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

TEST REPORT

For

Code & Modules Inc.

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Santa Clara, CA 95054

FCC ID: 2APEM-PXBD
IC: 23802-PXBD

Report Type: Original Report		**Product Type:** Edge Platform
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Report Number:	R1803143-407	
Report Date:	2018-05-10	
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* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "*" (Rev.2)

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1803143-407	Original Report	2018-05-10

1 General Description

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Code & Modules Inc.,* and their product models: *SO-0G-3GG, DO-1G-3GG, PO-2G-LTA and PP-4G-LTA,* FCC ID: 2APEM-PXBD IC: 23802-PXBD or the "EUT" as referred to in this report. The EUT is an Edge Platform.

Please refer to Declaration of Similarity letter provided by the manufacturer in Annex A of this report for the difference between *SO-0G-3GG, DO-1G-3GG, PO-2G-LTA and PP-4G-LTA*. The result in this report was gathered from typical production sample PP-4G-LTA and DO-1G-3GG, serial number: MPA751489001302 and MP8772903000431 assigned by Code & Modules.

1.2 Objective

This report is prepared on behalf of *Code & Modules 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, and Radiated Spurious Emissions.

1.3 Related Submittal(s)/Grant(s)

FCC 15.247 Report: R1803143-247 DSS
FCC 15.407 Report: R1803143-247 DTS

1.4 Test Methodology

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

1.5 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

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

1.6 Test Facility Registrations

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

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

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

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

1.7 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

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

BACL's ISO/IEC 17025:2005 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide

range of product categories. These product categories include Central Office Telecommunications Equipment [including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices, Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

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

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

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

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

- for Displays (ver. 6.0)
- for Imaging Equipment (ver. 2.0)
- for Computer Servers (ver. 2.0)

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

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

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

5 Other
- For Water Coolers (ver. 3.0)

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

- Australia: ACMA (Australian Communication and Media Authority) – APEC Tel MRA -Phase I;
- Canada: (Innovation, Science and Economic development Canada - ISEDC) Foreign Certification Body – FCB – APEC Tel MRA -Phase I & Phase II;
- Chinese Taipei (Republic of China – Taiwan):
  - BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
  - NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
  - EMC Directive 2014/30/EU US-EU EMC & Telecom MRA CAB (NB)
  - Radio & Teleterminal Equipment (R&TTE) Directive 1995/5/EC US -EU EMC & Telecom MRA CAB (NB)
  - Radio Equipment (RE) Directive 2014/53/EU US-EU EMC & Telecom MRA CAB (NB)
  - Low Voltage Directive (LVD) 2014/35/EU
- Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA) APEC Tel MRA -Phase I & Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Media Development Authority - IMDA) APEC Tel MRA -Phase I & Phase II;
- Japan: VCCI - Voluntary Control Council for Interference US-Japan Telecom Treaty VCCI Side Letter-
- USA:
  - ENERGY STAR Recognized Test Laboratory – US EPA
  - Telecommunications Certification Body (TCB) – US FCC;
  - Nationally Recognized Test Laboratory (NRTL) – US OSHA
- Vietnam: APEC Tel MRA -Phase I;

2 EUT Test Configuration

2.1 Justification

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

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

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

2.2 EUT Exercise Software

The test firmware used was Putty and Lab tool provided by *Code & Modules 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	11
	40	5200	11
	48	5240	11
	149	5745	11
	157	5785	11
	165	5825	11

Modulation	Channel	Frequency (MHz)	Power Setting
802.11n20 mode	36	5180	11
	40	5200	11
	48	5240	11
	149	5745	11
	157	5785	11
	165	5825	11
802.11n40 mode	38	5190	9
	46	5230	9
	151	5755	9
	159	5795	9

Modulation	Channel	Frequency (MHz)	Power Setting
802.11ac20 mode	36	5180	11
	40	5200	11
	48	5240	11
	149	5745	11
	157	5785	11
	165	5825	11
802.11ac40 mode	38	5190	9
	46	5230	9
	151	5775	9
	159	5795	9
802.11ac80 mode	42	5210	8
	155	5775	8

Note 1: *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
Note 2: 5150-5250 MHz band is not available for ISED.

2.3 Duty Cycle Correction Factor

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

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

5.2 GHz Results

Radio Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11a	42.34	100	42.34	3.732
802.11n20	39.34	100	39.34	4.052
802.11n40	19.00	100	19.00	7.212
802.11ac20	35.69	100	35.69	4.474
802.11ac40	15.20	100	15.20	8.182
802.11ac80	7.65	100	7.65	11.163

5.8 GHz Results

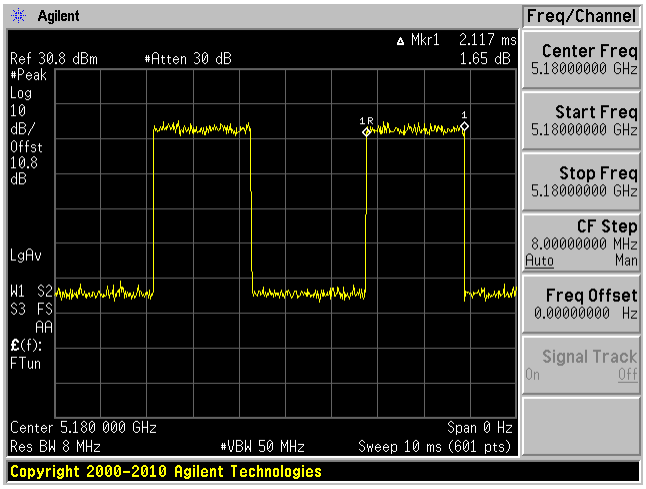
Radio Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11a	42.34	100	42.34	3.732
802.11n20	39.34	100	39.34	4.052
802.11n40	19.00	100	19.00	7.212
802.11ac20	35.69	100	35.69	4.474
802.11ac40	15.20	100	15.20	8.182
802.11ac80	7.65	100	7.65	11.163

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

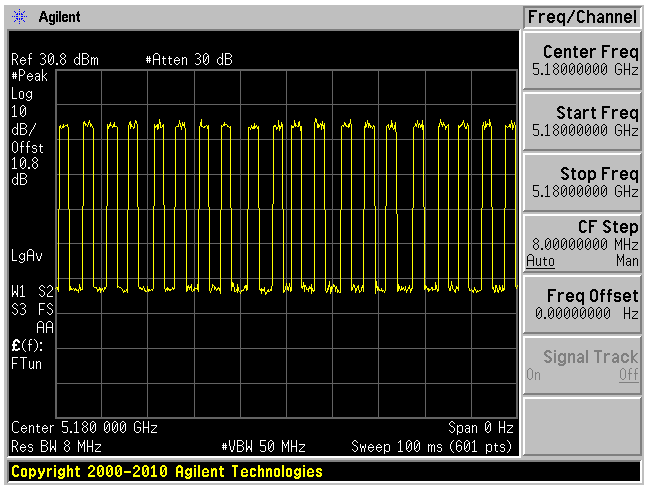
Please refer to the following plots.

5.2 GHz

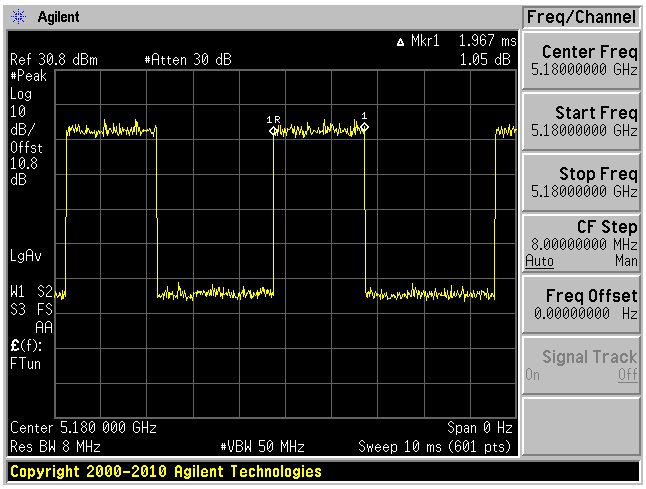
802.11a mode Pulse Width



802.11a mode # of Pulses in 100 ms



802.11n20 mode Pulse Width



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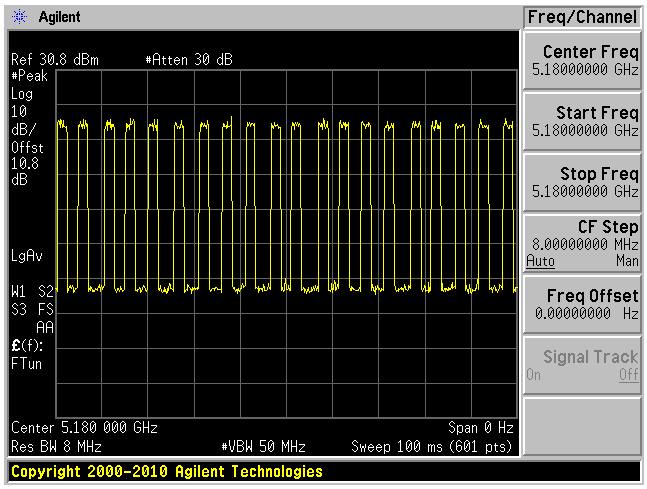
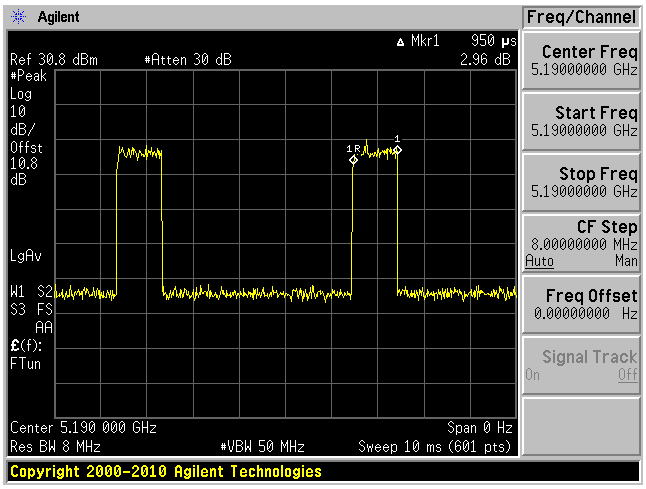
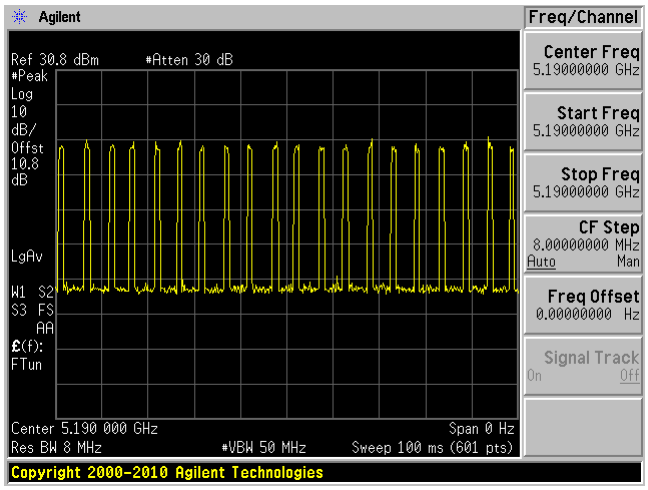


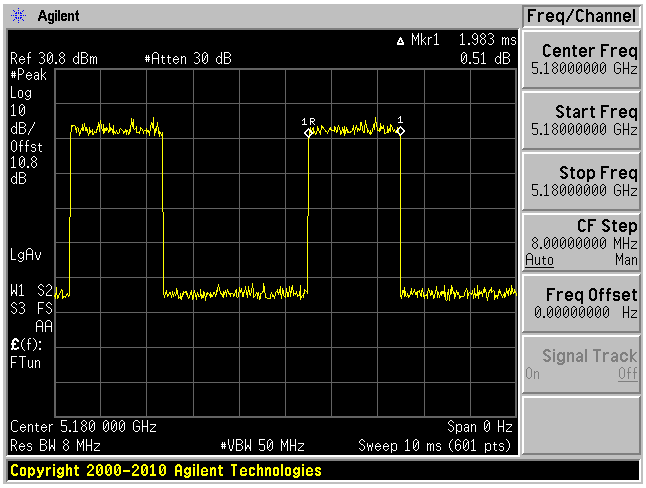
802.11n40 mode Pulse Width



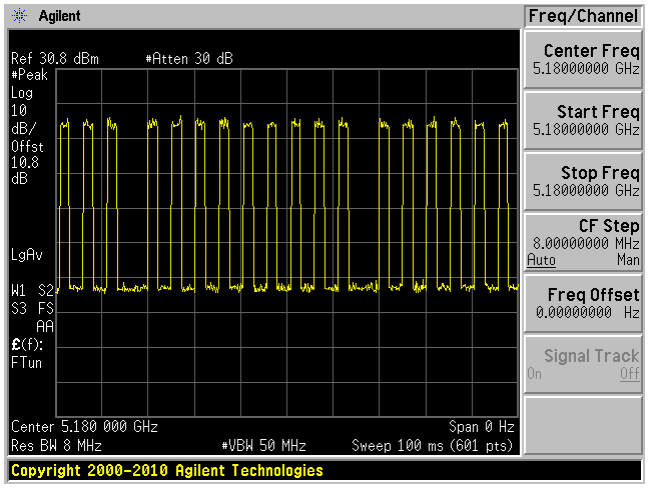
802.11n40 mode # of Pulses in 100 ms



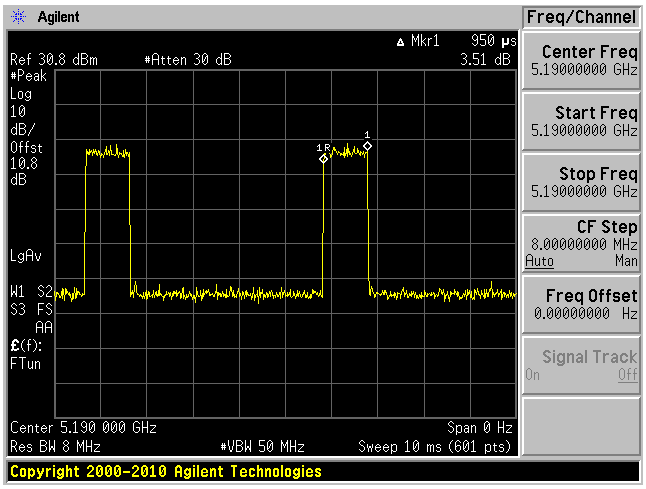
802.11ac20 mode Pulse Width



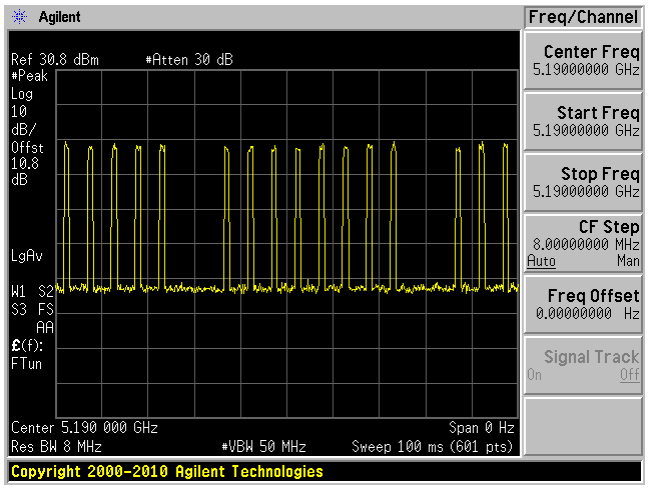
802.11ac20 mode # of Pulses in 100 ms



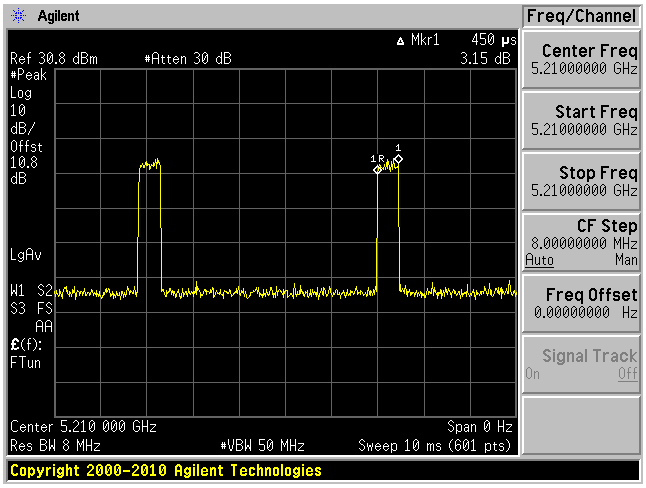
802.11ac40 mode Pulse Width



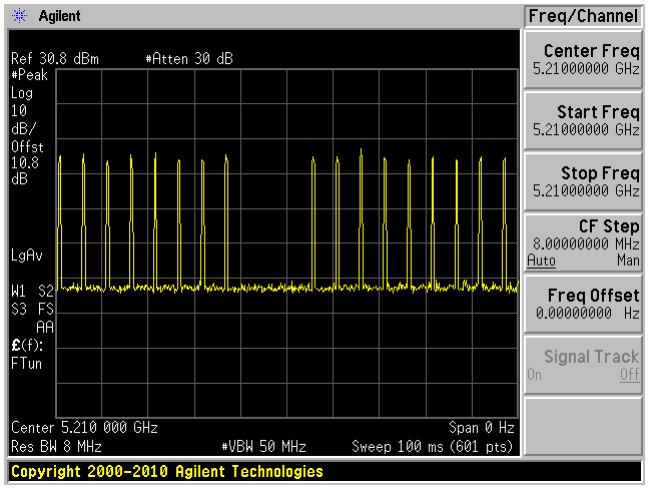
802.11ac40 mode # of Pulses in 100 ms



802.11ac80 mode Pulse Width

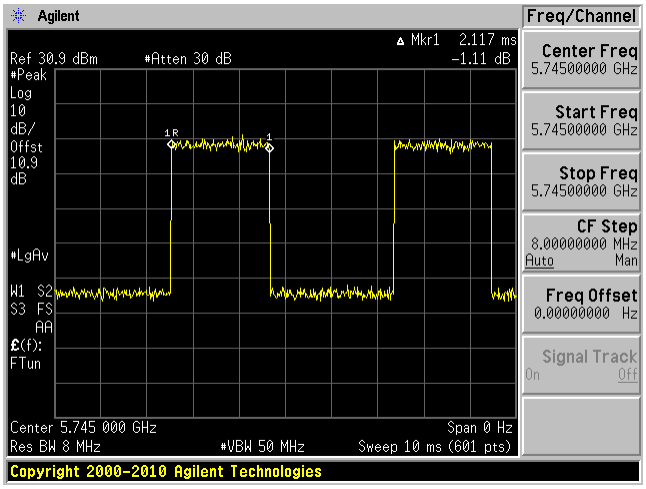


802.11ac80 mode # of Pulses in 100 ms

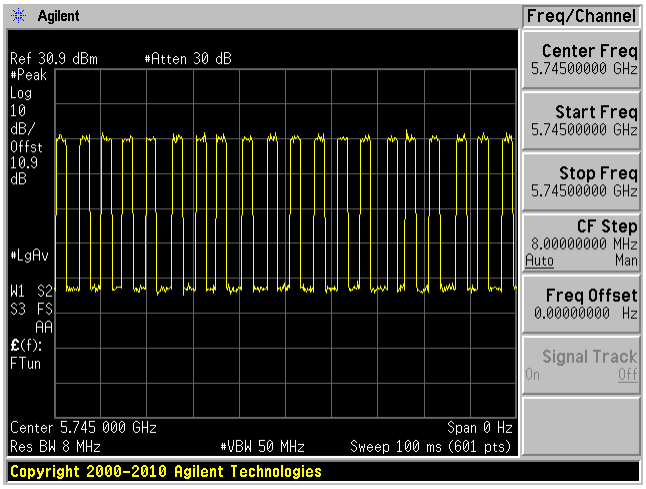


5.8 GHz

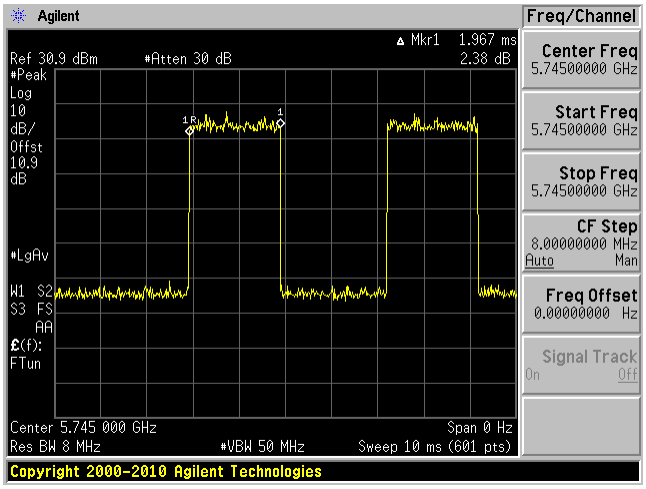
802.11a mode Pulse Width



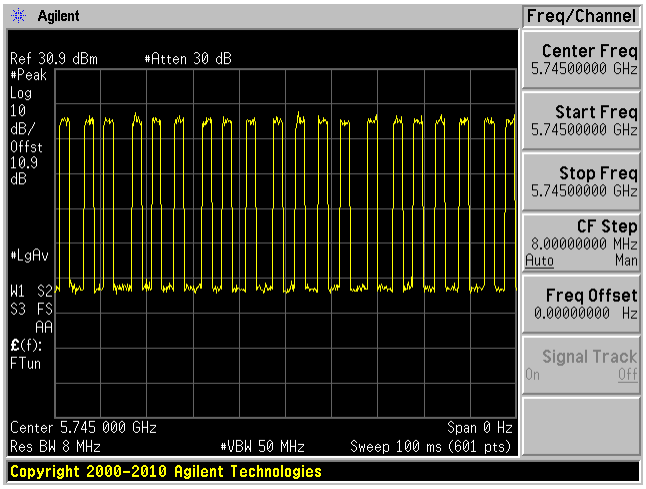
802.11a mode # of Pulses in 100 ms



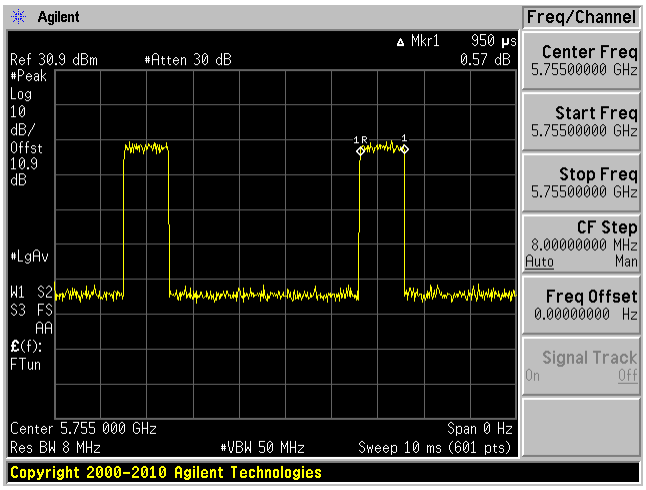
802.11n20 mode Pulse Width



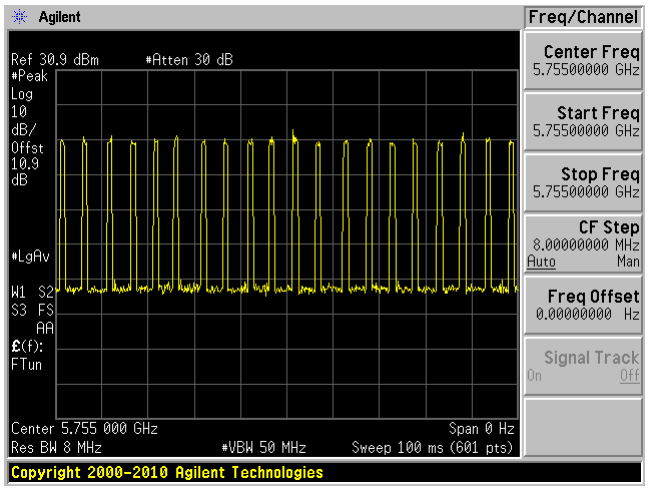
802.11n20 mode # of Pulses in 100 ms



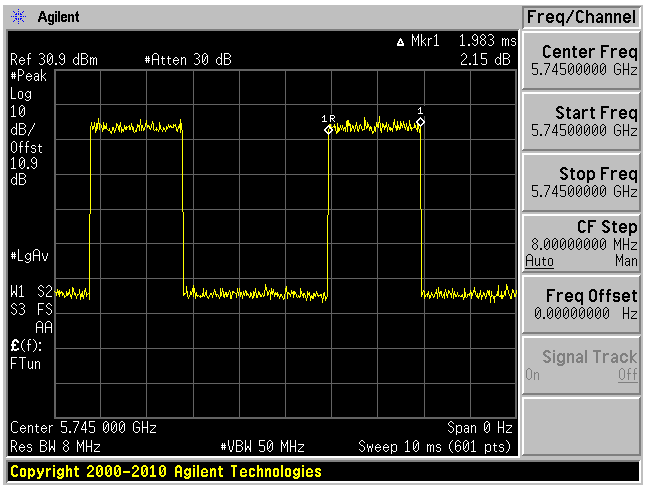
802.11n40 mode Pulse Width



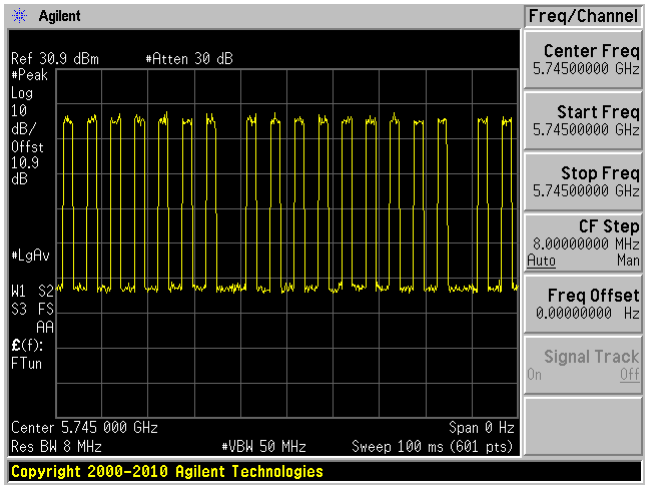
802.11n40 mode # of Pulses in 100 ms



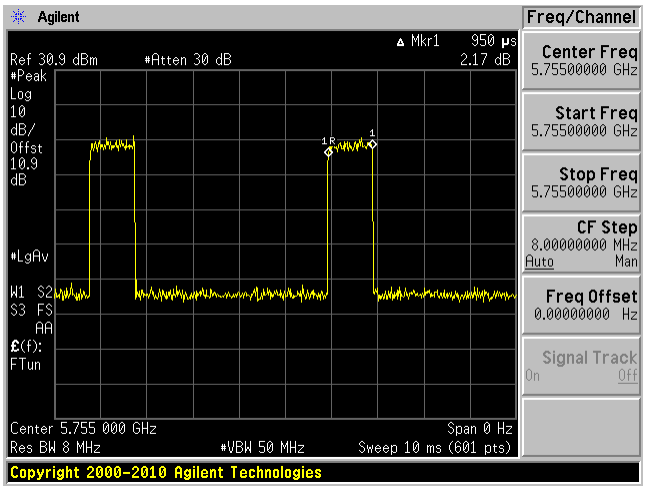
802.11ac20 mode Pulse Width



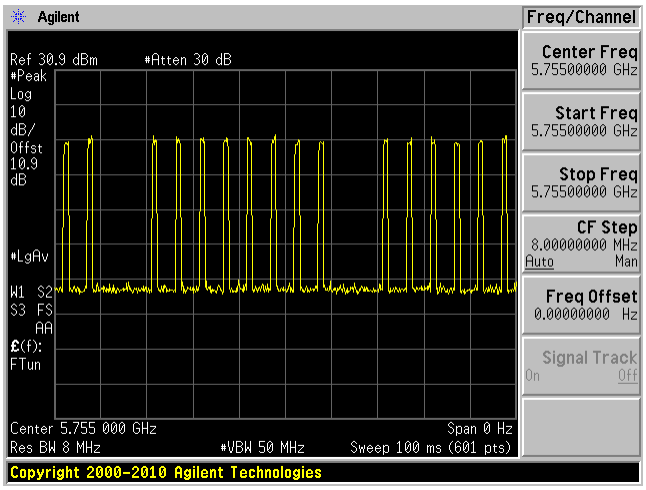
802.11ac20 mode # of Pulses in 100 ms



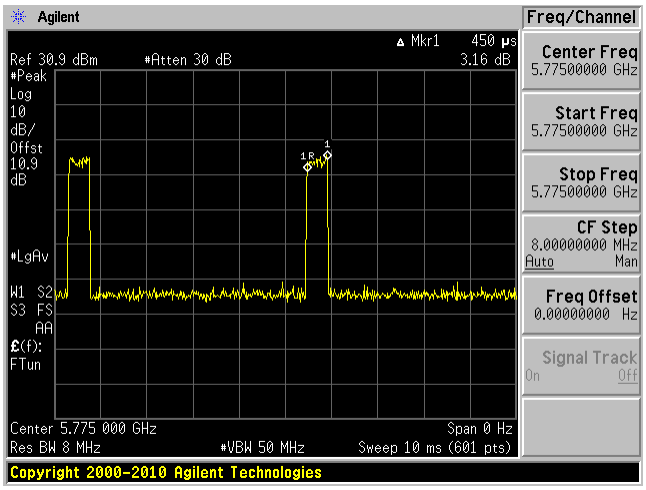
802.11ac40 mode Pulse Width



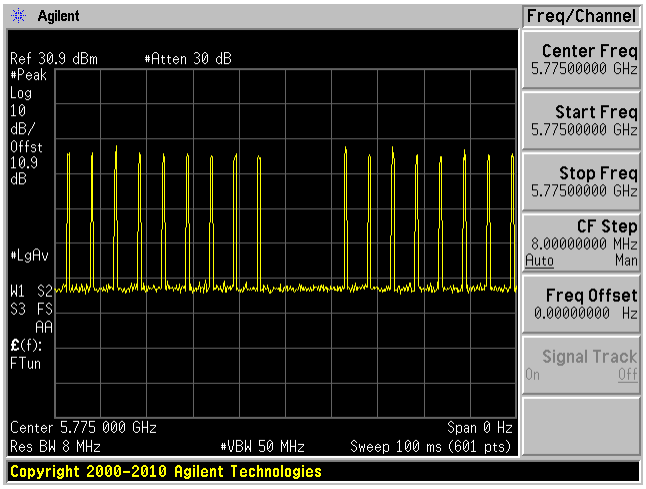
802.11ac40 mode # of Pulses in 100 ms



802.11ac80 mode Pulse Width



802.11ac80 mode # of Pulses in 100 ms



2.4 Equipment Modifications

None

2.5 Local Support Equipment

Manufacturer	Description	Model	Serial Number
Dell	Laptop	Latitude E6410	3CKRAQ1

2.6 Support Equipment

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

2.7 Power Supply/Adapter

Manufacturer	Description	Model
TRIAD	AC adapter	WS2U050-2000

2.8 Interface Ports and Cabling

Description	Length (m)	To	From
U.F.L to SMA	< 1 m	PSA	EUT
USB to Ethernet adapter	< 1 m	Laptop	Ethernet cable
Ethernet Cable	< 1 m	Ethernet adapter	Ethernet adapter
Ethernet adapter to USB	< 1 m	EUT	Ethernet cable

3 Summary of Test Results

FCC and IC Rules	Description of Test	Result
FCC §2.1091, §15.407(f), ISEDC RSS-102	RF Exposure	Compliant
FCC §15.203 ISEDC RSS-Gen §6.8	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

Note: 5150-5250 MHz band is not available for ISED.

4 FCC §2.1091, §15.407(f) & ISEDC RSS-102 - RF Exposure

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

Limits for General Population/Uncontrolled Exposure

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

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

Before equipment certification is granted, the procedure of IC RSS-102 must be followed concerning the exposure of humans to RF field

According to ISED RSS-102 Issue 5:

2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz[6] and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

4.1 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

4.2 MPE Results

2.4 GHz BLE

Maximum peak output power at antenna input terminal (dBm):	-3.04
Maximum peak output power at antenna input terminal (mW):	0.497
Prediction distance (cm):	20
Prediction frequency (MHz):	2480
Maximum Antenna Gain, typical (dBi):	2.0
Maximum Antenna Gain (numeric):	1.585
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.000157
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.000157 mW/cm^2. Limit is 1.0 mW/cm^2.

3G/4G

Pixieboard Version	Mode	Mobile Module	FCC ID	IC ID
PixieBoard Core	*SO-0G-3GG*	UMTS/HSPA+3G Module	XMR201510UC20	1022A-201510UC20
PixieBoard DUO	*DO-1G-3GG,*	UMTS/HSPA+3G Module	XMR201510UC20	1022A-201510UC20
PixieBoard PRO	*PO-2G-LTA*	LTE Module	XMR201605EC25A	10224A-201611EC25A
PixieBoard PRO+	*PP-4G-LTA*	LTE Module	XMR201605EC25A	10224A-201611EC25A

Mode	Frequency (MHz)	Target Power (dBm)	Target Power (mW)	Maximum Antenna Gain (dBi)	Numeric Antenna Gain	Evaluation Distance (cm)	Power density @20cm (mW/cm^2)	FCC MPE Limit (mW/cm^2)
WCDMA (Band V)	826.4-846.6	23.5	223.87	5.1	3.236	20	0.144122	0.551
WCDMA (Band II)	1852.4-1907.6	23.5	223.87	5.1	3.236	20	0.144122	1.0
WCDMA (Band IV)	1712.4-1752.6	23.5	223.87	5.1	3.236	20	0.144122	1.0
LTE (Band II)	1850.7-1909.3	24	251.19	5.1	3.236	20	0.161708	1.0
LTE (Band IV)	1710.7-1754.3	24	251.19	5.1	3.236	20	0.161708	1.0
LTE (Band XII)	699.7-715.3	24	251.19	5.1	3.236	20	0.161708	0.466

Note: Worst Case module was evaluated for 3G/4G.

2.4 GHz Classic Bluetooth

Maximum peak output power at antenna input terminal (dBm):	1.47
Maximum peak output power at antenna input terminal (mW):	1.403
Prediction distance (cm):	20
Prediction frequency (MHz):	2480
Maximum Antenna Gain, typical (dBi):	2.0
Maximum Antenna Gain (numeric):	1.585
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.000442
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.000442 mW/cm^2. Limit is 1.0 mW/cm^2.

5 GHz Wi-Fi

Maximum output power at antenna input terminal (dBm):	14.40
Maximum output power at antenna input terminal (mW):	27.542
Prediction distance (cm):	20
Prediction frequency (MHz):	5745
Maximum Antenna Gain, typical (dBi):	2.5
Maximum Antenna Gain (numeric):	1.778
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.009744
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.00974 mW/cm^2. Limit is 1.0 mW/cm^2.

Worst case colocation 3G/4G, 2.4 GHz Classic Bluetooth, and 5 GHz Wi-Fi.

Frequency Band	Max Conducted Power(dBm)	Evaluated Distance (cm)	Worst-Case MPE (mW/cm^2)	MPE Limit (mW/cm^2)	Worst-Case MPE Ratios	Sum of MPE Ratios	Limit
Worst Case							
2.4 GHz Classic Bluetooth	1.47	20	0.000442	1.0	0.044 %	35.72 %	100 %
5 GHz WiFi	14.40	20	0.009744	1.0	0.974 %		
LTE (Band XII)	24	20	0.161708	0.466	34.701 %		

Note: Worst Case module was evaluated for 3G/4G.

4.3 RF exposure evaluation exemption for IC

5 GHz Wi-Fi

14.40 + 2.5 dBi = 16.90 dBm < $1.31\times10^{-2}f^{0.6834}$ = 4.857 W = 36.864 dBm

Therefore the RF exposure is not required.

5 FCC §15.203 and ISEDC RSS-Gen §6.8 - Antenna Requirements

5.1 Applicable Standards

According to FCC §15.203:

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

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

According to ISEDC RSS-Gen §6.8: Transmitter Antenna

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

5.2 Antenna List

The antennas used by the EUT have nonstandard U.FL Connectors.

Antenna usage	Band of Operation (GHz)	Maximum Antenna Gain (dBi)
Wi-Fi/Bluetooth	2.4	2.0
Wi-Fi	5.0	2.5
3G/4G	850/900/1800/1900/2110	5.1

6 FCC §15.207 and 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 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

6.5 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	2016-06-23	2 years
Rohde and Schwarz	Impulse Limiter	ESH3-Z2	101963	2018-02-07	1 year
Keysight Technologies	RF Limiter	11867A	MY42242932	2018-01-15	1 year
Solar Electronics Company	High Pass Filter	Type 7930-100	7930150202	2018-02-27	1 year
Suirong	30 ft conductive emission cable	LMR 400	-	N/R	N/A
FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160129	2017-04-24	1 year

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

6.6 Test Environmental Conditions

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

The testing was performed by Vincent Licata on 2018-04-12 in 5 chamber 3.

6.7 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:

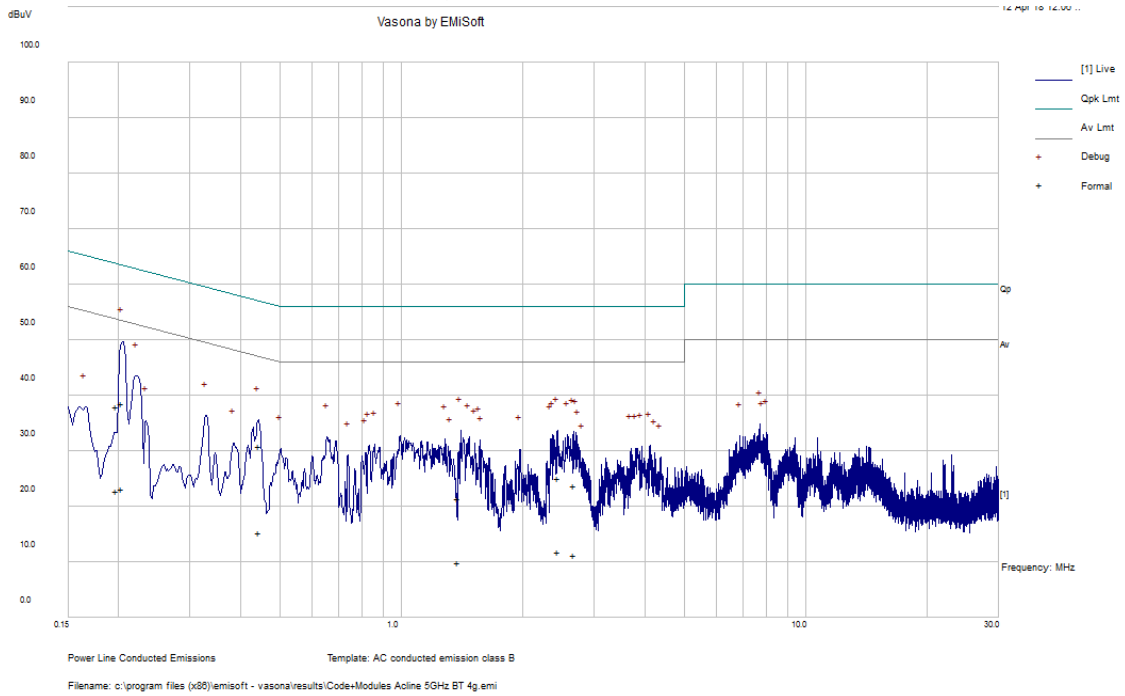
Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Live/Neutral)**	**Range (MHz)**
-18.51	0.152311	Line	0.15-30

6.8 Conducted Emissions Test Plots and Data

PP-4G-LTA

5.8 GHz Wi-Fi, ac20 mode (5745 MHz), BT (2480 MHz), WCDMA (1888.4 MHz)

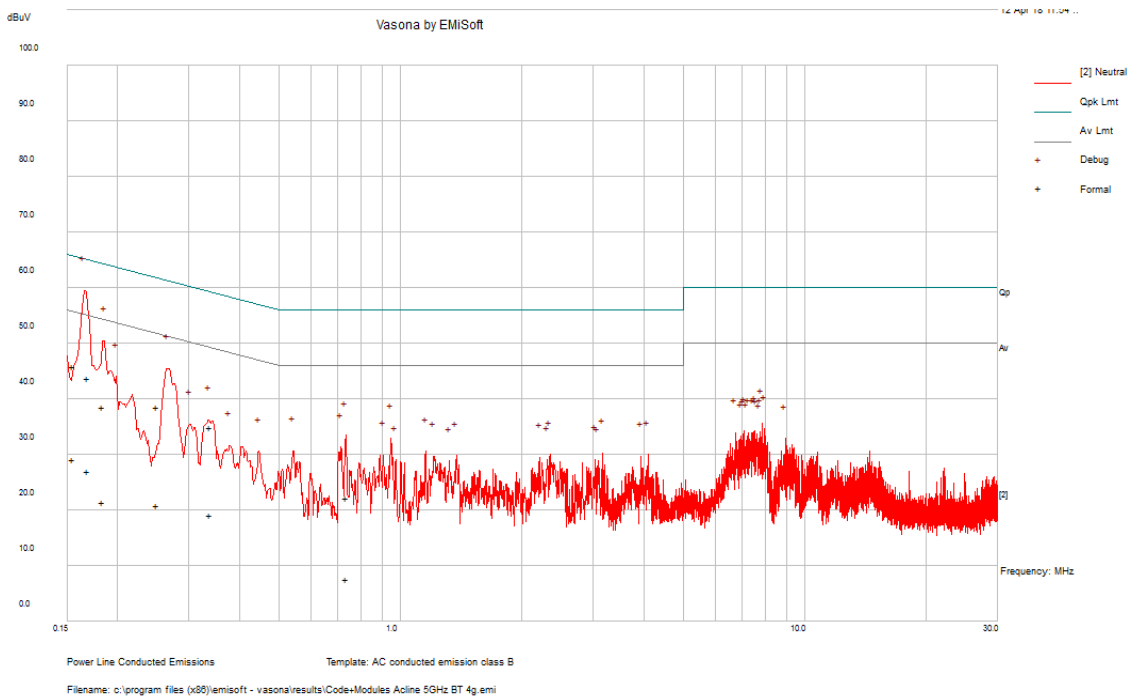
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.197044	38.06	Line	63.73	-25.67	QP
0.203663	38.59	Line	63.46	-24.87	QP
0.443514	30.9	Line	57	-26.09	QP
2.446435	25.12	Line	56	-30.88	QP
1.383487	21.4	Line	56	-34.6	QP
2.666957	23.86	Line	56	-32.14	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.197044	22.75	Line	53.73	-30.98	Ave.
0.203663	23.14	Line	53.46	-30.32	Ave.
0.443514	15.28	Line	47	-31.72	Ave.
2.446435	11.94	Line	46	-34.06	Ave.
1.383487	10.04	Line	46	-35.96	Ave.
2.666957	11.28	Line	46	-34.72	Ave.

120 V, 60 Hz – Neutral



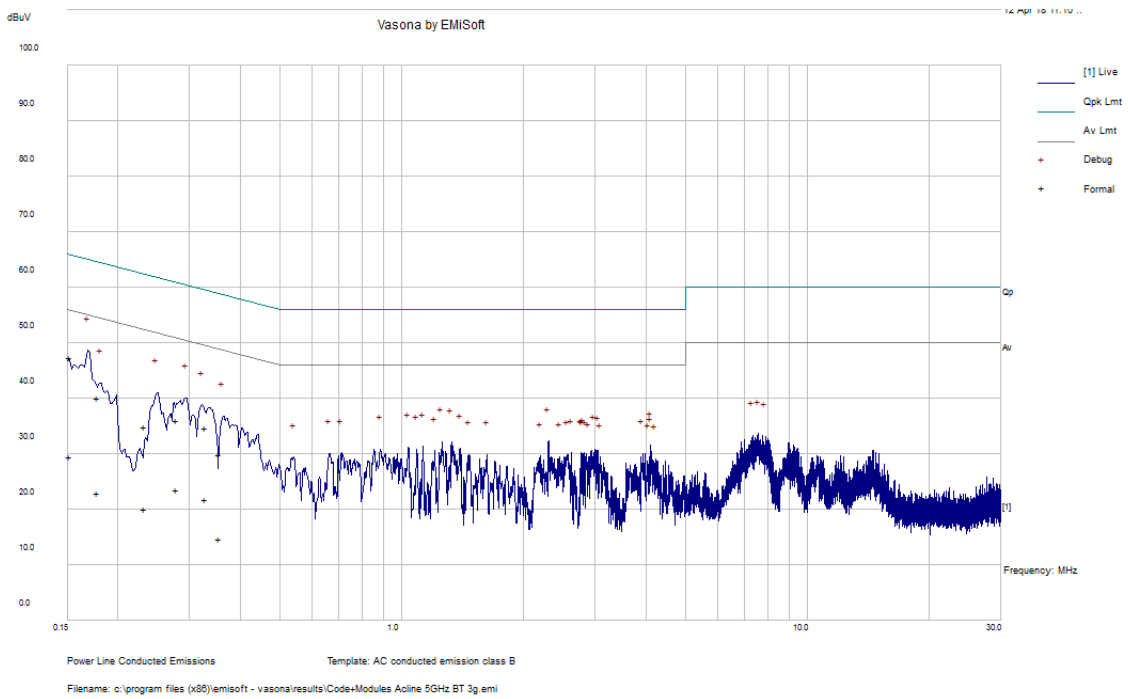
Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.15533	45.98	Neutral	65.71	-19.73	QP
0.168543	43.87	Neutral	65.03	-21.16	QP
0.249857	38.61	Neutral	61.76	-23.15	QP
0.184139	38.61	Neutral	64.3	-25.69	QP
0.734628	22.19	Neutral	56	-33.81	QP
0.337576	34.97	Neutral	59.26	-24.3	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.15533	29.13	Neutral	55.71	-26.58	Ave.
0.168543	26.97	Neutral	55.03	-28.06	Ave.
0.249857	20.96	Neutral	51.76	-30.81	Ave.
0.184139	21.5	Neutral	54.3	-32.8	Ave.
0.734628	7.65	Neutral	46	-38.35	Ave.
0.337576	19.21	Neutral	49.26	-30.06	Ave.

DO-1G-3GG

5.8 GHz Wi-Fi, ac20 mode (5745 MHz), BT (2480 MHz), WCDMA (1888.4 MHz)

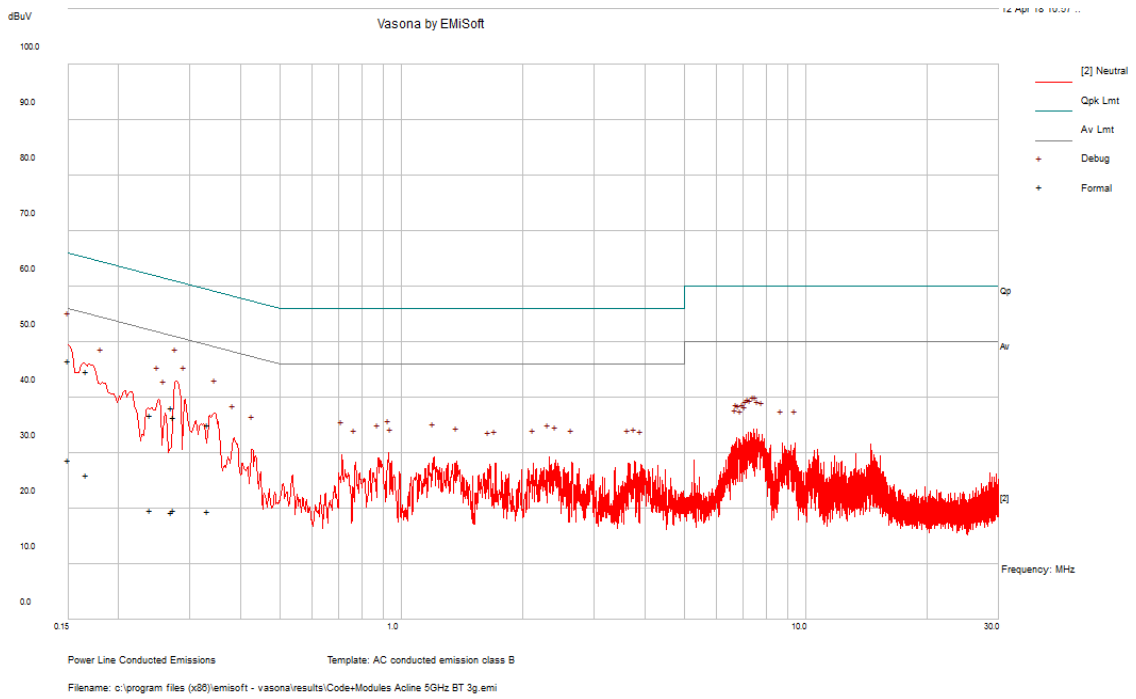
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.152311	47.37	Line	65.87	-18.51	QP
0.27883	36.09	Line	60.85	-24.76	QP
0.232708	34.88	Line	62.35	-27.47	QP
0.328394	34.69	Line	59.49	-24.81	QP
0.177592	40.09	Line	64.6	-24.5	QP
0.354819	29.96	Line	58.85	-28.88	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.152311	29.5	Line	55.87	-26.38	Ave.
0.27883	23.66	Line	50.85	-27.19	Ave.
0.232708	20.18	Line	52.35	-32.18	Ave.
0.328394	21.84	Line	49.49	-27.65	Ave.
0.177592	23.09	Line	54.6	-31.5	Ave.
0.354819	14.7	Line	48.85	-34.15	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.150142	46.69	Neutral	65.99	-19.3	QP
0.270158	38.19	Neutral	61.11	-22.93	QP
0.274642	36.41	Neutral	60.98	-24.57	QP
0.166972	44.72	Neutral	65.11	-20.39	QP
0.331658	35.16	Neutral	59.41	-24.24	QP
0.239631	36.85	Neutral	62.11	-25.26	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.150142	28.75	Neutral	55.99	-27.24	Ave.
0.270158	19.35	Neutral	51.11	-31.77	Ave.
0.274642	19.82	Neutral	50.98	-31.15	Ave.
0.166972	26.05	Neutral	55.11	-29.06	Ave.
0.331658	19.58	Neutral	49.41	-29.83	Ave.
0.239631	19.77	Neutral	52.11	-32.34	Ave.

7 FCC §15.209, §15.407(b) and 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 = 100 ms
(2) Average: RBW = 1 / T / 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	100044	2017-09-19	2 years
Agilent	Analyzer, Spectrum	E4446A	US44300386	2017-04-20	1 year
Rohde & Schwarz	Analyzer, Spectrum	FSQ26	200749	2017-06-08	2 years
Sunol Sciences	System Controller	SC99V	011003-1	N/R	N/A
Sunol Sciences	Antenna, Biconi-Log	JB1	A013105-3	2018-02-26	2 years
Wisewave	Antenna, Horn	ARH-4223-02	10555-02	2017-12-15	2 years
Agilent	Amplifier, Pre	8447D	2944A10187	2018-04-02	1 year
IW	AOBOR Hi frequency Co AX Cable	DC 1531	KPS-1501A3960K PS	2017-08-05	1 year
-	SMA cable	-	C00011	Each time[1]	N/A
-	N-Type Cable	-	C00012	Each time[1]	N/A
-	N-Type Cable	-	C00014	Each time[1]	N/A
HP	Pre-Amplifier	8449B	3147A00400	2018-02-02	1 year
Sunol Sciences	Antenna, Horn	DRH-118	A052704	2017-03-27	2 years
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

Note[1]: cables included in the test set-up will be checked each time before testing.

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

7.6 Test Environmental Conditions

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

The testing was performed by Vincent Licata 2018-04-03 to 2018-04-12 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:

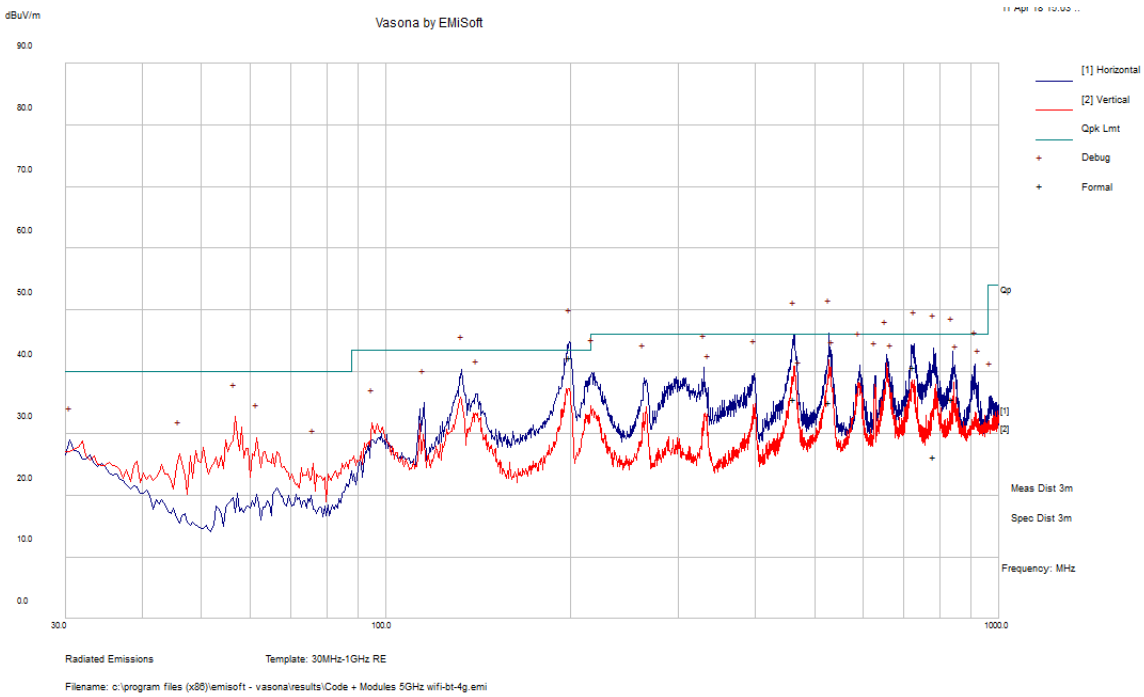
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-0.35	198.82	Horizontal	DO-1G-3GG Colocation

7.8 Radiated Emissions Test Result Data

30 MHz – 1 GHz Worst Case, Measured at 3 meters

PP-4G-LTA

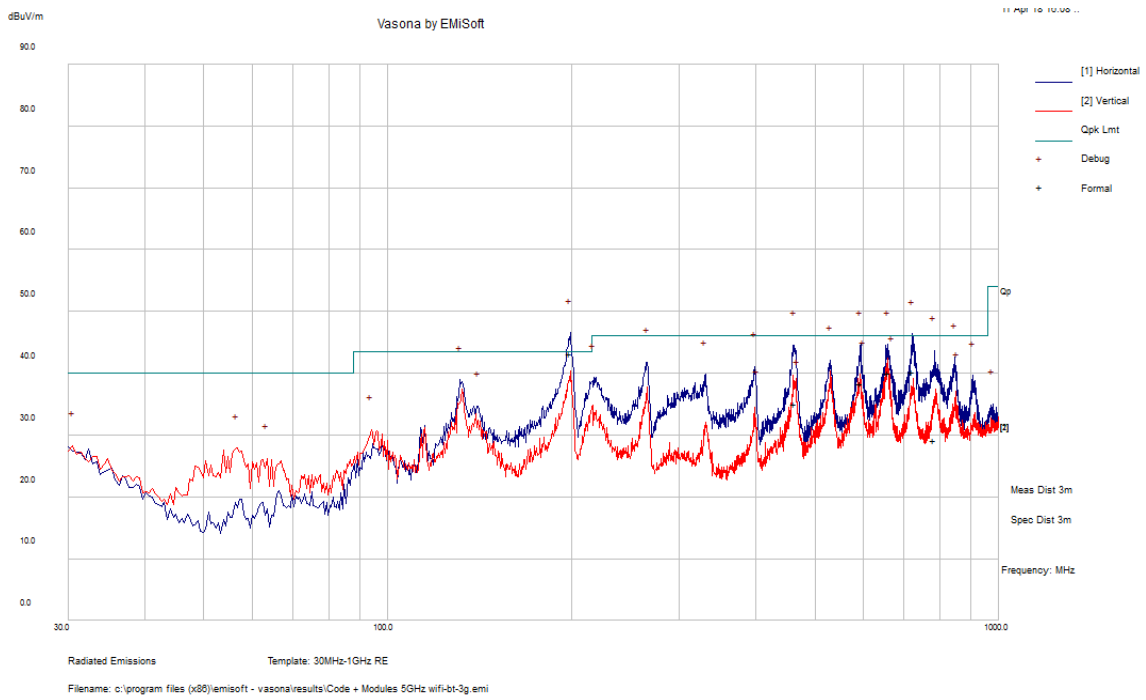
5.8 GHz Wi-Fi, ac20 mode (5745 MHz), BT (2480 MHz), WCDMA (1888.4 MHz)



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
199.0683	42.4	110	H	261	43.5	-1.1	QP
527.9333	35.06	276	H	321	46	-10.94	QP
462.2495	35.66	193	H	94	46	-10.34	QP
726.7858	40.85	121	H	359	46	-5.15	QP
782.3085	26.19	234	H	162	46	-19.81	QP
839.475	35.62	99	H	258	46	-10.38	QP

DO-1G-3GG

5.8 GHz Wi-Fi, ac20 mode (5745 MHz), BT (2480 MHz), WCDMA (1888.4 MHz)



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
198.8198	43.15	150	H	193	43.5	-0.35	QP
721.8788	40.28	147	H	15	46	-5.72	QP
594.1688	38.42	136	H	342	46	-7.58	QP
657.855	40.11	145	H	152	46	-5.89	QP
462.9845	35.03	112	H	321	46	-10.97	QP
784.0788	29.22	194	H	148	46	-16.78	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	60.47	45	184	H	33.58	8.53	0.00	102.58	-	-	PK
5180	49.37	45	184	H	33.58	8.53	0.00	91.48	-	-	AV
5180	58.19	162	300	V	33.58	8.53	0.00	100.30	-	-	PK
5180	46.75	162	300	V	33.58	8.53	0.00	88.86	-	-	AV
5150	50.03	45	184	H	33.42	9.75	33.15	60.05	74.00	-13.9	PK
5150	35.26	45	184	H	33.42	9.75	33.15	45.28	54.00	-8.72	AV
5150	47.59	162	300	V	33.42	9.75	33.15	57.61	74.00	-16.4	PK
5150	32.39	162	300	V	33.42	9.75	33.15	42.41	54.00	-11.6	AV
10360	43.14	0	100	H	38.09	14.60	32.88	62.95	74.00	-11.1	PK
10360	29.81	0	100	H	38.09	14.60	32.88	49.62	54.00	-4.38	AV
Middle Channel 5200 MHz											
5200	60.84	318	252	H	33.58	8.53	0.00	102.95	-	-	PK
5200	49.48	318	252	H	33.58	8.53	0.00	91.59	-	-	AV
5200	58.44	180	300	V	33.58	8.53	0.00	100.55	-	-	PK
5200	47.22	180	300	V	33.58	8.53	0.00	89.33	-	-	AV
10400	42.75	0	100	H	38.12	14.60	32.88	62.58	74.00	-11.4	PK
10400	28.96	0	100	H	38.12	14.60	32.88	48.79	54.00	-5.21	AV
High Channel 5240 MHz											
5240	59.13	318	268	H	33.56	8.53	0.00	101.22	-	-	PK
5240	48.26	318	268	H	33.56	8.53	0.00	90.35	-	-	AV
5240	58.55	175	300	V	33.56	8.53	0.00	100.64	-	-	PK
5240	48.21	175	300	V	33.56	8.53	0.00	90.30	-	-	AV
5350	45.02	0	100	H	33.76	9.91	33.22	55.47	74.00	-18.5	PK
5350	30.92	0	100	H	33.76	9.91	33.22	41.37	54.00	-12.6	AV
10480	43.27	0	100	H	38.19	14.79	32.88	63.37	74.00	-10.6	PK
10480	29.09	0	100	H	38.19	14.79	32.88	49.19	54.00	-4.81	AV

802.11n20 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	60.82	315	100	H	33.58	8.53	0.00	102.93	-	-	PK
5180	48.62	315	100	H	33.58	8.53	0.00	90.73	-	-	AV
5180	57.03	165	293	V	33.58	8.53	0.00	99.14	-	-	PK
5180	46.02	165	293	V	33.58	8.53	0.00	88.13	-	-	AV
5150	51.27	315	100	H	33.42	9.75	33.15	61.29	74.00	-12.7	PK
5150	34.28	315	100	H	33.42	9.75	33.15	44.30	54.00	-9.70	AV
5150	46.68	165	293	V	33.42	9.75	33.15	56.70	74.00	-17.3	PK
5150	32.39	165	293	V	33.42	9.75	33.15	42.41	54.00	-11.6	AV
10360	43.58	0	100	H	38.09	14.60	32.88	63.39	74.00	-10.6	PK
10360	29.21	0	100	H	38.09	14.60	32.88	49.02	54.00	-4.98	AV
Middle Channel 5200 MHz											
5200	60.36	318	100	H	33.58	8.53	0.00	102.47	-	-	PK
5200	48.23	318	100	H	33.58	8.53	0.00	90.34	-	-	AV
5200	58.62	164	286	V	33.58	8.53	0.00	100.73	-	-	PK
5200	47.72	164	286	V	33.58	8.53	0.00	89.83	-	-	AV
10400	43.70	0	100	H	38.12	14.60	32.88	63.53	74.00	-10.5	PK
10400	29.18	0	100	H	38.12	14.60	32.88	49.01	54.00	-4.99	AV
5200	60.36	318	100	H	33.58	8.53	0.00	102.47	-	-	PK
5200	48.23	318	100	H	33.58	8.53	0.00	90.34	-	-	AV
High Channel 5240 MHz											
5240	59.49	314	100	H	33.56	8.53	0.00	101.58	-	-	PK
5240	47.94	314	100	H	33.56	8.53	0.00	90.03	-	-	AV
5240	58.60	169	300	V	33.56	8.53	0.00	100.69	-	-	PK
5240	47.59	169	300	V	33.56	8.53	0.00	89.68	-	-	AV
5350	44.82	0	100	H	33.76	9.91	33.22	55.27	74.00	-18.7	PK
5350	31.02	0	100	H	33.76	9.91	33.22	41.47	54.00	-12.5	AV
10480	43.32	0	100	H	38.19	14.79	32.88	63.42	74.00	-10.6	PK
10480	29.52	0	100	H	38.19	14.79	32.88	49.62	54.00	-4.38	AV

802.11n40 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	55.08	317	100	H	33.58	8.53	0.00	97.19	-	-	PK
5190	43.74	317	100	H	33.58	8.53	0.00	85.85	-	-	AV
5190	50.76	160	295	V	33.58	8.53	0.00	92.87	-	-	PK
5190	40.53	160	295	V	33.58	8.53	0.00	82.64	-	-	AV
5150	51.26	317	100	H	33.42	9.75	33.15	61.28	74.00	-12.7	PK
5150	35.01	317	100	H	33.42	9.75	33.15	45.03	54.00	-8.97	AV
5150	45.75	160	295	V	33.42	9.75	33.15	55.77	74.00	-18.2	PK
5150	32.50	160	295	V	33.42	9.75	33.15	42.52	54.00	-11.5	AV
10380	43.27	0	100	H	38.09	14.60	32.88	63.08	74.00	-10.9	PK
10380	29.76	0	100	H	38.09	14.60	32.88	49.57	54.00	-4.43	AV
High Channel 5230 MHz											
5230	54.42	317	100	H	33.56	8.53	0.00	96.51	-	-	PK
5230	43.51	317	100	H	33.56	8.53	0.00	85.60	-	-	AV
5230	52.56	169	300	V	33.56	8.53	0.00	94.65	-	-	PK
5230	41.02	169	300	V	33.56	8.53	0.00	83.11	-	-	AV
5350	44.86	0	100	H	33.76	9.91	33.22	55.31	74.00	-18.7	PK
5350	30.85	0	100	H	33.76	9.91	33.22	41.30	54.00	-12.7	AV
10460	43.29	0	100	H	38.19	14.79	32.88	63.39	74.00	-10.6	PK
10460	29.52	0	100	H	38.19	14.79	32.88	49.62	54.00	-4.38	AV

802.11ac20 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	60.29	316	100	H	33.58	8.53	0.00	102.40	-	-	PK
5180	48.11	316	100	H	33.58	8.53	0.00	90.22	-	-	AV
5180	56.40	160	294	V	33.58	8.53	0.00	98.51	-	-	PK
5180	45.74	160	294	V	33.58	8.53	0.00	87.85	-	-	AV
5150	52.13	316	100	H	33.42	9.75	33.15	62.15	74.00	-11.9	PK
5150	35.18	316	100	H	33.42	9.75	33.15	45.20	54.00	-8.8	AV
5150	48.22	160	294	V	33.42	9.75	33.15	58.24	74.00	-15.8	PK
5150	32.71	160	294	V	33.42	9.75	33.15	42.73	54.00	-11.3	AV
10360	43.64	0	100	H	38.09	14.60	32.88	63.45	74.00	-10.5	PK
10360	29.44	0	100	H	38.09	14.60	32.88	49.25	54.00	-4.75	AV
Middle Channel 5200 MHz											
5200	60.69	319	100	H	33.58	8.53	0.00	102.80	-	-	PK
5200	48.68	319	100	H	33.58	8.53	0.00	90.79	-	-	AV
5200	58.57	166	300	V	33.58	8.53	0.00	100.68	-	-	PK
5200	47.09	166	300	V	33.58	8.53	0.00	89.20	-	-	AV
10400	42.85	0	100	H	38.12	14.60	32.88	62.68	74.00	-11.3	PK
10400	28.91	0	100	H	38.12	14.60	32.88	48.74	54.00	-5.26	AV
High Channel 5240 MHz											
5240	60.41	318	100	H	33.56	8.53	0.00	102.50	-	-	PK
5240	48.38	318	100	H	33.56	8.53	0.00	90.47	-	-	AV
5240	58.07	168	300	V	33.56	8.53	0.00	100.16	-	-	PK
5240	47.16	168	300	V	33.56	8.53	0.00	89.25	-	-	AV
5350	44.54	0	100	H	33.76	9.91	33.22	54.99	74.00	-19.0	PK
5350	30.79	0	100	H	33.76	9.91	33.22	41.24	54.00	-12.8	AV
10480	43.78	0	100	H	38.19	14.79	32.88	63.88	74.00	-10.1	PK
10480	29.77	0	100	H	38.19	14.79	32.88	49.87	54.00	-4.13	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 5190 MHz											
5190	55.01	317	100	H	33.58	8.53	0.00	97.12	-	-	PK
5190	43.53	317	100	H	33.58	8.53	0.00	85.64	-	-	AV
5190	52.71	163	296	V	33.58	8.53	0.00	94.82	-	-	PK
5190	42.85	163	296	V	33.58	8.53	0.00	84.96	-	-	AV
5150	52.07	317	100	H	33.42	9.75	33.15	62.09	74.00	-11.9	PK
5150	36.91	317	100	H	33.42	9.75	33.15	46.93	54.00	-7.07	AV
5150	47.43	163	296	V	33.42	9.75	33.15	57.45	74.00	-16.6	PK
5150	33.74	163	296	V	33.42	9.75	33.15	43.76	54.00	-10.2	AV
10380	43.96	0	100	H	38.09	14.60	32.88	63.77	74.00	-10.2	PK
10380	30.28	0	100	H	38.09	14.60	32.88	50.09	54.00	-3.91	AV
High Channel 5230 MHz											
5230	54.76	318	100	H	33.56	8.53	0.00	96.85	-	-	PK
5230	43.21	318	100	H	33.56	8.53	0.00	85.30	-	-	AV
5230	52.55	170	300	V	33.56	8.53	0.00	94.64	-	-	PK
5230	42.68	170	300	V	33.56	8.53	0.00	84.77	-	-	AV
5350	44.21	0	100	H	33.76	9.91	33.22	54.66	74.00	-19.3	PK
5350	30.99	0	100	H	33.76	9.91	33.22	41.44	54.00	-12.5	AV
10460	43.46	0	100	H	38.19	14.79	32.88	63.56	74.00	-10.4	PK
10460	29.31	0	100	H	38.19	14.79	32.88	49.41	54.00	-4.59	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	50.91	46	100	H	33.58	8.53	0.00	93.02	-	-	PK
5210	40.67	46	100	H	33.58	8.53	0.00	82.78	-	-	AV
5210	47.75	165	292	V	33.58	8.53	0.00	89.86	-	-	PK
5210	38.16	165	292	V	33.58	8.53	0.00	80.27	-	-	AV
5150	57.45	46	100	H	33.42	9.75	33.15	67.47	74.00	-6.53	PK
5150	41.25	46	100	H	33.42	9.75	33.15	51.27	54.00	-2.73	AV
5150	49.86	165	292	V	33.42	9.75	33.15	59.88	74.00	-14.1	PK
5150	35.93	165	292	V	33.42	9.75	33.15	45.95	54.00	-8.05	AV
5350	44.45	0	100	H	33.76	9.91	33.22	54.90	74.00	-19.1	PK
5350	31.83	0	100	H	33.76	9.91	33.22	42.28	54.00	-11.7	AV
10420	43.47	0	100	H	38.12	14.60	32.88	63.30	74.00	-10.7	PK
10420	30.56	0	100	H	38.12	14.60	32.88	50.39	54.00	-3.61	AV

Note: 5150-5250 MHz band is FCC use only

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	63.90	315	272	H	33.94	9.00	0.00	106.84	-	-	PK
5745	52.99	315	272	H	33.94	9.00	0.00	95.93	-	-	AV
5745	65.00	184	290	V	33.94	9.00	0.00	107.94	-	-	PK
5745	54.46	184	290	V	33.94	9.00	0.00	97.40	-	-	AV
5720	53.92	315	272	H	33.94	10.31	33.22	64.94	68.26	-3.32	PK
5720	51.84	184	290	V	33.94	10.31	33.22	62.86	68.26	-5.40	PK
5725	59.54	315	272	H	33.94	10.31	33.22	70.56	122.00	-51.4	PK
5725	57.39	184	290	V	33.94	10.31	33.22	68.41	122.00	-53.6	PK
11490	43.01	0	100	V	38.96	15.88	32.75	65.10	74.00	-8.90	PK
11490	28.36	0	100	V	38.96	15.88	32.75	50.45	54.00	-3.55	AV
Middle Channel 5785 MHz											
5785	63.29	318	270	H	33.86	9.10	0.00	106.25	-	-	PK
5785	52.83	318	270	H	33.86	9.10	0.00	95.79	-	-	AV
5785	63.37	184	300	V	33.86	9.10	0.00	106.33	-	-	PK
5785	52.95	184	300	V	33.86	9.10	0.00	95.91	-	-	AV
11570	42.32	0	100	V	39.27	15.88	32.75	64.71	74.00	-9.29	PK
11570	28.36	0	100	V	39.27	15.88	32.75	50.75	54.00	-3.25	AV
High Channel 5825 MHz											
5825	64.49	315	231	H	33.86	9.10	0.00	107.45	-	-	PK
5825	53.62	315	231	H	33.86	9.10	0.00	96.58	-	-	AV
5825	64.51	184	300	V	33.86	9.10	0.00	107.47	-	-	PK
5825	53.83	184	300	V	33.86	9.10	0.00	96.79	-	-	AV
5850	51.78	315	231	H	33.93	10.44	33.19	62.96	68.26	-5.30	PK
5850	51.97	184	300	V	33.93	10.44	33.19	63.15	68.26	-5.11	PK
11650	42.23	0	100	V	39.46	15.88	32.75	64.81	74.00	-9.19	PK
11650	28.32	0	100	V	39.46	15.88	32.75	50.90	54.00	-3.10	AV

802.11n20 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	63.83	321	224	H	33.94	9.00	0.00	106.77	-	-	PK
5745	52.76	321	224	H	33.94	9.00	0.00	95.70	-	-	AV
5745	64.09	181	292	V	33.94	9.00	0.00	107.03	-	-	PK
5745	52.92	181	292	V	33.94	9.00	0.00	95.86	-	-	AV
5720	51.16	321	224	H	33.94	10.31	33.22	62.18	68.26	-6.08	PK
5720	51.27	181	292	V	33.94	10.31	33.22	62.29	68.26	-5.97	PK
5725	60.29	321	224	H	33.94	10.31	33.22	71.31	122.00	-50.7	PK
5725	60.44	181	292	V	33.94	10.31	33.22	71.46	122.00	-50.5	PK
11490	41.67	0	100	V	38.96	15.88	32.75	63.76	74.00	-10.2	PK
11490	28.30	0	100	V	38.96	15.88	32.75	50.39	54.00	-3.61	AV
Middle Channel 5785 MHz											
5785	63.99	321	230	H	33.86	9.10	0.00	106.95	-	-	PK
5785	52.87	321	230	H	33.86	9.10	0.00	95.83	-	-	AV
5785	64.30	184	300	V	33.86	9.10	0.00	107.26	-	-	PK
5785	52.98	184	300	V	33.86	9.10	0.00	95.94	-	-	AV
11570	42.16	0	100	V	39.27	15.88	32.75	64.55	74.00	-9.45	PK
11570	28.28	0	100	V	39.27	15.88	32.75	50.67	54.00	-3.33	AV
High Channel 5825 MHz											
5825	64.28	323	241	H	33.86	9.10	0.00	107.24	-	-	PK
5825	52.98	323	241	H	33.86	9.10	0.00	95.94	-	-	AV
5825	65.41	187	300	V	33.86	9.10	0.00	108.37	-	-	PK
5825	54.26	187	300	V	33.86	9.10	0.00	97.22	-	-	AV
5850	53.12	323	241	H	33.93	10.44	33.19	64.30	68.26	-3.96	PK
5850	53.81	187	300	V	33.93	10.44	33.19	64.99	68.26	-3.27	PK
11650	41.82	0	100	V	39.46	15.88	32.75	64.40	74.00	-9.60	PK
11650	28.13	0	100	V	39.46	15.88	32.75	50.71	54.00	-3.29	AV

802.11n40 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	58.41	317	142	H	33.94	9.00	0.00	101.35	-	-	PK
5755	47.48	317	142	H	33.94	9.00	0.00	90.42	-	-	AV
5755	58.74	183	293	V	33.94	9.00	0.00	101.68	-	-	PK
5755	47.84	183	293	V	33.94	9.00	0.00	90.78	-	-	AV
5720	55.16	317	142	H	33.94	10.31	33.22	66.18	68.26	-2.08	PK
5720	56.26	183	293	V	33.94	10.31	33.22	67.28	68.26	-0.98	PK
5725	57.38	317	142	H	33.94	10.31	33.22	68.40	122.00	-53.6	PK
5725	57.45	183	293	V	33.94	10.31	33.22	68.47	122.00	-53.5	PK
11510	41.79	0	100	V	38.96	15.88	32.75	63.88	74.00	-10.1	PK
11510	28.07	0	100	V	38.96	15.88	32.75	50.16	54.00	-3.84	AV
High Channel 5795 MHz											
5795	59.05	318	270	H	33.86	9.10	0.00	102.01	-	-	PK
5795	48.09	318	270	H	33.86	9.10	0.00	91.05	-	-	AV
5795	59.37	184	300	V	33.86	9.10	0.00	102.33	-	-	PK
5795	48.55	184	300	V	33.86	9.10	0.00	91.51	-	-	AV
5850	45.48	318	270	H	33.93	10.44	33.19	56.66	68.26	-11.6	PK
5850	45.88	184	300	V	33.93	10.44	33.19	57.06	68.26	-11.2	PK
11590	41.84	0	100	V	39.46	15.88	32.75	64.42	74.00	-9.58	PK
11590	28.22	0	100	V	39.46	15.88	32.75	50.80	54.00	-3.20	AV

802.11ac20 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	64.22	317	263	H	33.94	9.00	0.00	107.16	-	-	PK
5745	53.03	317	263	H	33.94	9.00	0.00	95.97	-	-	AV
5745	64.36	184	289	V	33.94	9.00	0.00	107.30	-	-	PK
5745	53.15	184	289	V	33.94	9.00	0.00	96.09	-	-	AV
5720	53.34	317	263	H	33.94	10.31	33.22	64.36	68.26	-3.90	PK
5720	54.81	184	289	V	33.94	10.31	33.22	65.83	68.26	-2.43	PK
5725	59.74	317	263	H	33.94	10.31	33.22	70.76	122.00	-51.2	PK
5725	58.74	184	289	V	33.94	10.31	33.22	69.76	122.00	-52.2	PK
11490	42.28	0	100	V	38.96	15.88	32.75	64.37	74.00	-9.63	PK
11490	28.21	0	100	V	38.96	15.88	32.75	50.30	54.00	-3.70	AV
Middle Channel 5785 MHz											
5785	64.40	320	241	H	33.86	9.10	0.00	107.36	-	-	PK
5785	53.04	320	241	H	33.86	9.10	0.00	96.00	-	-	AV
5785	65.53	184	300	V	33.86	9.10	0.00	108.49	-	-	PK
5785	54.31	184	300	V	33.86	9.10	0.00	97.27	-	-	AV
11570	42.21	0	100	V	39.27	15.88	32.75	64.60	74.00	-9.40	PK
11570	28.19	0	100	V	39.27	15.88	32.75	50.58	54.00	-3.42	AV
High Channel 5825 MHz											
5825	65.19	317	264	H	33.86	9.10	0.00	108.15	-	-	PK
5825	53.06	317	264	H	33.86	9.10	0.00	96.02	-	-	AV
5825	65.92	184	300	V	33.86	9.10	0.00	108.88	-	-	PK
5825	54.57	184	300	V	33.86	9.10	0.00	97.53	-	-	AV
5850	55.04	317	264	H	33.93	10.44	33.19	66.22	68.26	-2.04	PK
5850	55.26	184	300	V	33.93	10.44	33.19	66.44	68.26	-1.82	PK
11650	42.22	0	100	V	39.46	15.88	32.75	64.80	74.00	-9.20	PK
11650	28.15	0	100	V	39.46	15.88	32.75	50.73	54.00	-3.27	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	58.67	318	269	H	33.94	9.00	0.00	101.61	-	-	PK
5755	48.07	318	269	H	33.94	9.00	0.00	91.01	-	-	AV
5755	58.75	185	290	V	33.94	9.00	0.00	101.69	-	-	PK
5755	48.05	185	290	V	33.94	9.00	0.00	90.99	-	-	AV
5720	53.28	318	269	H	33.94	10.31	33.22	64.30	68.26	-3.96	PK
5720	55.39	185	290	V	33.94	10.31	33.22	66.41	68.26	-1.85	PK
5725	55.85	318	269	H	33.94	10.31	33.22	66.87	122.00	-55.1	PK
5725	58.16	185	290	V	33.94	10.31	33.22	69.18	122.00	-52.8	PK
11510	42.11	0	100	V	38.96	15.88	32.75	64.20	74.00	-9.80	PK
11510	28.31	0	100	V	38.96	15.88	32.75	50.40	54.00	-3.60	AV
High Channel 5795 MHz											
5795	58.02	317	245	H	33.86	9.10	0.00	100.98	-	-	PK
5795	47.19	317	245	H	33.86	9.10	0.00	90.15	-	-	AV
5795	59.47	184	300	V	33.86	9.10	0.00	102.43	-	-	PK
5795	48.73	184	300	V	33.86	9.10	0.00	91.69	-	-	AV
5850	45.91	317	245	H	33.93	10.44	33.19	57.09	68.26	-11.2	PK
5850	45.74	184	300	V	33.93	10.44	33.19	56.92	68.26	-11.3	PK
11590	41.84	0	100	V	39.46	15.88	32.75	64.42	74.00	-9.58	PK
11590	28.39	0	100	V	39.46	15.88	32.75	50.97	54.00	-3.03	AV

802.11ac80 mode

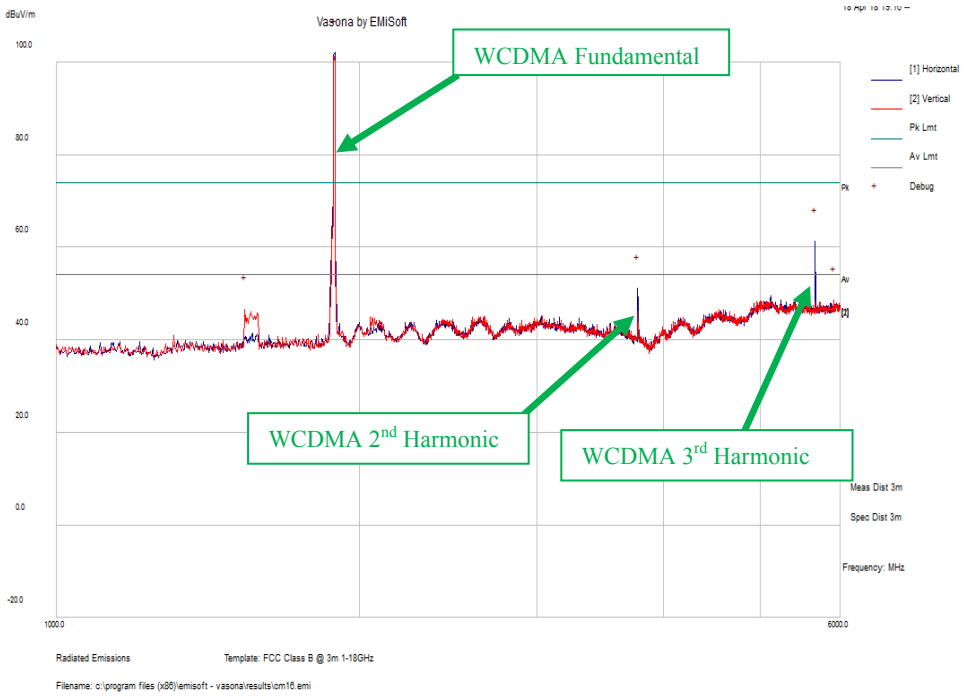
Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
5775 MHz											
5775	53.83	317	246	H	33.94	9.00	0.00	96.77	-	-	PK
5775	44.09	317	246	H	33.94	9.00	0.00	87.03	-	-	AV
5775	54.70	184	300	V	33.94	9.00	0.00	97.64	-	-	PK
5775	44.54	184	300	V	33.94	9.00	0.00	87.48	-	-	AV
5720	55.28	317	246	H	33.94	10.31	33.22	66.30	68.26	-1.96	PK
5720	56.24	184	300	V	33.94	10.31	33.22	67.26	68.26	-1.00	PK
5725	56.19	317	246	H	33.94	10.31	33.22	67.21	122.00	-54.8	PK
5725	57.54	184	300	V	33.94	10.31	33.22	68.56	122.00	-53.4	PK
5850	54.81	317	246	H	33.93	10.44	33.19	65.99	68.26	-2.27	PK
5850	56.33	184	300	V	33.93	10.44	33.19	67.51	68.26	-0.75	PK
11550	42.29	0	100	V	38.96	15.88	32.75	64.38	74.00	-9.62	PK
11550	28.36	0	100	V	38.96	15.88	32.75	50.45	54.00	-3.55	AV

Note 1: Any emissions above 12 GHz are emissions from the noise floor.
Note 2: The worst-case modulations were used to show compliance.

1-6 GHz

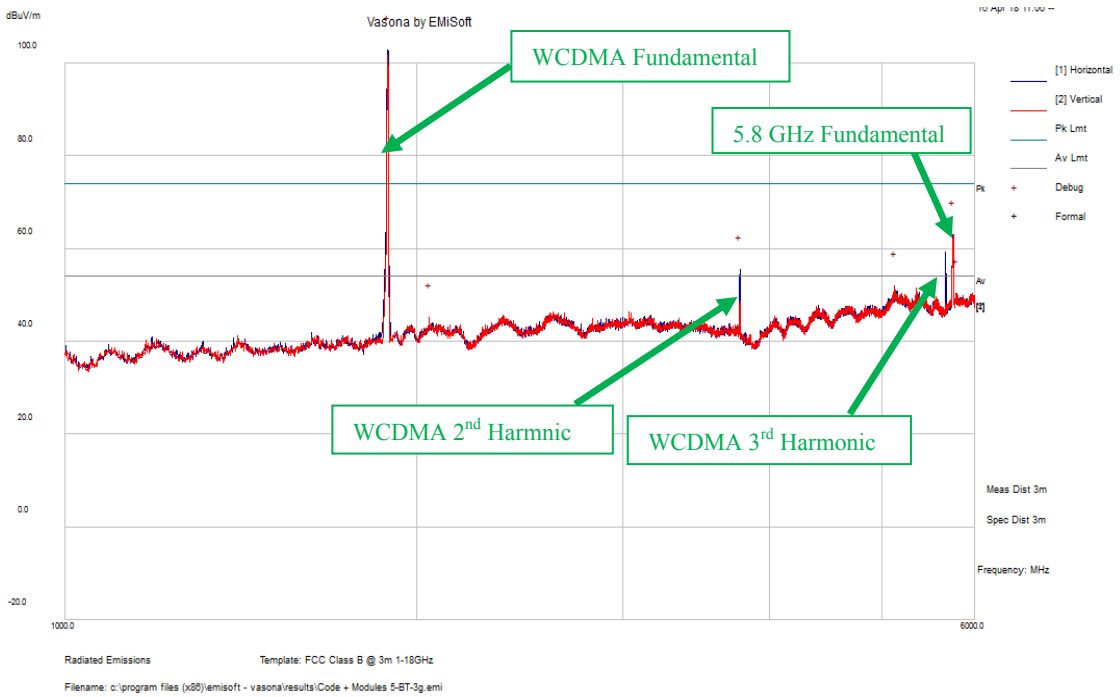
PP-4G-LTA

5.8 GHz Wi-Fi, ac20 mode (5745 MHz), BT (2480 MHz), WCDMA (1888.4 MHz)



DO-1G-3GG

5.8 GHz Wi-Fi, ac20 mode (5745 MHz), BT (2480 MHz), WCDMA (1888.4 MHz)

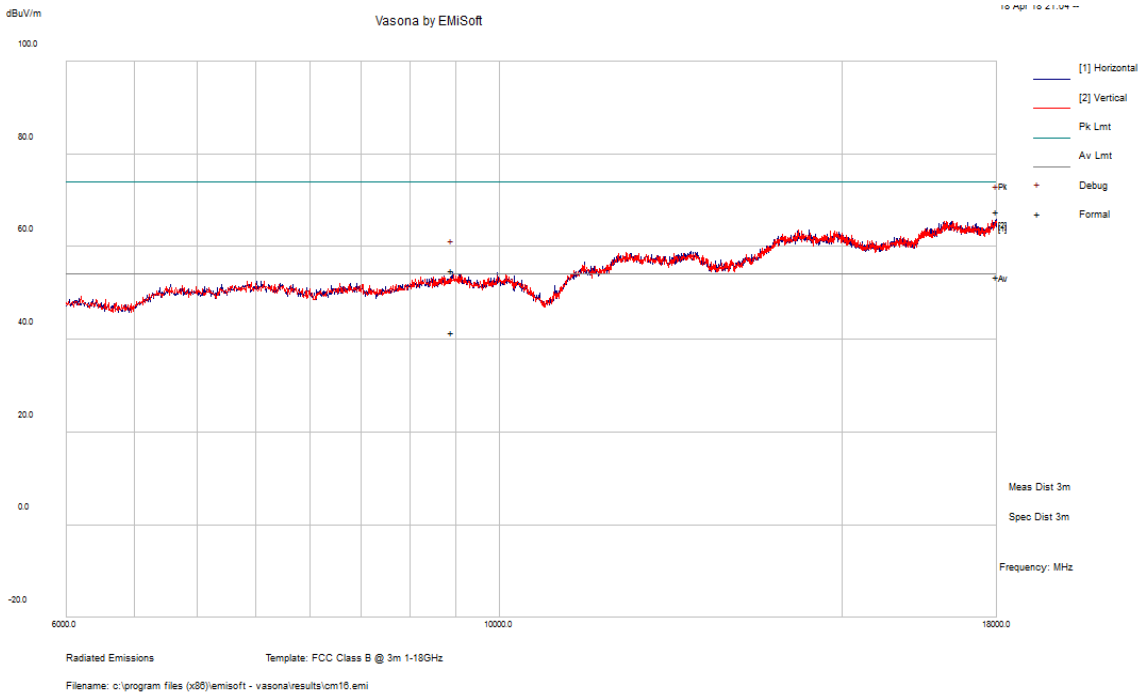


Note: After verification, the 2nd and 3rd Harmonics from the WCDMA signal was not due to colocation so therefore were not evaluated.

6-18 GHz

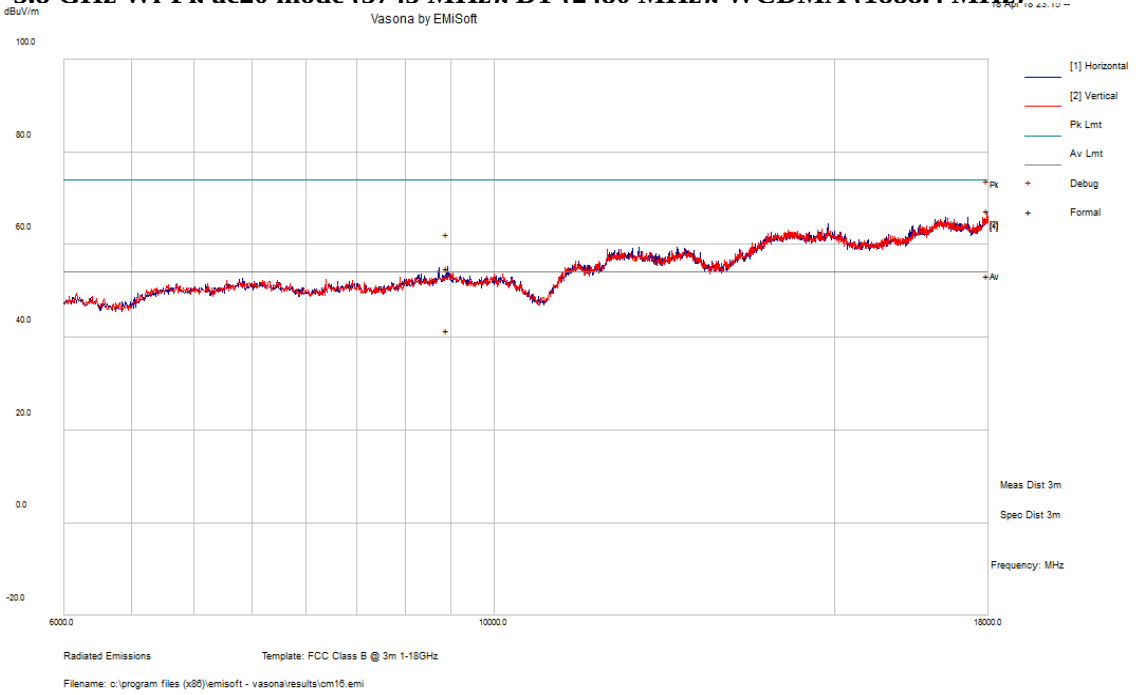
PP-4G-LTA

5.8 GHz Wi-Fi, ac20 mode (5745 MHz), BT (2480 MHz), WCDMA (1888.4 MHz)



DO-1G-3GG

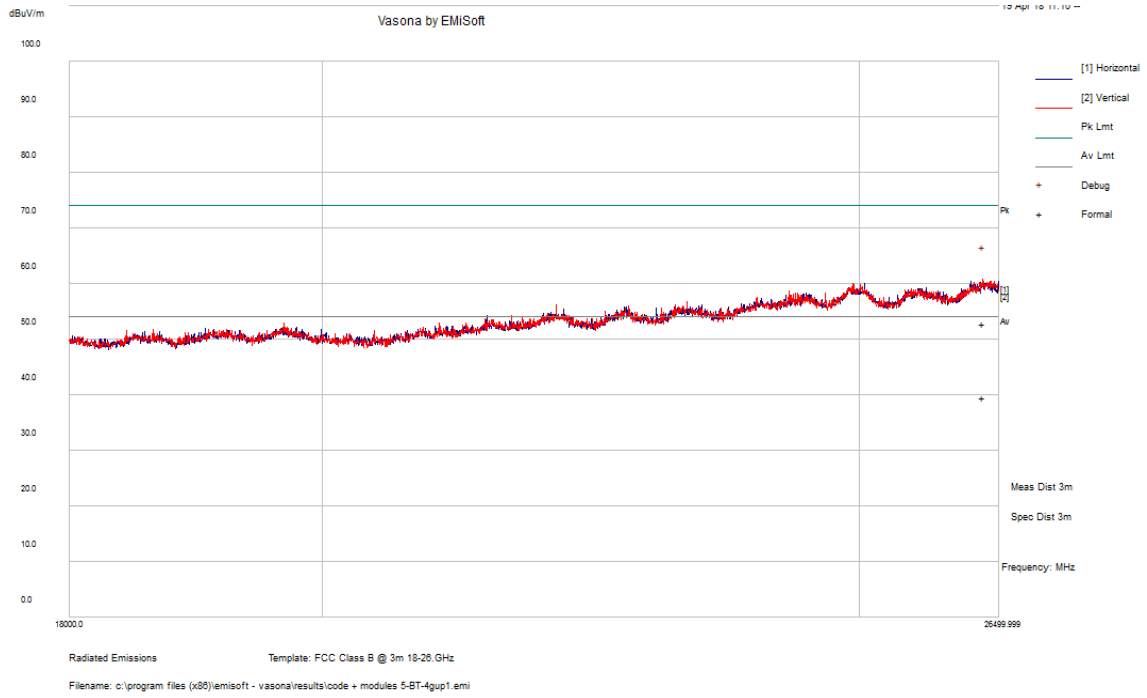
5.8 GHz Wi-Fi, ac20 mode (5745 MHz), BT (2480 MHz), WCDMA (1888.4 MHz)



18-26.5 GHz

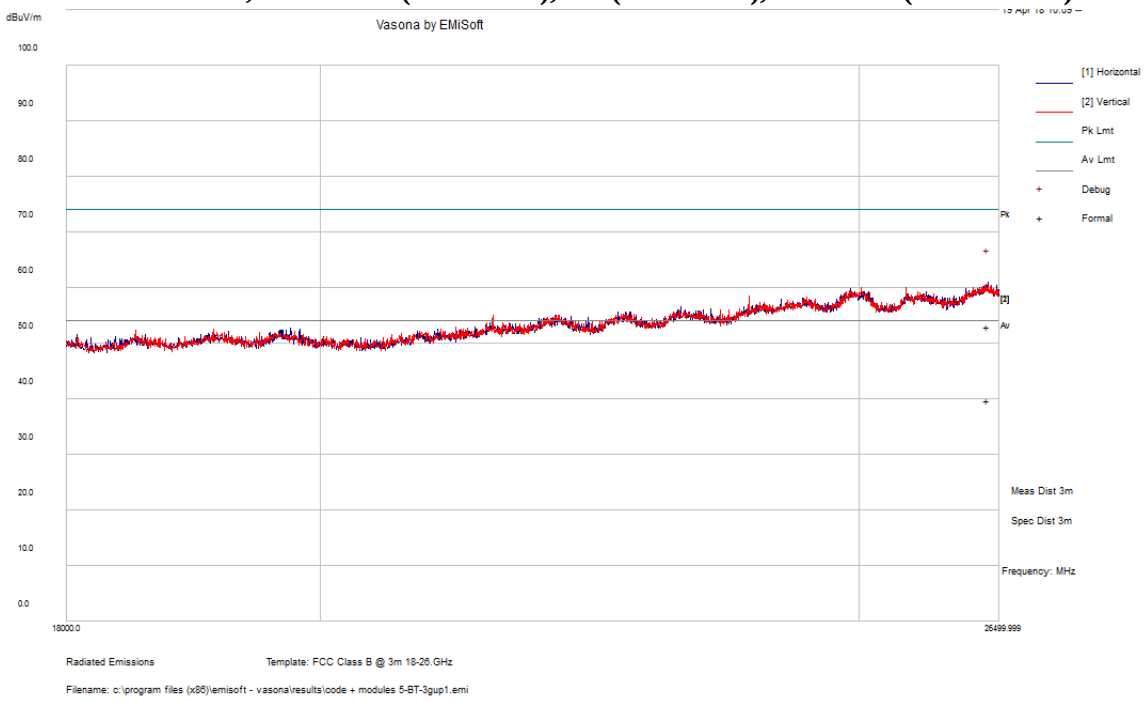
PP-4G-LTA

5.8 GHz Wi-Fi, ac20 mode (5745 MHz), BT (2480 MHz), WCDMA (1888.4 MHz)



DO-1G-3GG

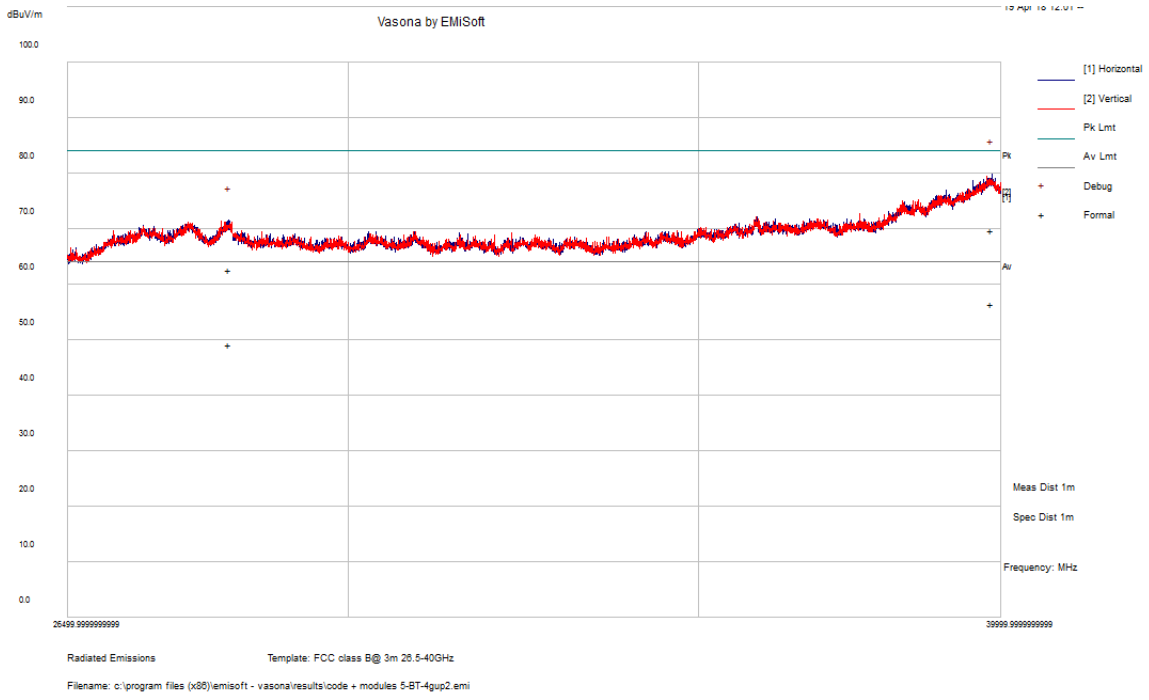
5.8 GHz Wi-Fi, ac20 mode (5745 MHz), BT (2480 MHz), WCDMA (1888.4 MHz)



26.5-40 GHz

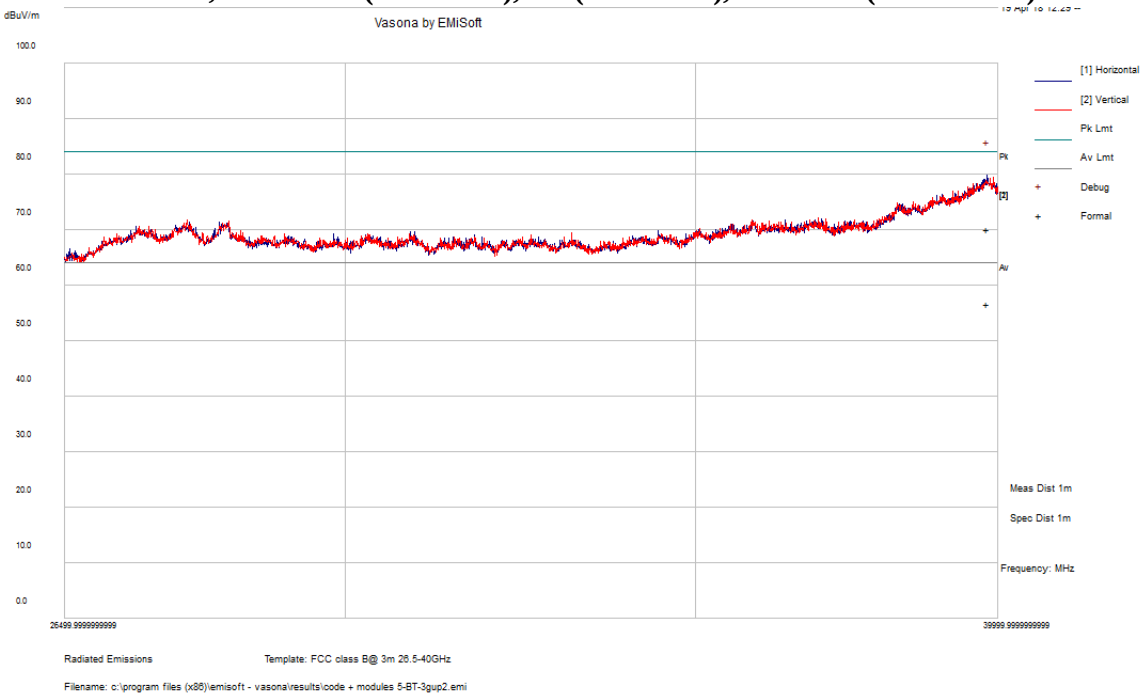
PP-4G-LTA

5.8 GHz Wi-Fi, ac20 mode (5745 MHz), BT (2480 MHz), WCDMA (1888.4 MHz)



DO-1G-3GG

5.8 GHz Wi-Fi, ac20 mode (5745 MHz), BT (2480 MHz), WCDMA (1888.4 MHz)



8 FCC §15.407(e) and ISEDC RSS-247 §6.2 - 6 dB, 26 dB, and 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

The measurements are based on FCC KDB 789033 D02 General U-NII Test Procedures New Rules v02r01: C. Bandwidth Measurement.

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

8.4 Test Environmental Conditions

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

The testing was performed by Vincent Licata on 2018-03-21 to 2018-03-23 at RF site.

8.5 Test Results

Please refer to the following tables and plots.

5150 - 5250 MHz

ANT A

Channel	Frequency (MHz)	99% OBW (kHz)	26 dB OBW (kHz)
802.11 a mode			
36	5180	16539.8	19542
40	5200	16531.1	19555
48	5240	16525.5	19511
802.11n20 mode			
36	5180	17549.4	19951
40	5200	17542.0	19837
48	5240	17557.6	19997
802.11n40 mode			
38	5190	36033.1	40296
46	5230	36041.1	40539
802.11ac20 mode			
36	5180	17552.9	19836
40	5200	17555.2	19928
48	5240	17549.0	19942
802.11ac40 mode			
38	5190	35998.0	40404
46	5230	36020.8	40376
802.11ac80 mode			
42	5210	76224.4	83052

ANT B

Channel	Frequency (MHz)	99% OBW (kHz)	26 dB OBW (kHz)
802.11 a mode			
36	5180	16485.6	19412
40	5200	16509.1	19466
48	5240	16501.1	19389
802.11n20 mode			
36	5180	17557.5	19863
40	5200	17559.5	19914
48	5240	17557.4	19846
802.11n40 mode			
38	5190	36027.5	40033
46	5230	35995.0	40097
802.11ac20 mode			
36	5180	17565.7	19766
40	5200	17576.4	19891
48	5240	17556.9	19933
802.11ac40 mode			
38	5190	36004.4	40071
46	5230	36014.6	40163
802.11ac80 mode			
42	5210	76022.3	81797

Note: 5150-5250 MHz band is FCC use only

5725 - 5850 MHz

ANT A

Channel	Frequency (MHz)	99% OBW (kHz)	6 dB OBW (kHz)
802.11 a mode			
149	5745	16553.9	16357
157	5785	16539.5	16404
165	5825	16554.9	16364
802.11n20 mode			
149	5745	17563.8	17309
157	5785	17534.2	17565
165	5825	17541.5	17202
802.11n40 mode			
151	5755	36038.2	35261
159	5795	36034.3	35477
802.11ac20 mode			
149	5745	17544.2	17565
157	5785	17560.2	17562
165	5825	17572.6	17308
802.11ac40 mode			
151	5755	35844.0	35377
159	5795	35927.6	35454
802.11ac80 mode			
155	5775	76299.6	76052

ANT B

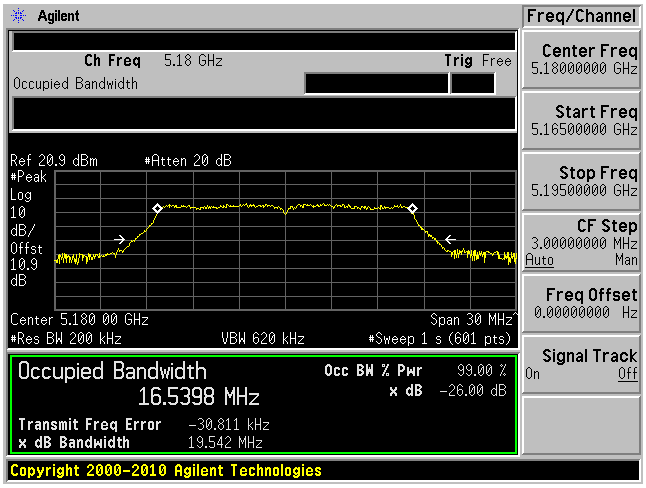
Channel	Frequency (MHz)	99% OBW (kHz)	6 dB OBW (kHz)
802.11 a mode			
149	5745	16519.1	16390
157	5785	16408.2	16378
165	5825	16502.2	16366
802.11n20 mode			
149	5745	17575.8	17571
157	5785	17574.5	17582
165	5825	17586.9	17559
802.11n40 mode			
151	5755	36002.9	35256
159	5795	36016.0	35429
802.11ac20 mode			
149	5745	17545.3	17549
157	5785	17543.5	17293
165	5825	17585.2	17339
802.11ac40 mode			
151	5755	36033.9	35593
159	5795	35943.5	35254
802.11ac80 mode			
155	5775	75992.1	76268

5150 – 5250 MHz

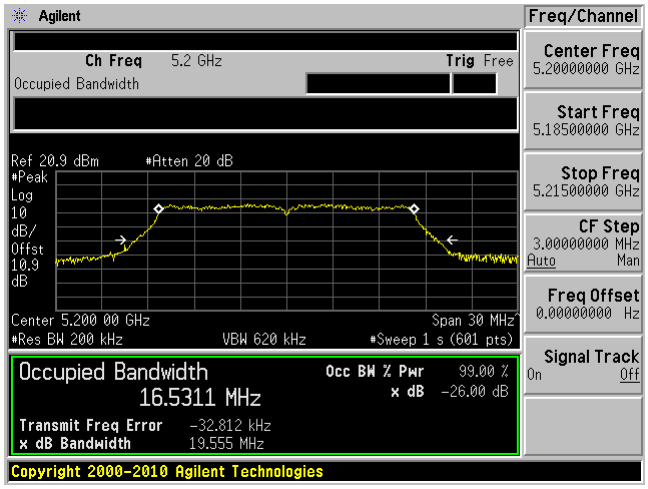
ANT A

802.11a mode

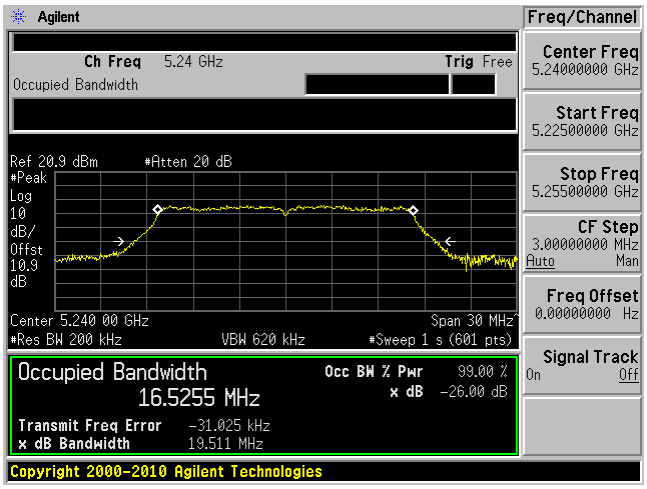
5180 MHz



5200 MHz

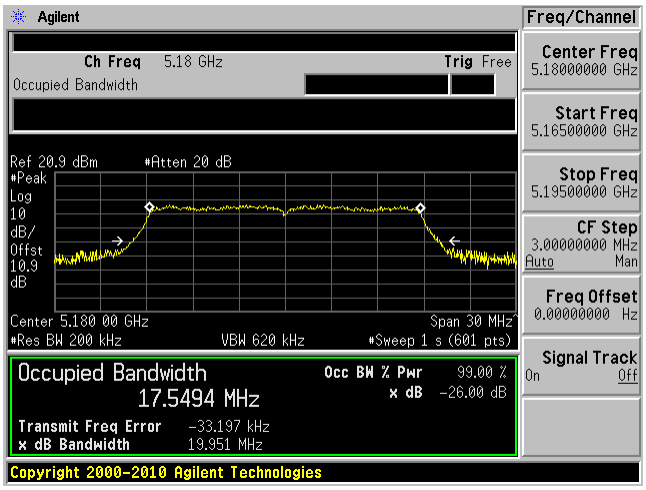


5240 MHz

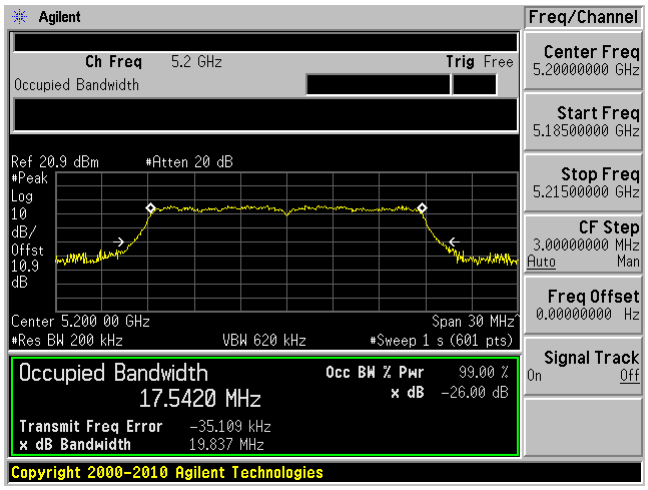


802.11n20 mode

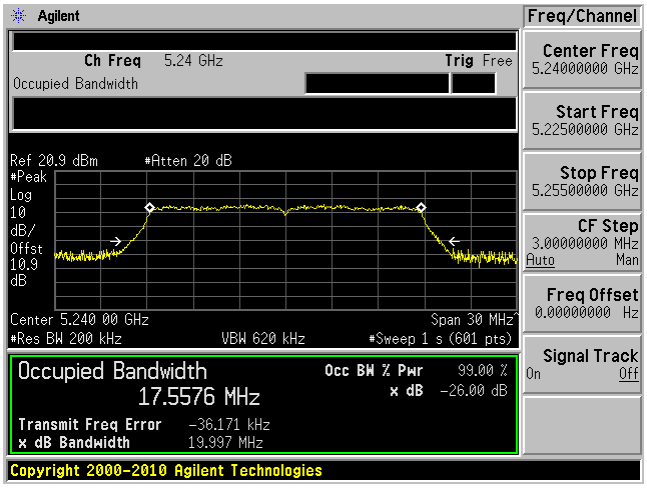
5180 MHz



5200 MHz

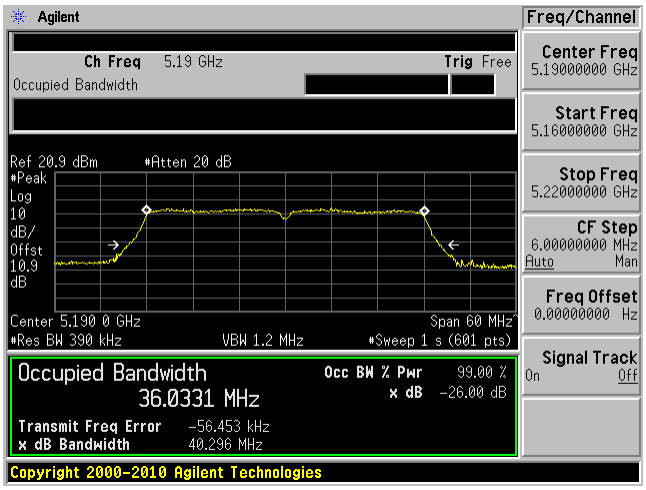


5240 MHz

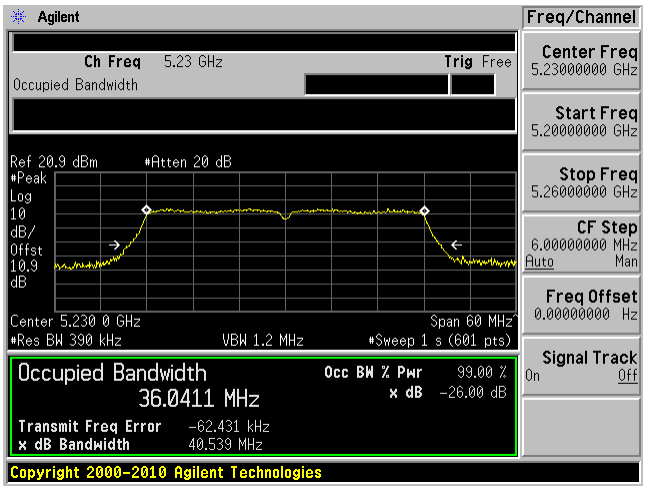


802.11n40 mode

5190 MHz

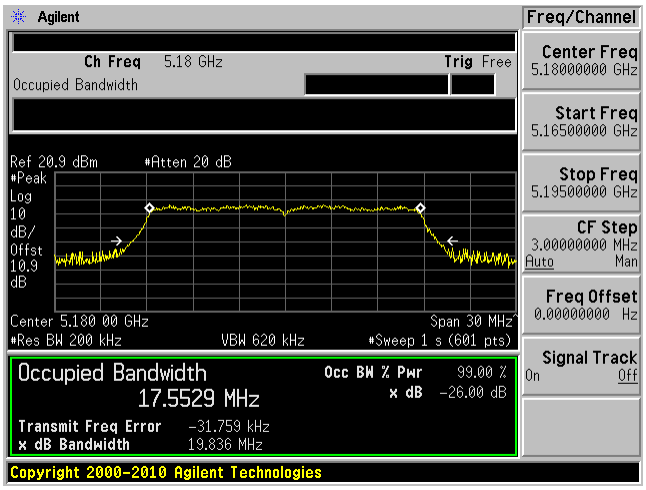


5230 MHz

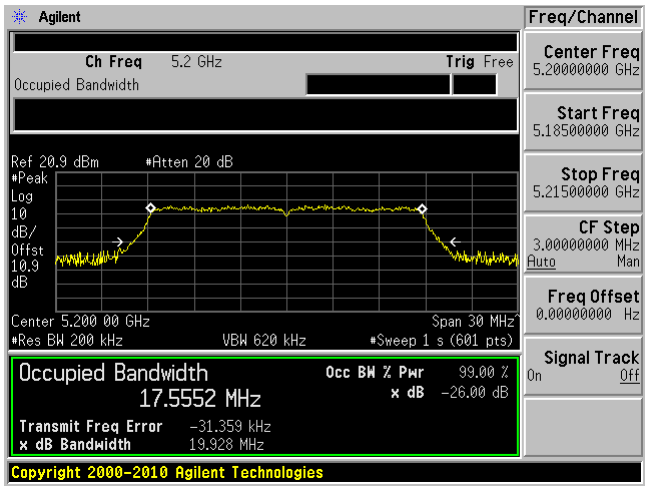


802.11ac20 mode

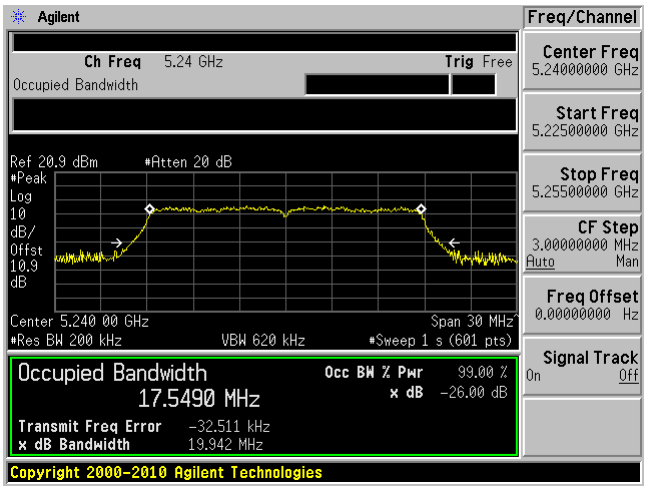
5180 MHz



5200 MHz

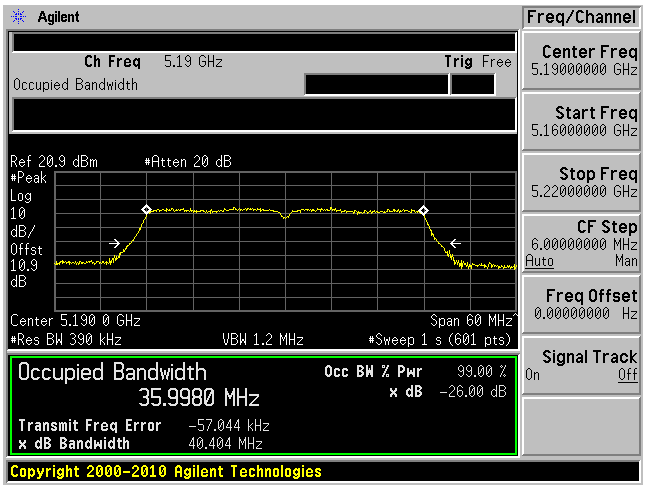


5240 MHz

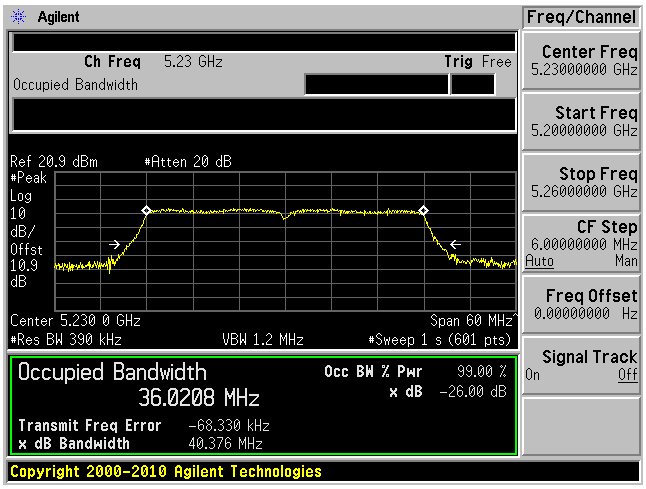


802.11ac40 mode

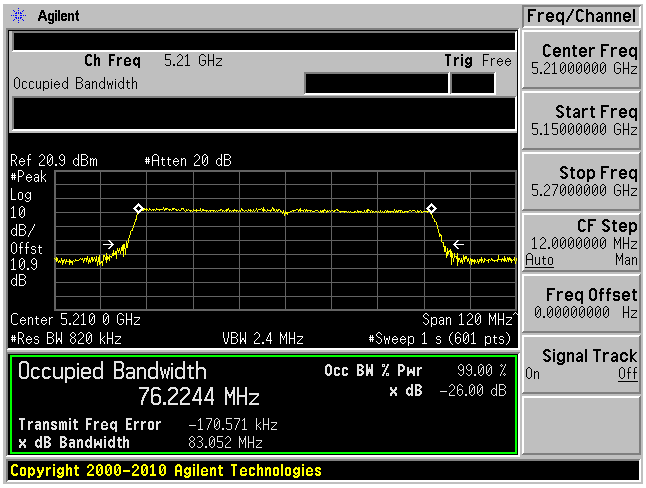
5190 MHz



5230 MHz



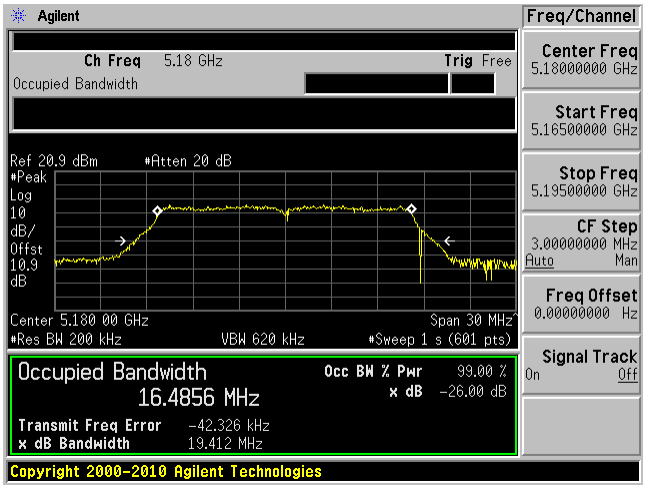
802.11ac80 mode, 5210 MHz



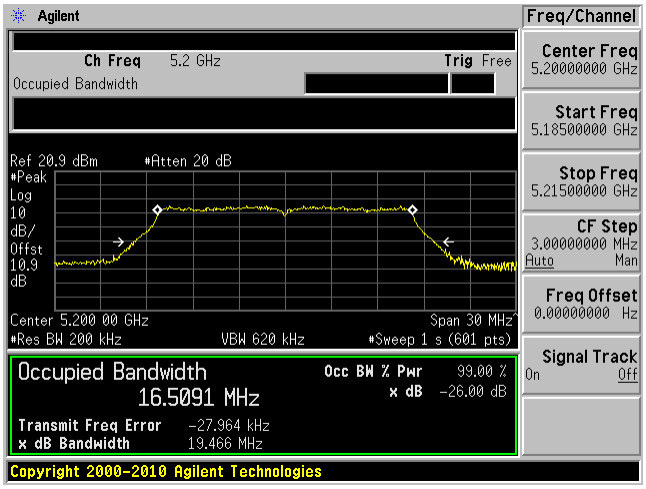
ANT B

802.11a mode

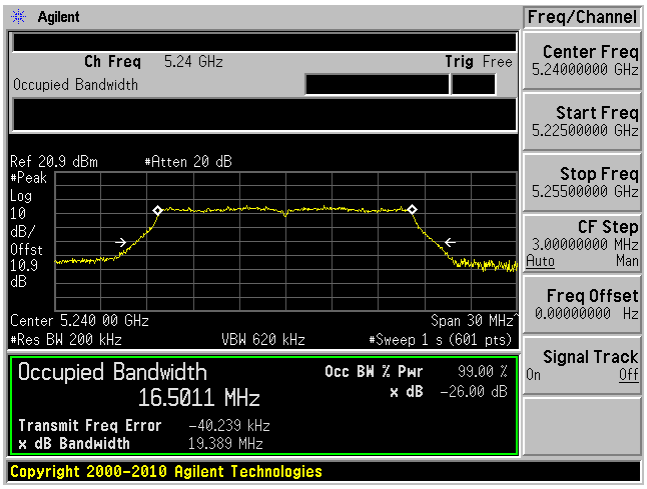
5180 MHz



5200 MHz

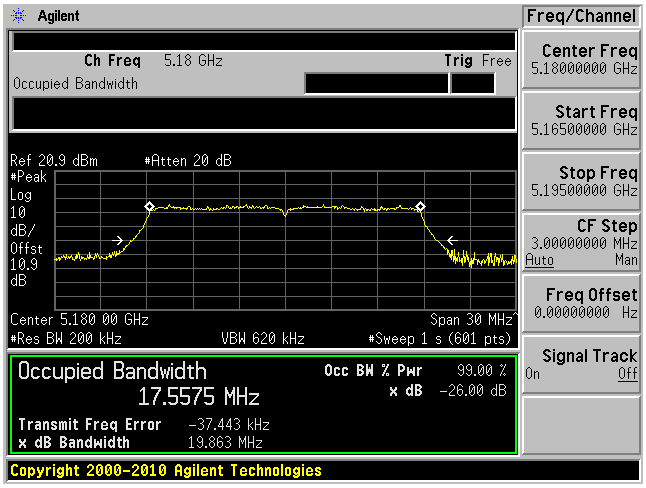


5240 MHz

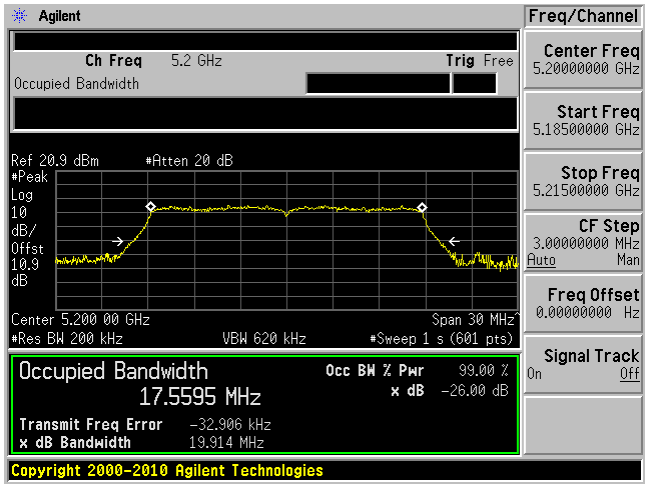


802.11n20 mode

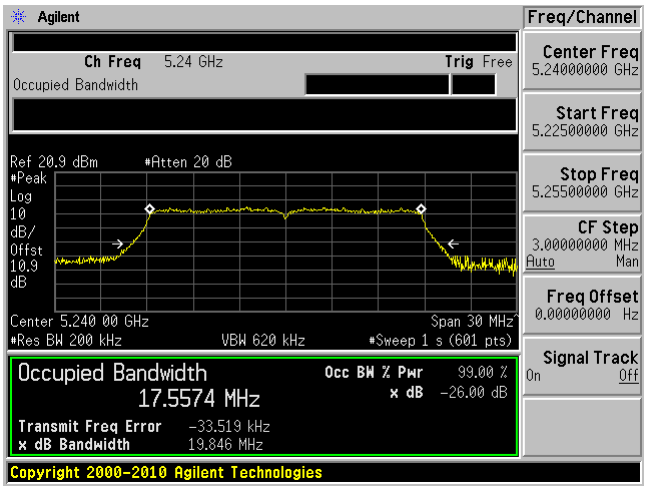
5180 MHz



5200 MHz

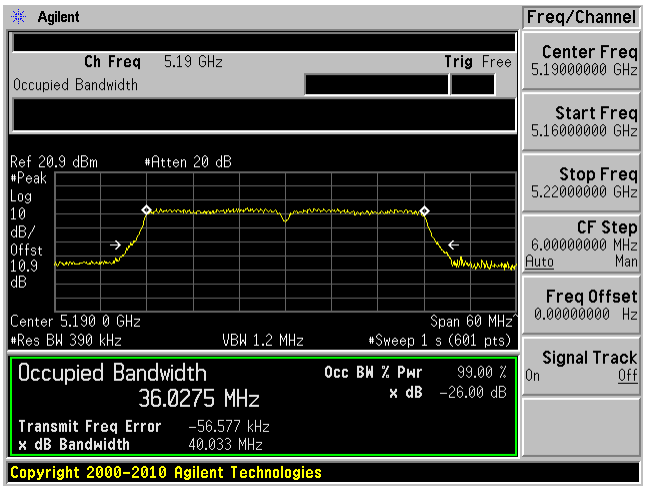


5240 MHz

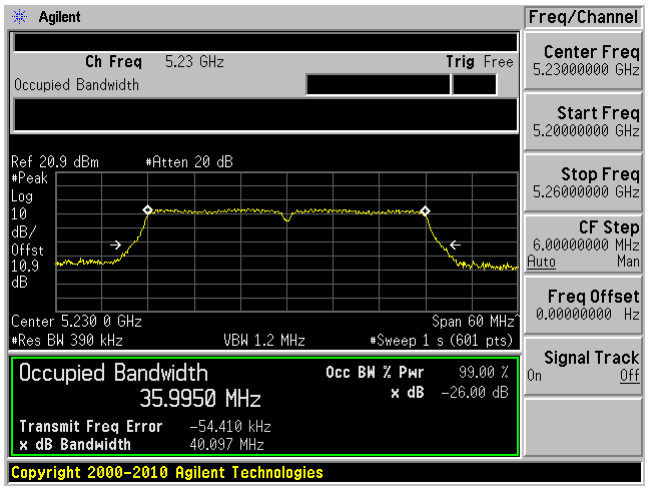


802.11n40 mode

5190 MHz

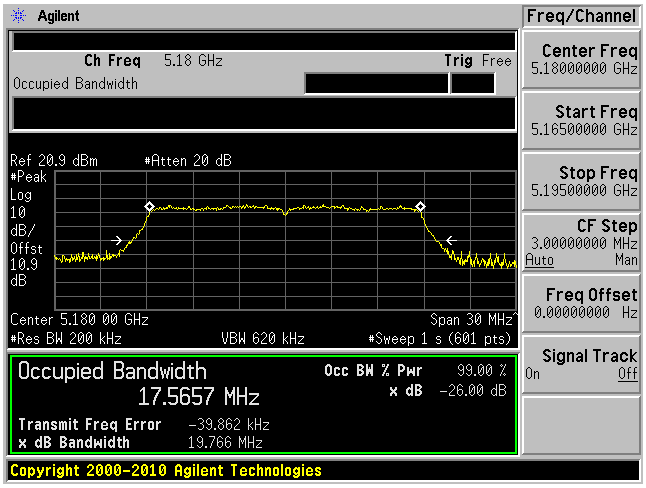


5230 MHz

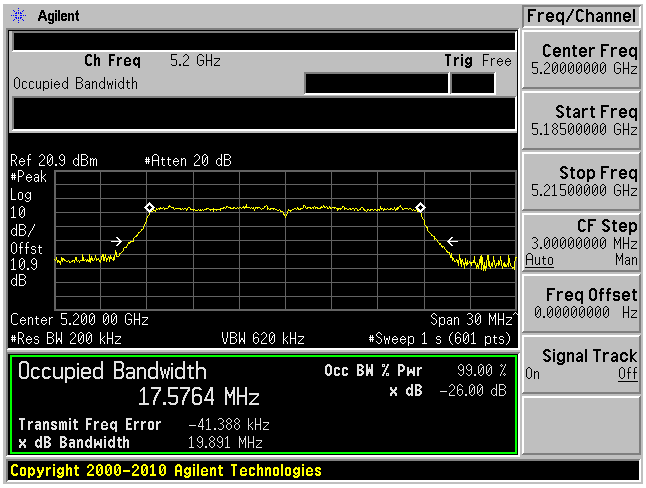


802.11ac20 mode

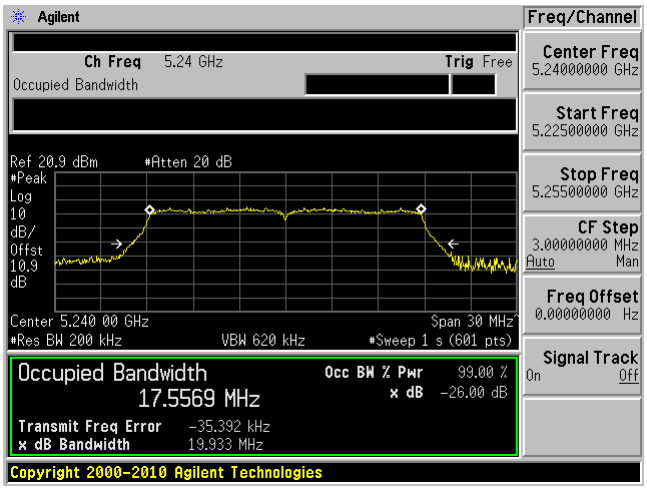
5180 MHz



5200 MHz

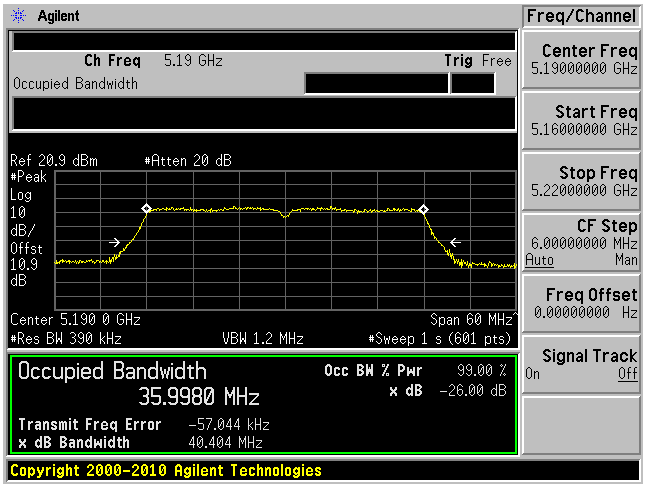


5240 MHz

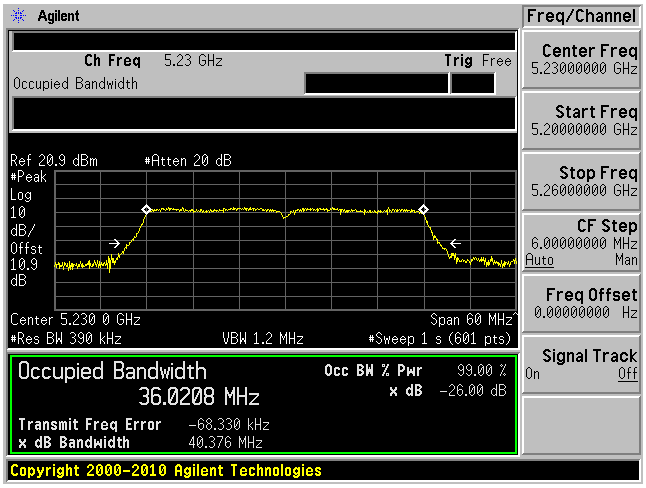


802.11ac40 mode

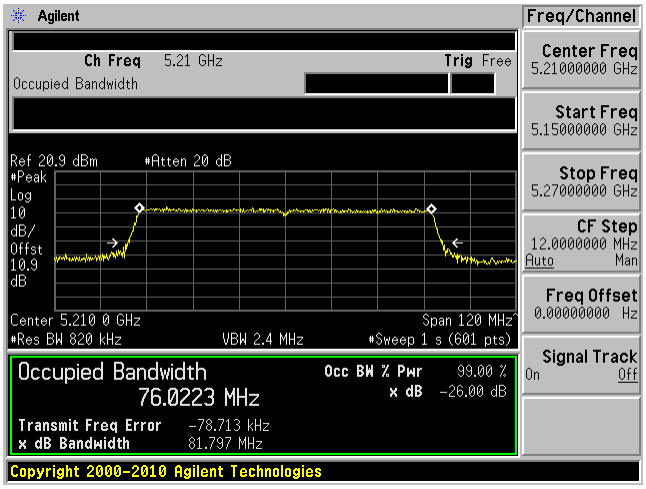
5190 MHz



5230 MHz



802.11ac80 mode, 5210 MHz

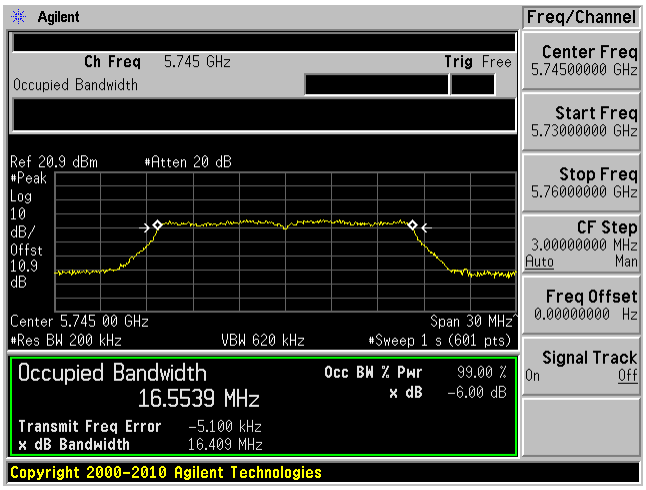


5725 – 5850 MHz 99% OBW

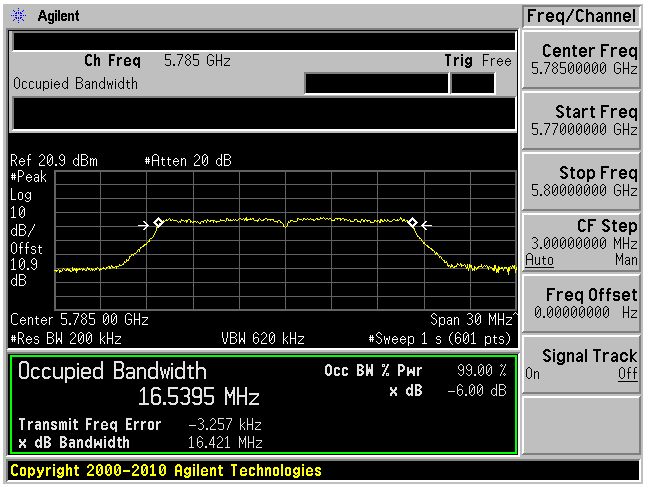
ANT A

802.11a mode

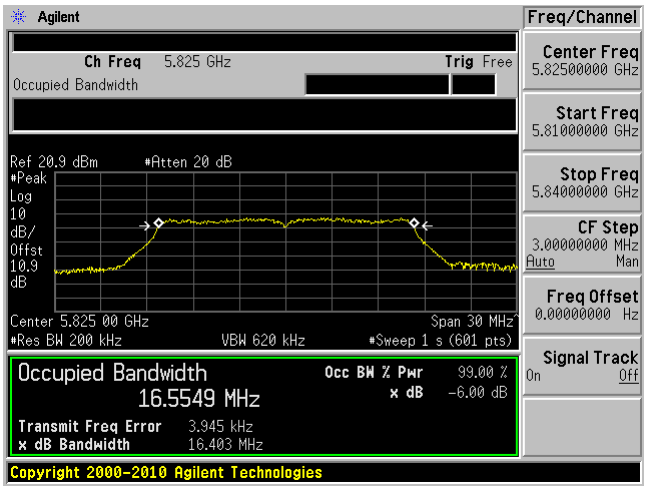
5745 MHz



5785 MHz

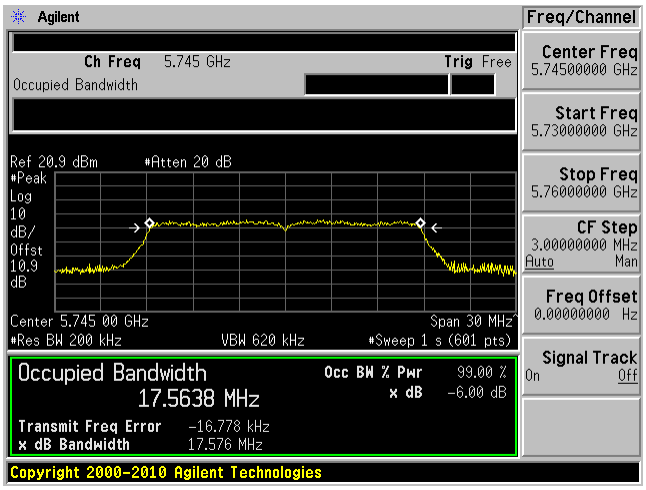


5825 MHz

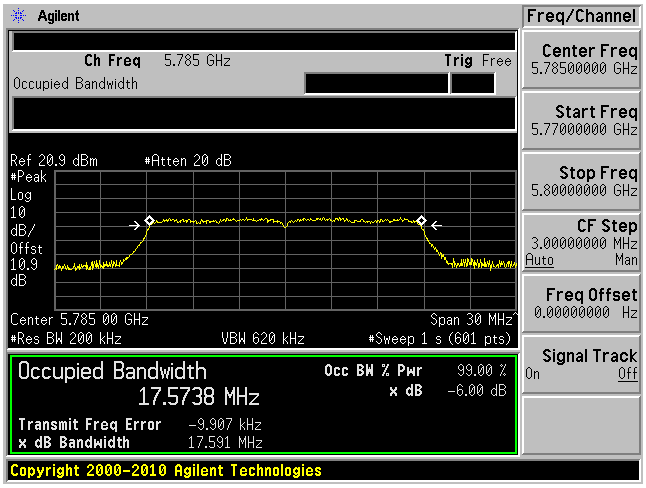


802.11n20 mode

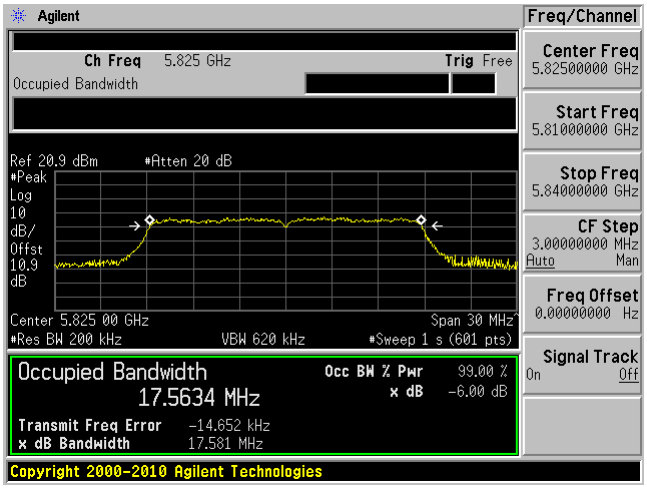
5745 MHz



5785 MHz

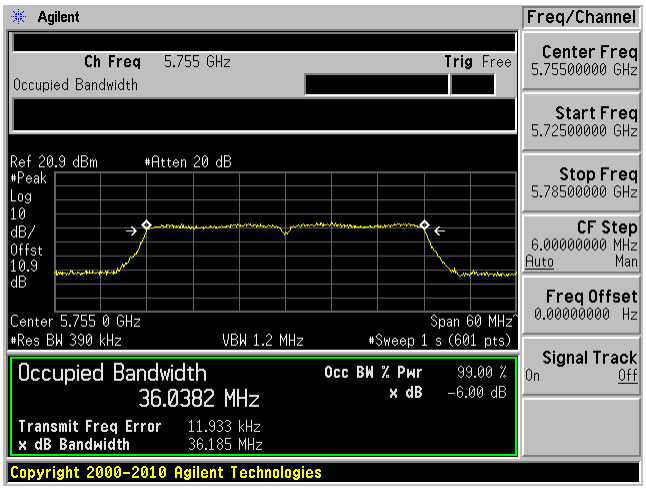


5825 MHz

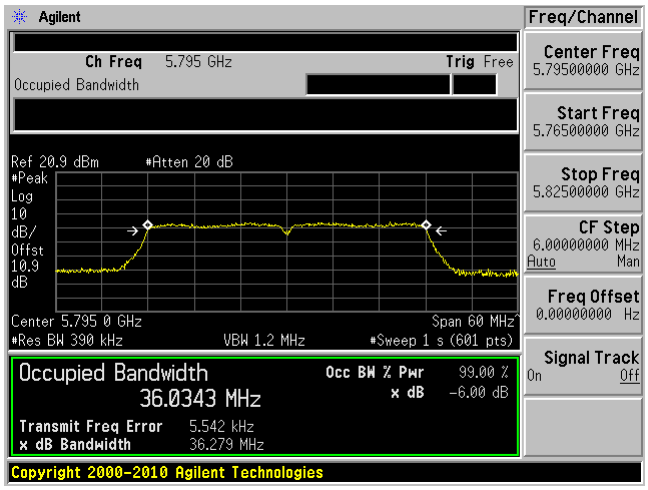


802.11n40 mode

5755 MHz

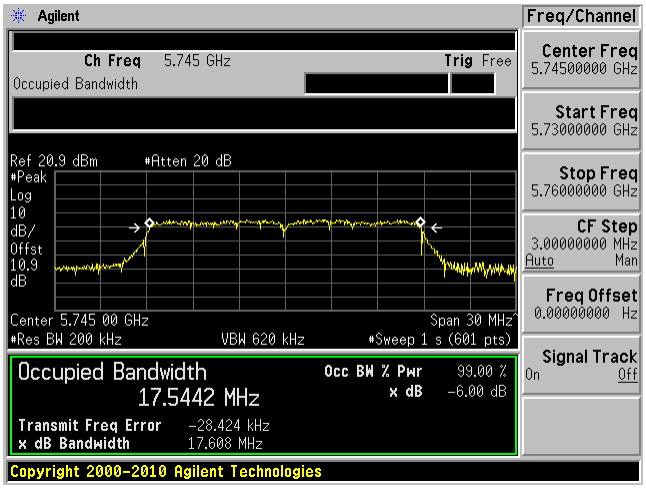


5795 MHz

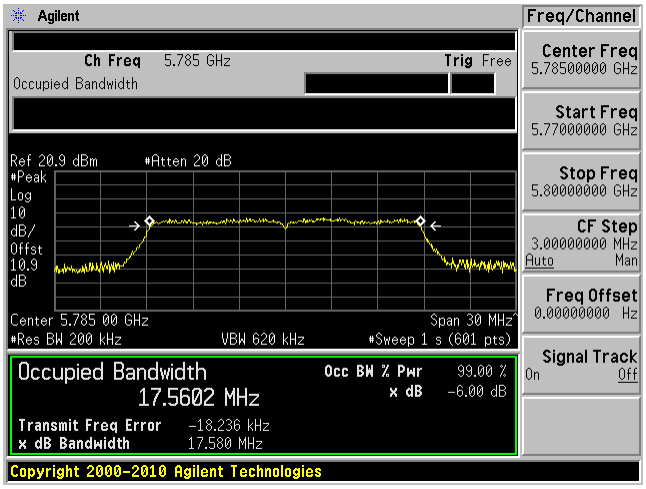


802.11ac20 mode

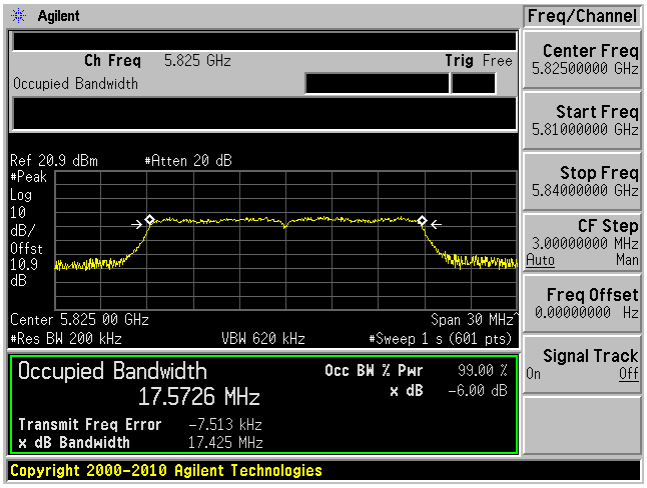
5745 MHz



5785 MHz

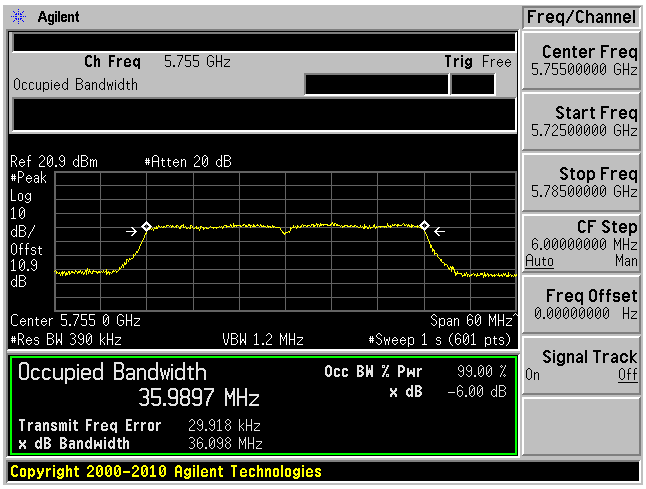


5825 MHz

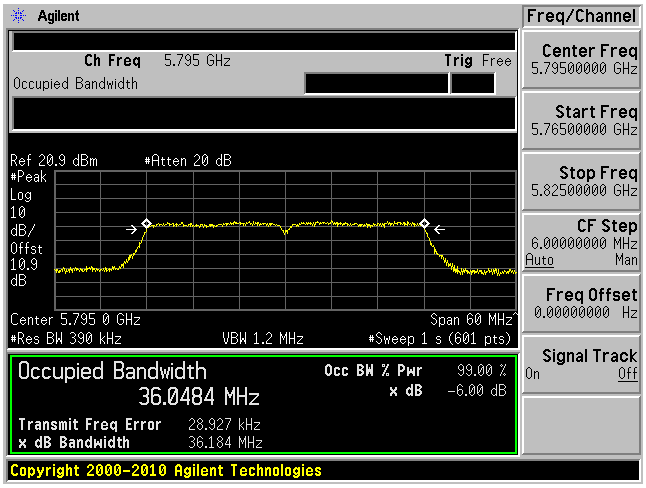


802.11ac40 mode

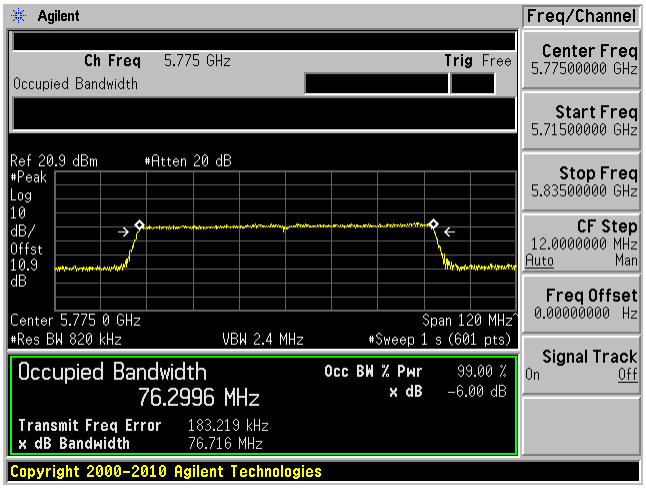
5755 MHz



5795 MHz



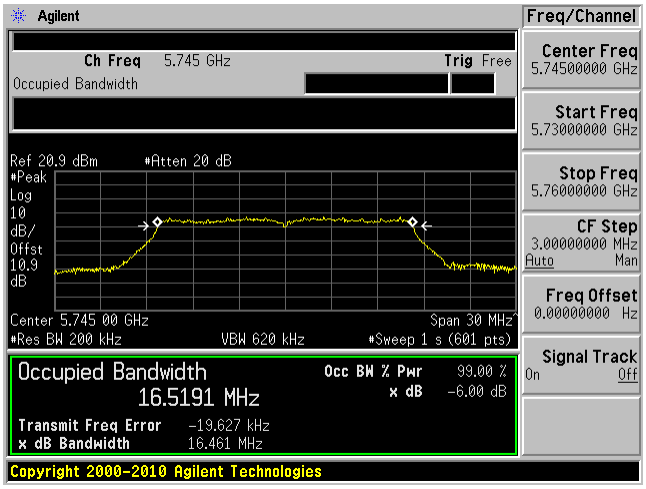
802.11ac80 mode, 5775 MHz



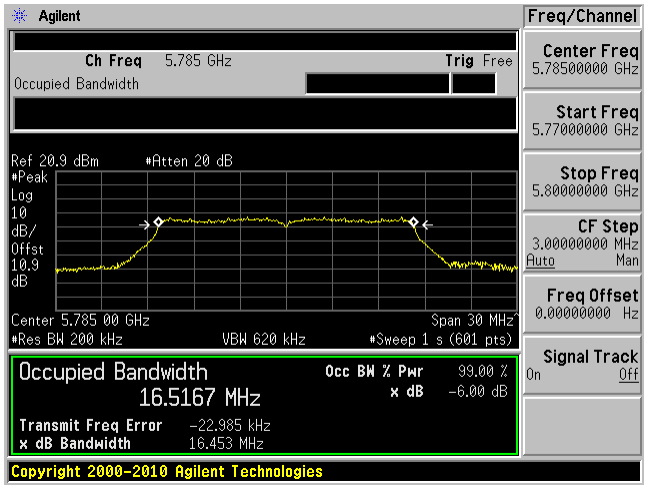
ANT B

802.11a mode

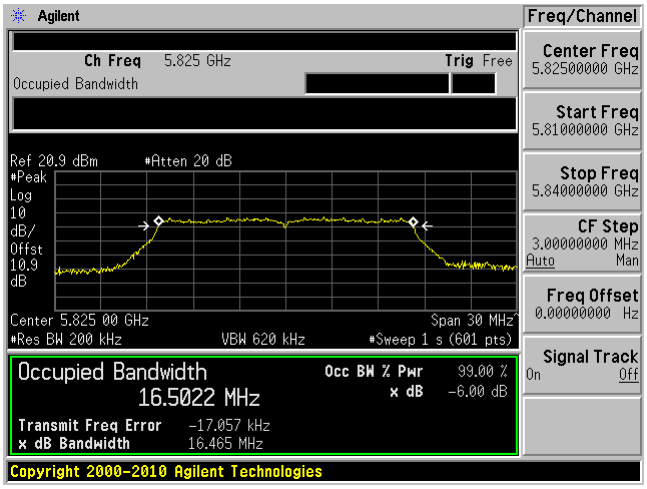
5745 MHz



5785 MHz

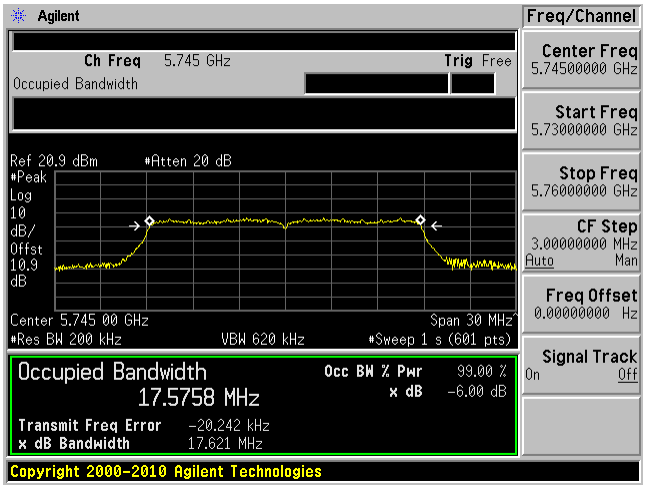


5825 MHz

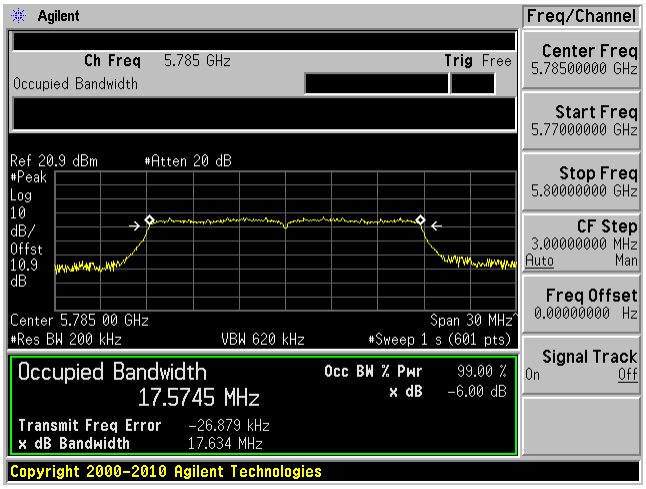


802.11n20 mode

5745 MHz



5785 MHz



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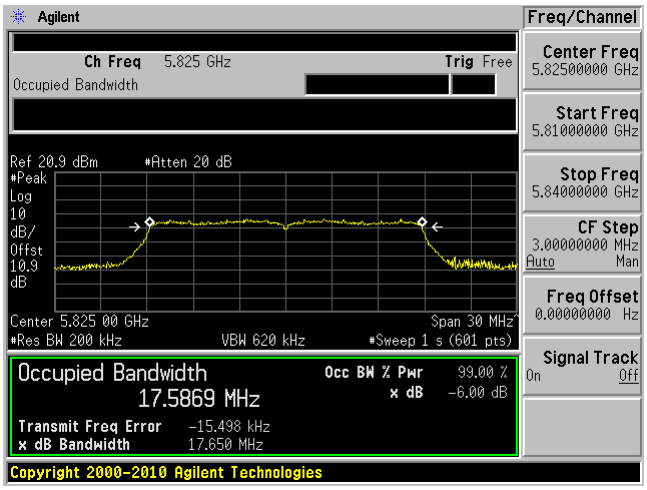
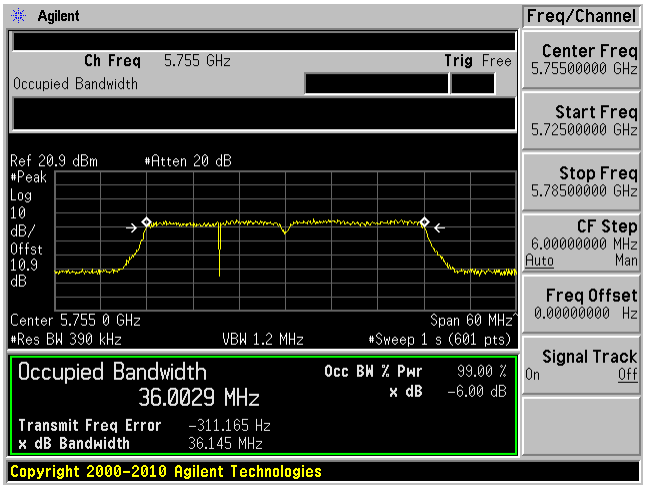


802.11n40 mode

5755 MHz



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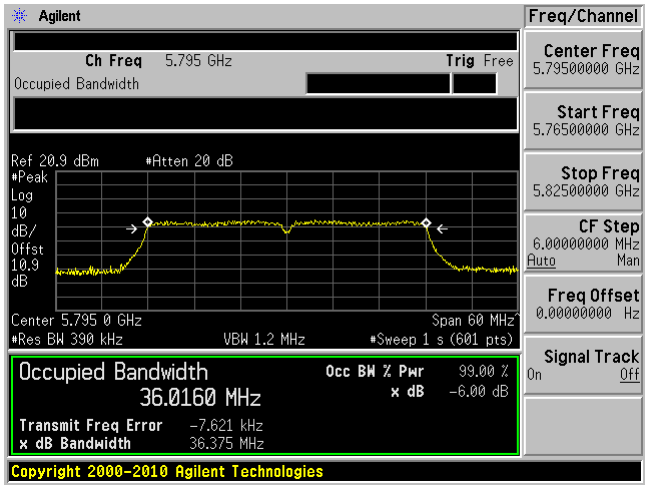
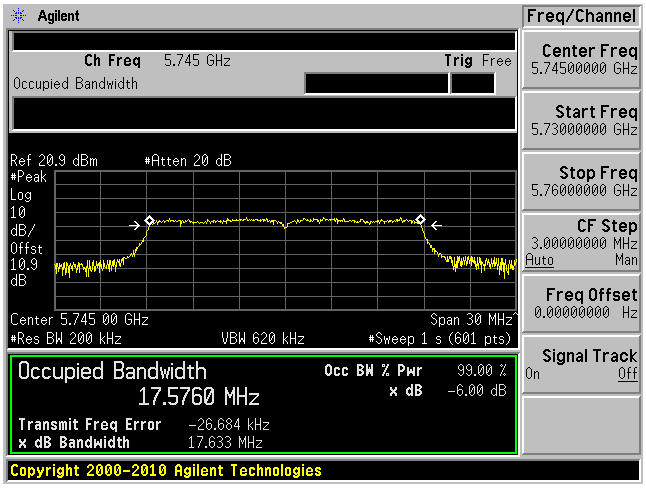


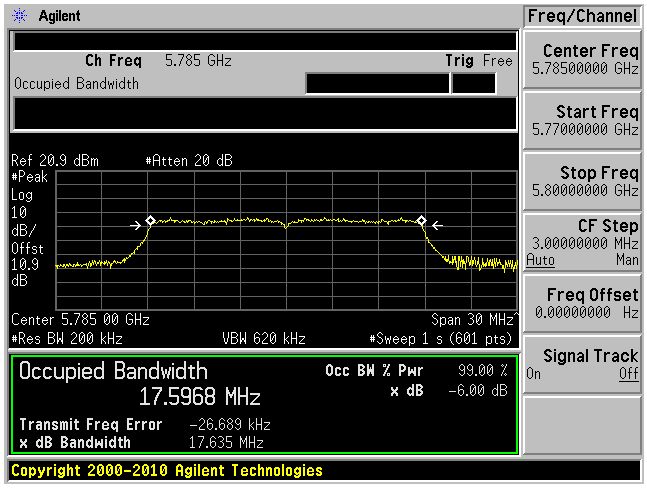
802.11ac20 mode

5745 MHz



v

5785 MHz



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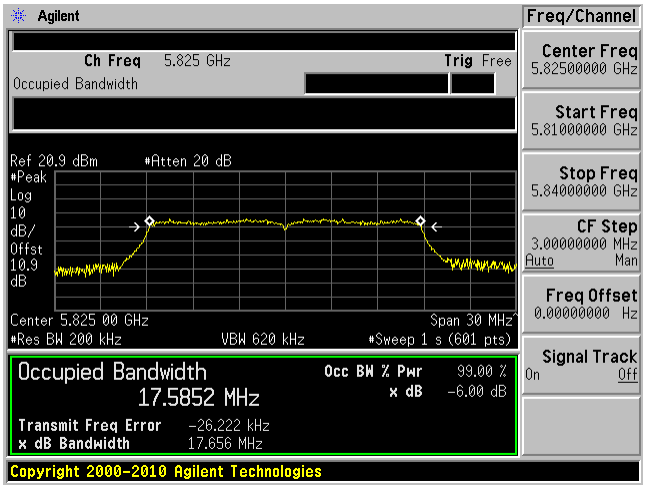
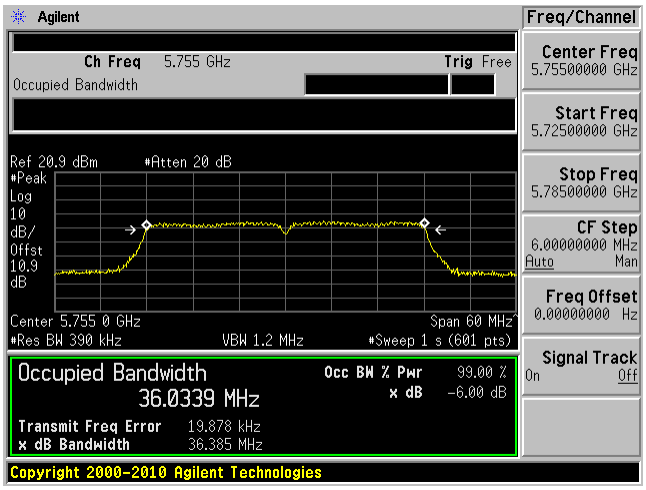
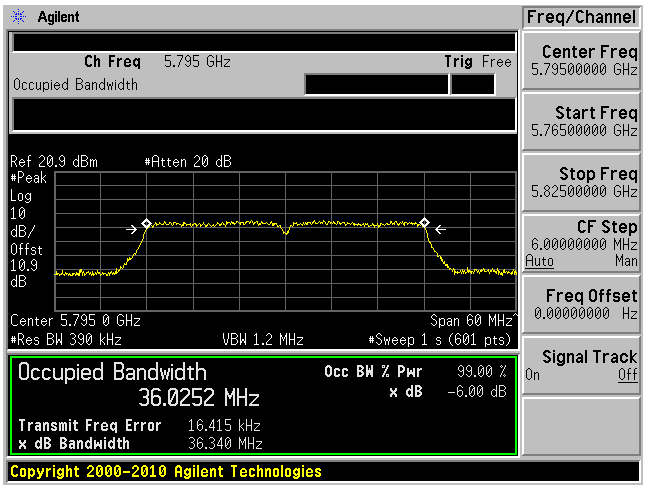


802.11ac40 mode

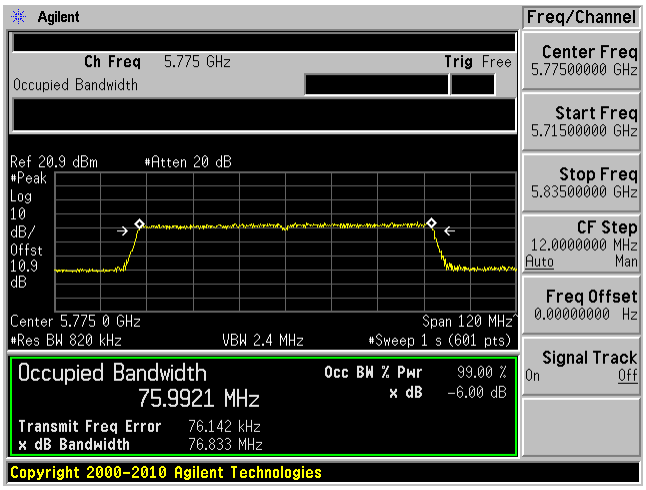
5755 MHz



5795 MHz



802.11ac80 mode, 5775 MHz

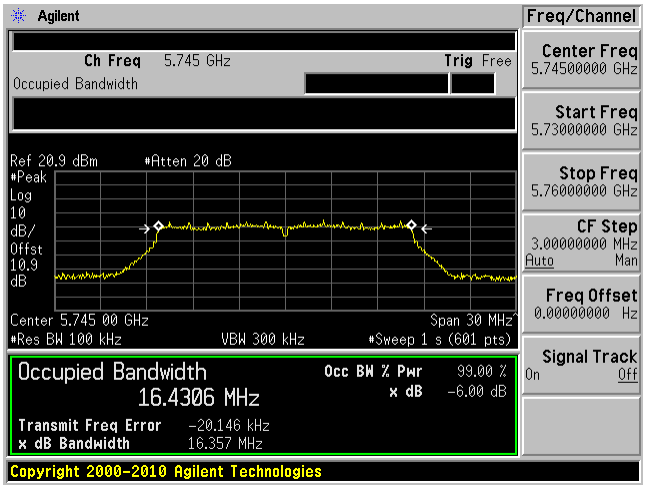


5725 – 5850 MHz 6 dB OBW

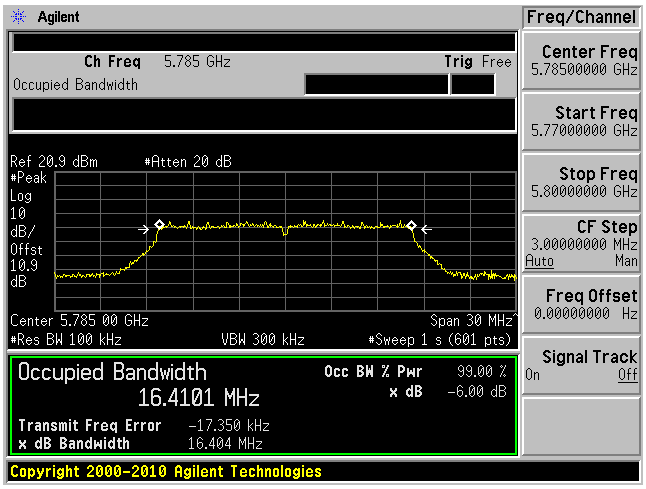
ANT A

802.11a mode

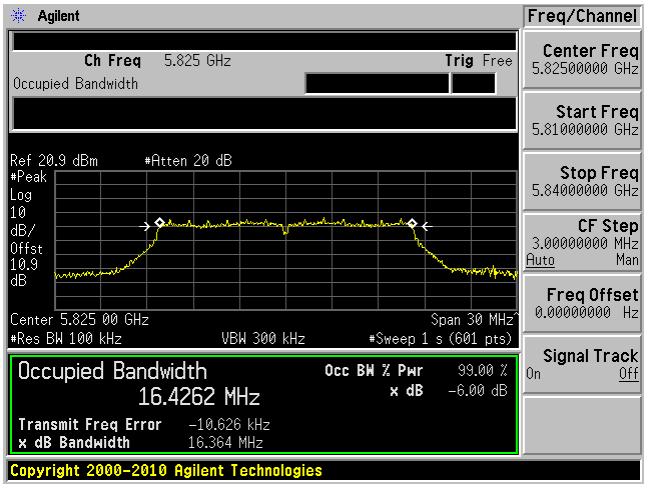
5745 MHz



5785 MHz

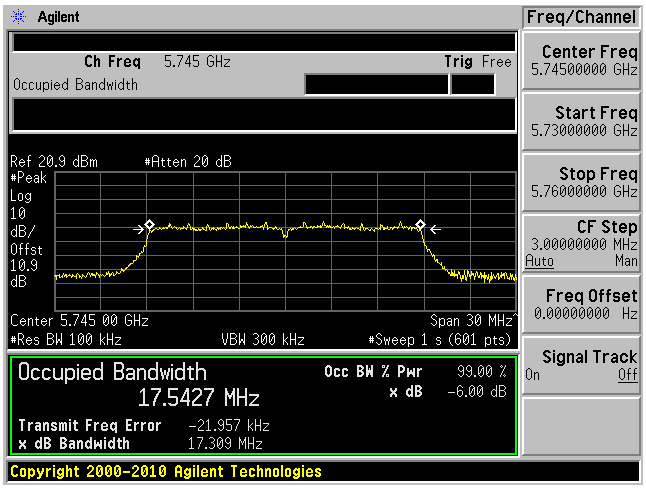


5825 MHz



802.11n20 mode

5745 MHz



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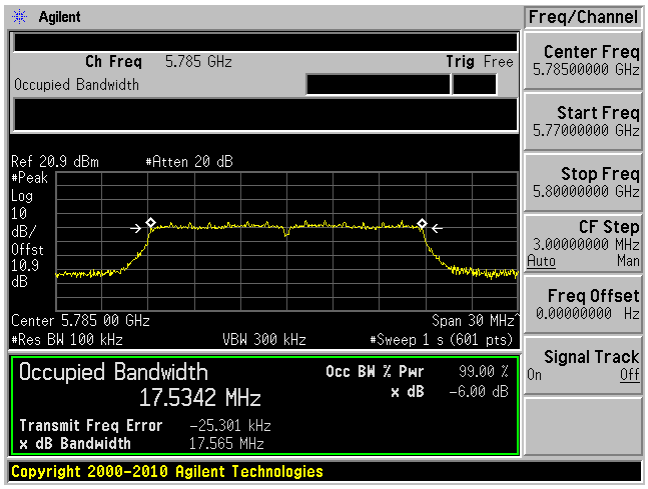

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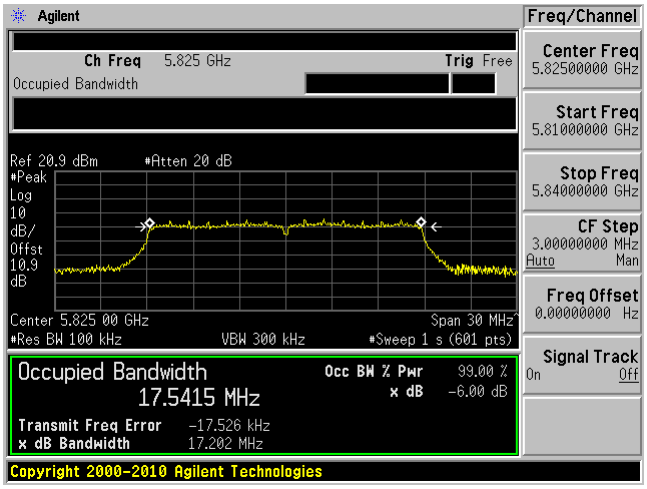
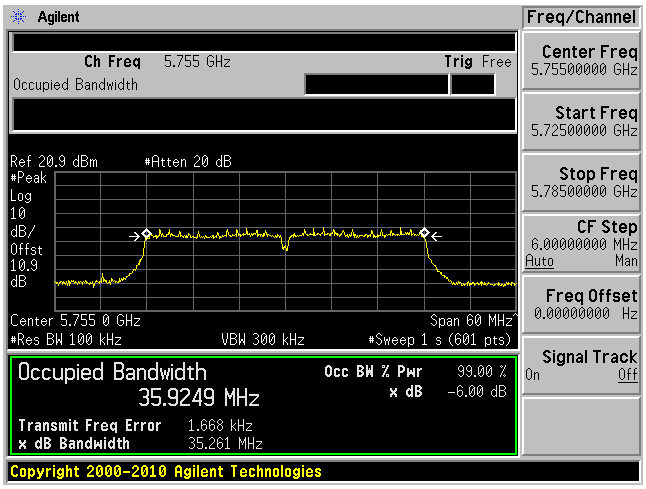
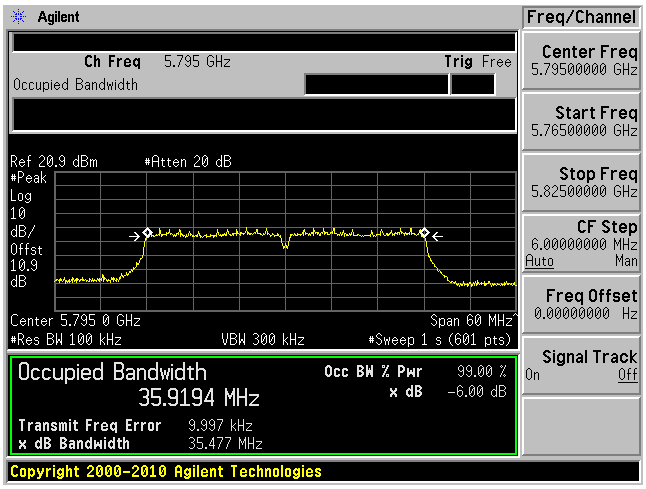


802.11n40 mode

5755 MHz

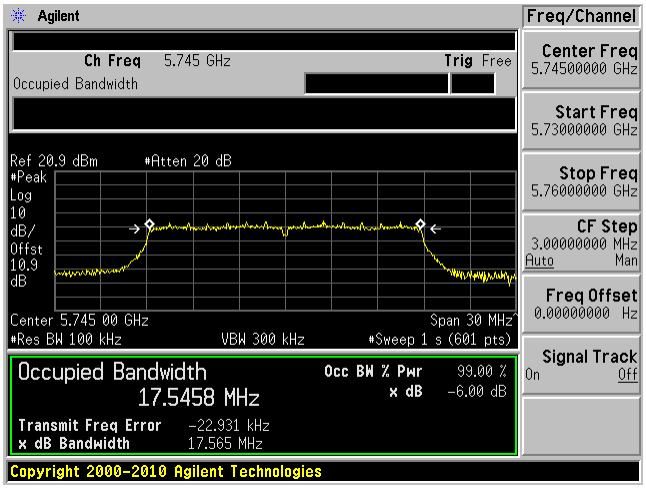


5795 MHz

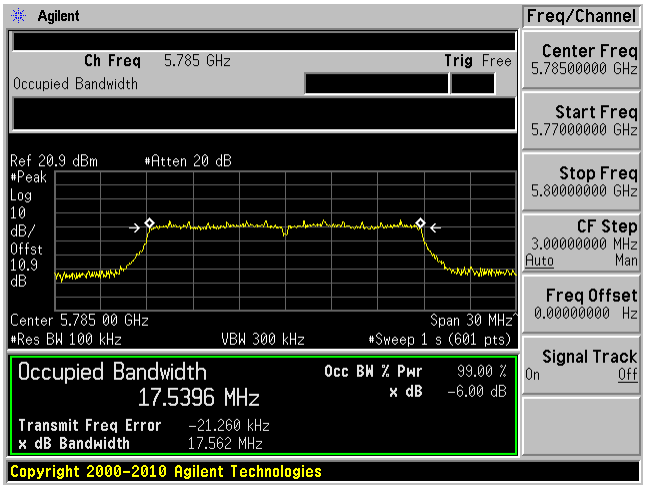


802.11ac20 mode

5745 MHz



5785 MHz



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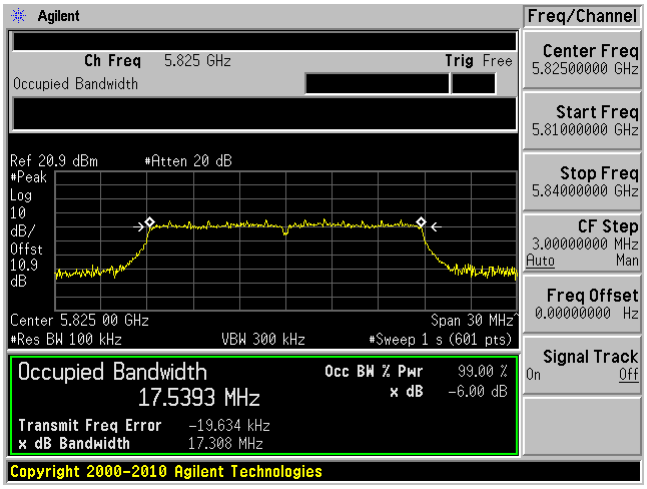
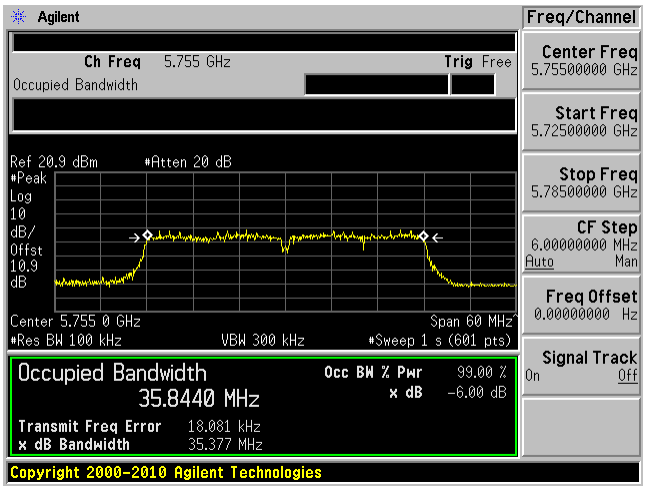
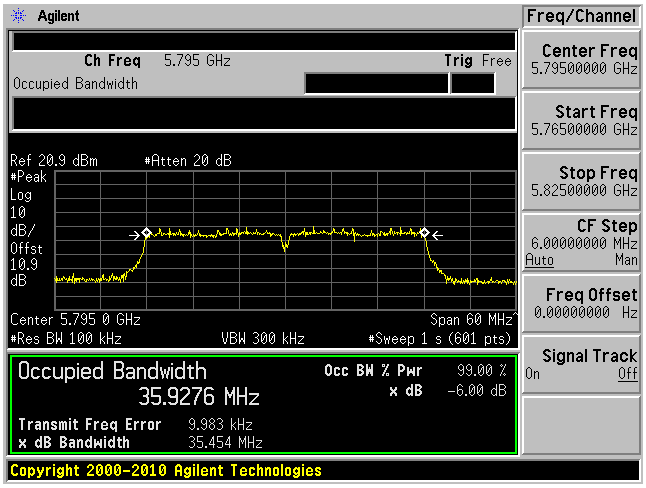


802.11ac40 mode

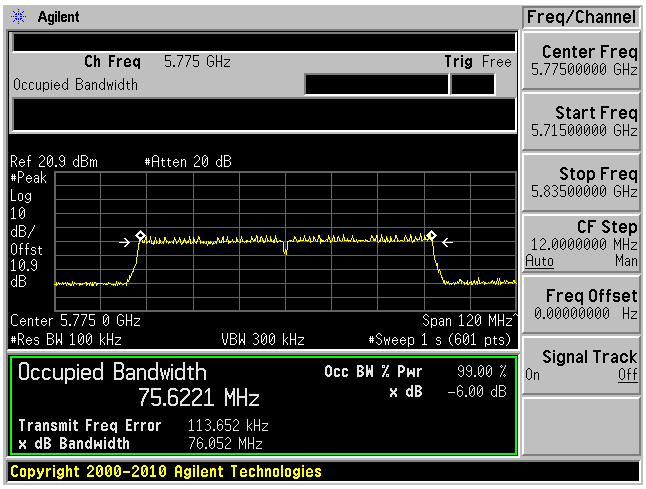
5755 MHz



5795 MHz



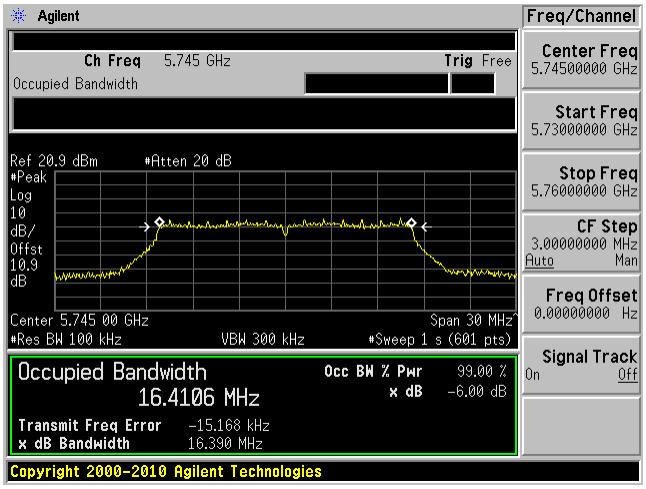
802.11ac80 mode, 5775 MHz



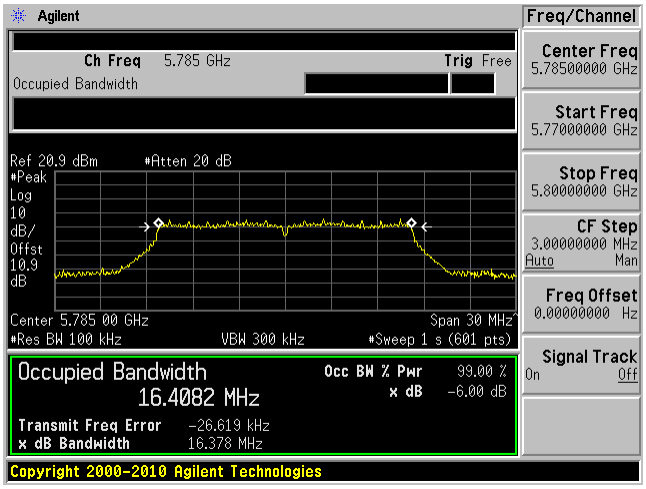
ANT B

802.11a mode

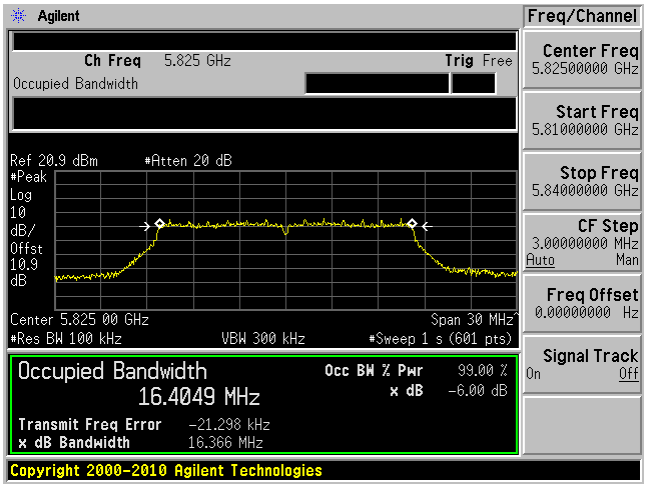
5745 MHz



5785 MHz

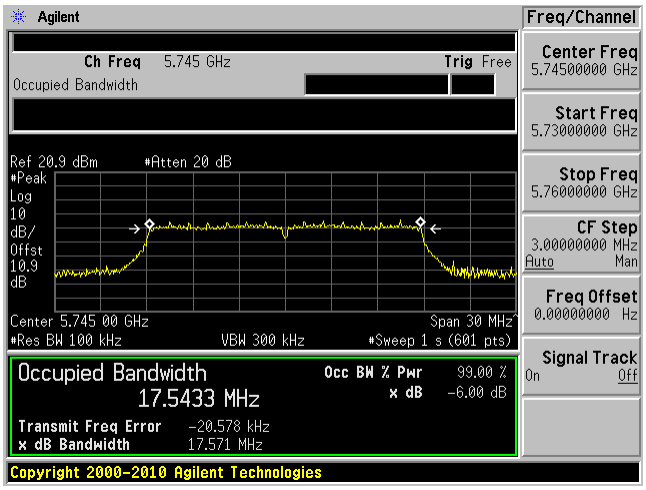


5825 MHz



802.11n20 mode

5745 MHz



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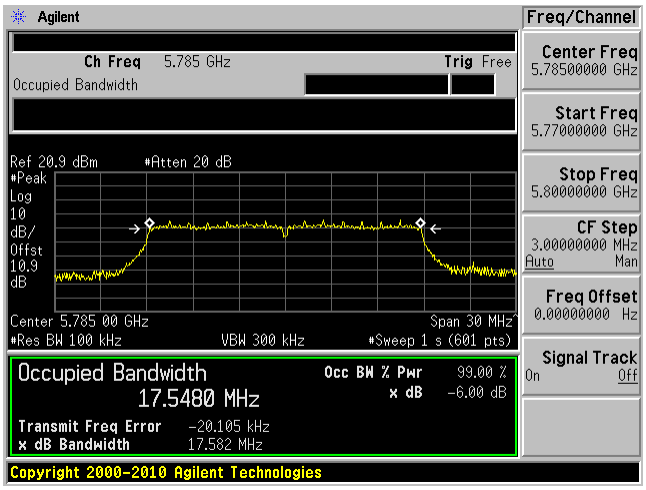

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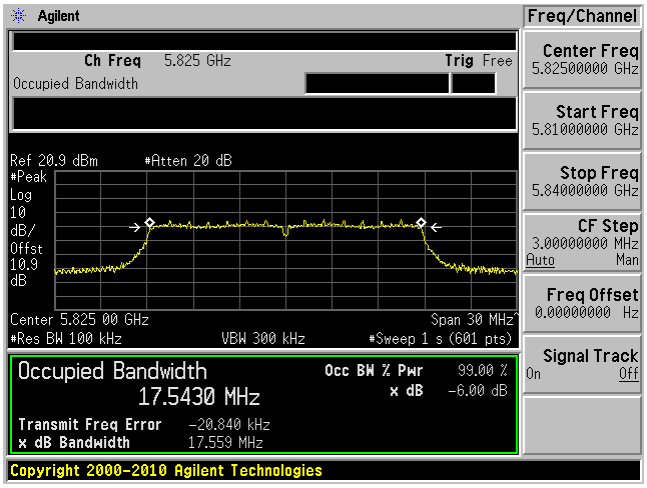
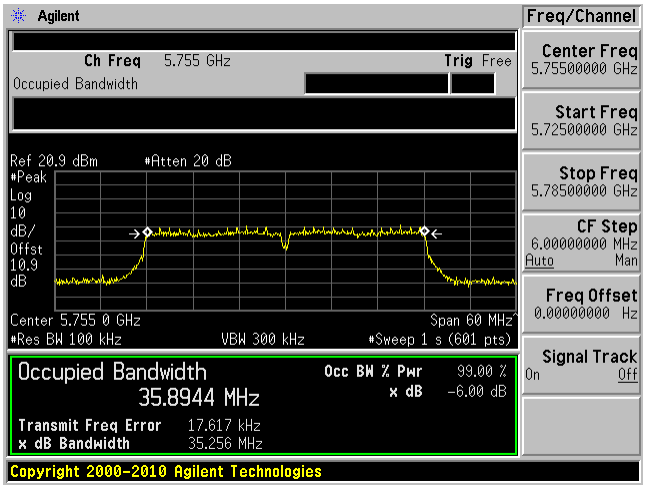
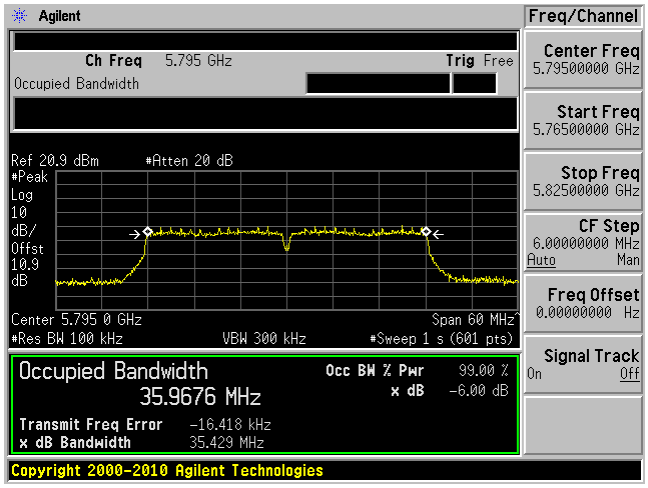


802.11n40 mode

5755 MHz

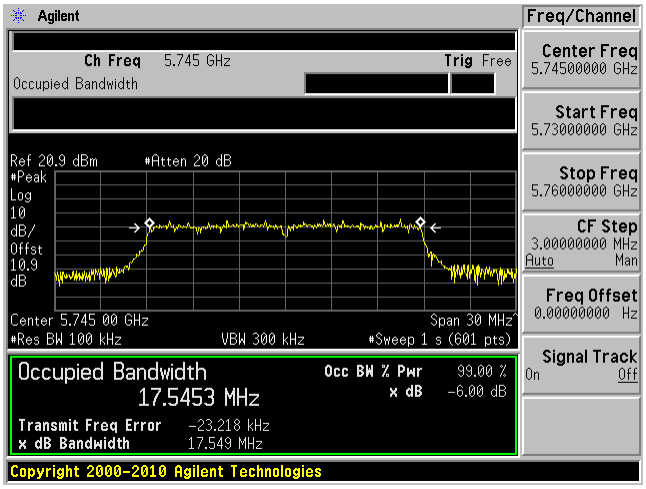


5795 MHz



802.11ac20 mode

5745 MHz



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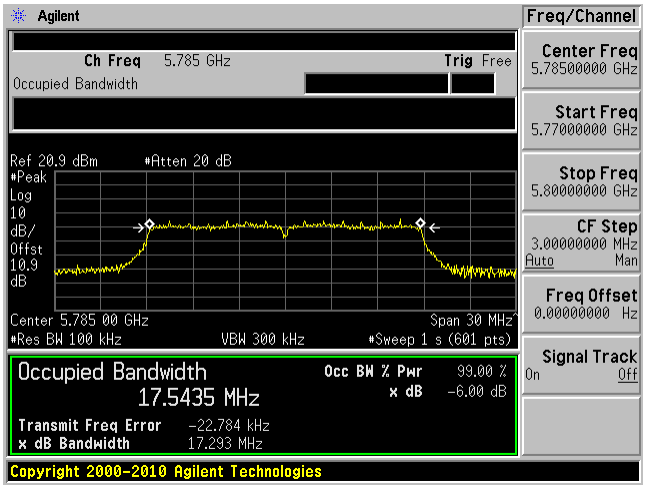
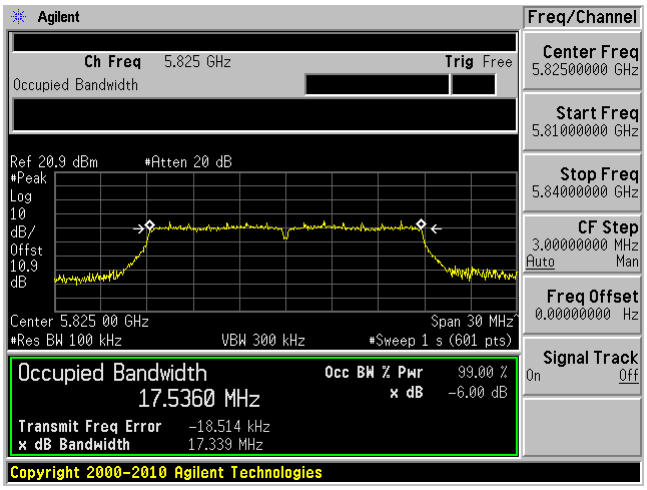
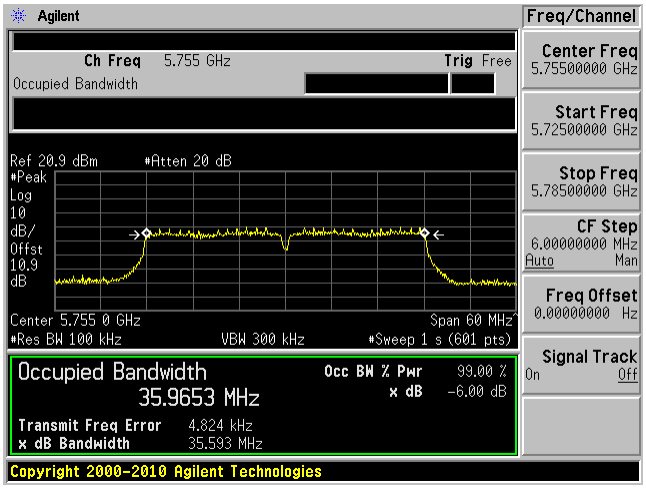


5825 MHz

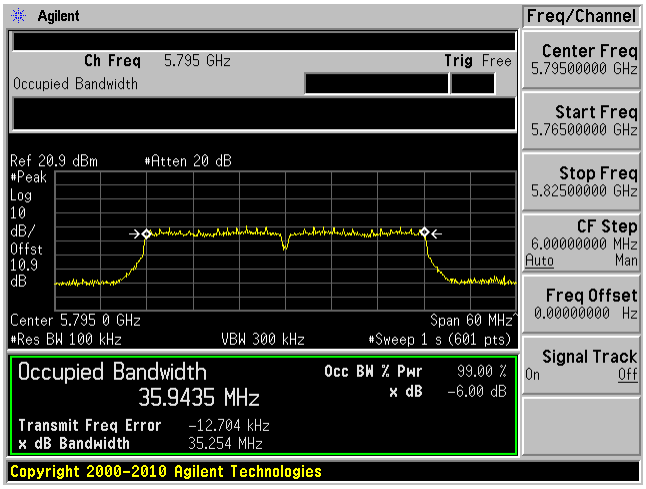


802.11ac40 mode

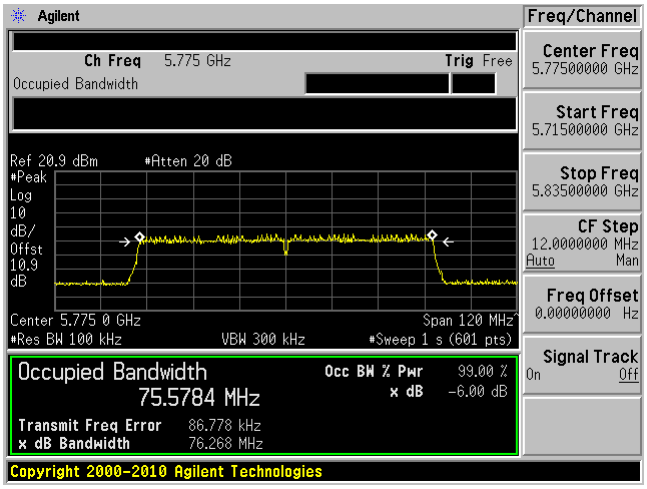
5755 MHz



5795 MHz



802.11ac80 mode, 5775 MHz



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

9.1 Applicable Standards

According to FCC §15.407(a):

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

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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

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

The measurements are based on FCC KDB 789033 D02 General U-NII Test Procedures New Rules v02r01: E. Maximum Conducted Output Power.

g) **Method SA-3 Alternative** (Reduced VBW with max hold):

(i) Set span to encompass the entire emission bandwidth (EBW) of the signal.
(ii) Set sweep trigger to “free run.”
(iii) Set RBW = 1 MHz.
(iv) Set VBW ≥ 1/T, where T is defined in II.B.1.a).
(v) 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.)
(vi) Sweep time = auto.
(vii) Detector = peak.
(viii) Video filtering shall be applied to a voltage-squared or power signal (rms), if possible. Otherwise, it shall be set to operate on a linear voltage signal (which may require use of linear display mode). Log mode must not be used.
- The preferred voltage-squared (i.e., power or rms) mode is selected on some analyzers by setting the “Average-VBW Type” to power or rms.
- If power averaging (rms) mode is not available, linear voltage mode is selected on some analyzers by setting the display mode to linear. Other analyzers have a setting for “Average-VBW Type” that can be set to “Voltage” regardless of the display mode.

(ix) Trace mode = max hold.
(x) Allow max hold to run for at least 60 seconds, or longer as needed to allow the trace to stabilize.
(xi) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument’s band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.
(xii) If linear mode was used in II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.

9.3 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
-	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 of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

9.4 Test Environmental Conditions

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

The testing was performed by Vincent Licata on 2018-03-21 to 2018-03-23 at RF site.

9.5 Test Results

5150 - 5250 MHz

FCC Results

Frequency (MHz)	Mode	TX Paths	Ant-A (dBm)	Ant-B (dBm)	Total Conducted Average Power (dBm)	Limit (dBm)
5180	802.11a	2	8.07	6.78	10.49	24.00
	802.11n20	2	8.04	6.75	10.45	24.00
	802.11ac20	2	7.99	6.73	10.41	24.00
5200	802.11a	2	7.61	6.61	10.15	24.00
	802.11n20	2	7.81	6.26	10.11	24.00
	802.11ac20	2	7.70	6.30	10.07	24.00
5240	802.11a	2	7.48	6.10	9.85	24.00
	802.11n20	2	7.53	6.27	9.96	24.00
	802.11ac20	2	7.51	6.30	9.96	24.00
5190	802.11n40	2	5.58	4.38	8.03	24.00
	802.11ac40	2	5.59	4.35	8.02	24.00
5230	802.11n40	2	5.09	3.74	7.48	24.00
	802.11ac40	2	4.98	3.73	7.41	24.00
5210	802.11ac80	2	3.67	3.61	6.65	24.00

Note: 5150-5250 MHz band is FCC use only

5725 - 5850 MHz

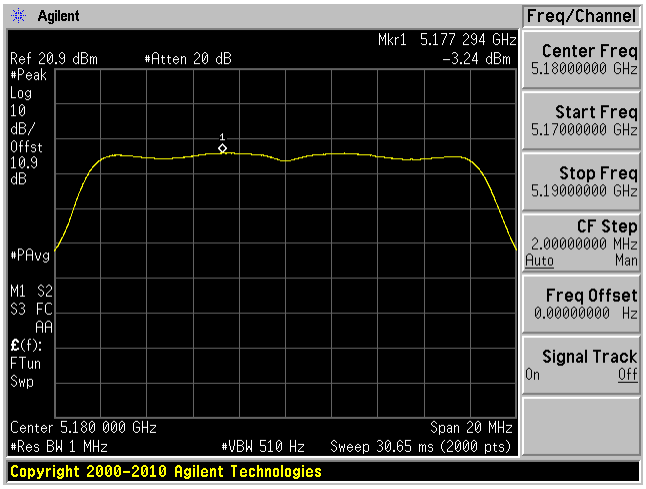
Frequency (MHz)	Mode	TX Paths	Ant-A (dBm)	Ant-B (dBm)	Total Conducted Average Power (dBm)	Limit (dBm)
5745	802.11a	2	11.10	11.57	14.35	30.00
	802.11n20	2	11.14	11.27	14.21	30.00
	802.11ac20	2	11.15	11.62	14.40	30.00
5785	802.11a	2	10.91	11.16	14.04	30.00
	802.11n20	2	11.05	11.31	14.19	30.00
	802.11ac20	2	10.76	10.88	13.83	30.00
5825	802.11a	2	10.61	10.34	13.48	30.00
	802.11n20	2	10.29	10.38	13.35	30.00
	802.11ac20	2	10.34	10.39	13.37	30.00
5755	802.11n40	2	8.43	9.22	11.85	30.00
	802.11ac40	2	8.65	9.17	11.93	30.00
5795	802.11n40	2	8.53	8.53	11.54	30.00
	802.11ac40	2	8.58	8.62	11.61	30.00
5775	802.11ac80	2	7.78	8.14	10.97	30.00

5150 – 5250 MHz

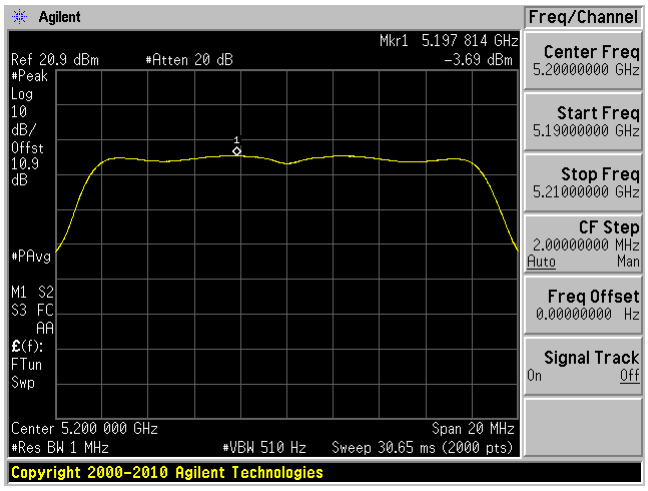
ANT A MIMO

802.11a mode

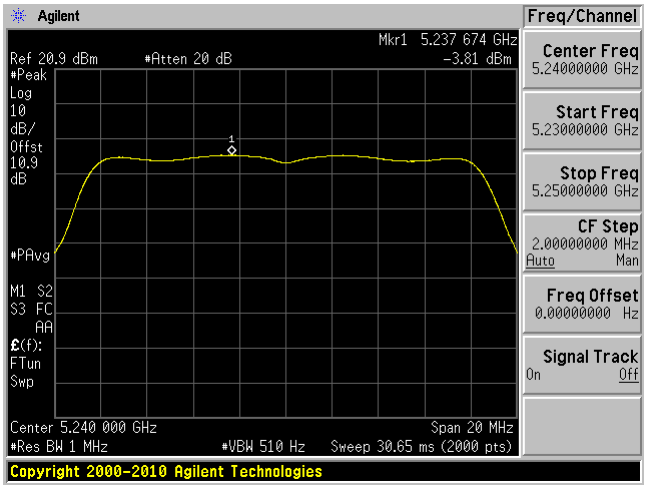
5180 MHz



5200 MHz

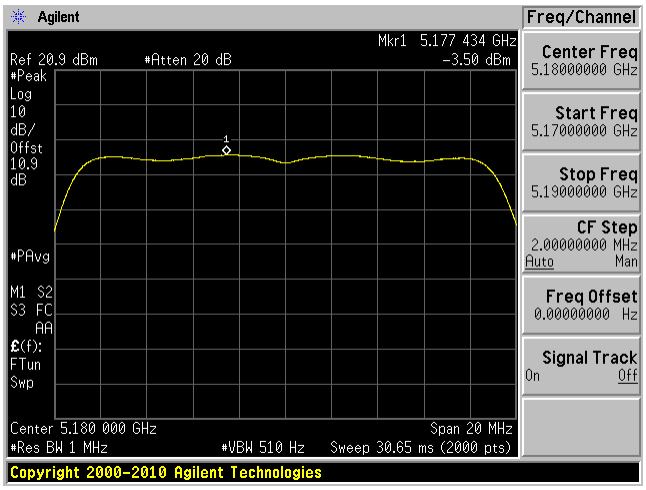


5240 MHz

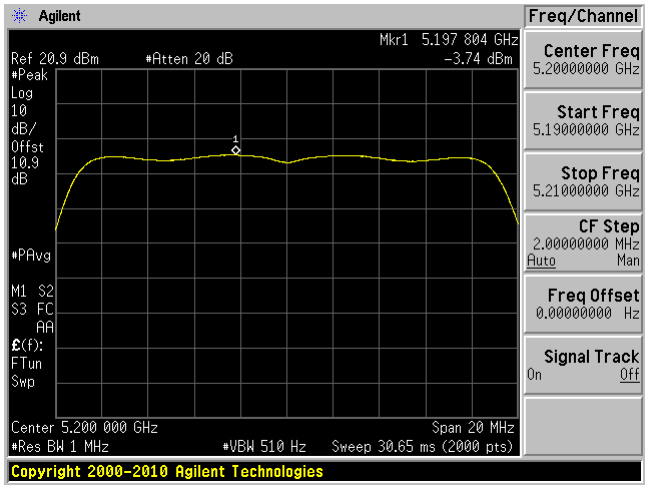


802.11n20 mode

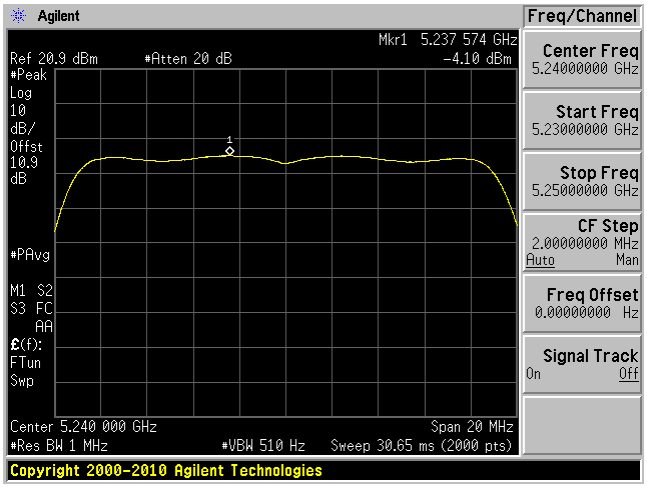
5180 MHz



5200 MHz

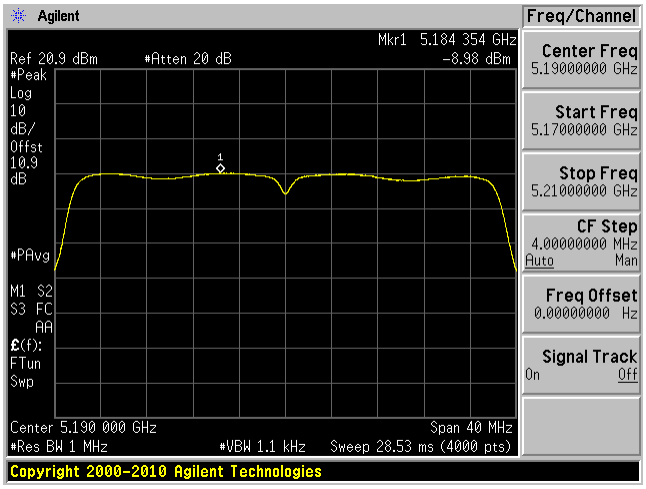


5240 MHz

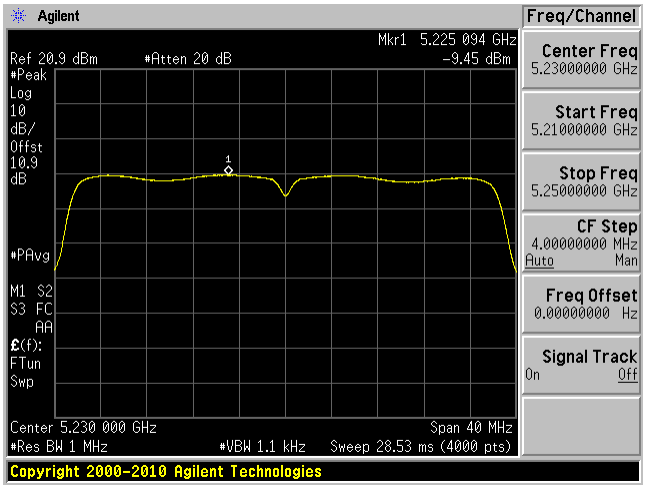


802.11n40 mode

5190 MHz

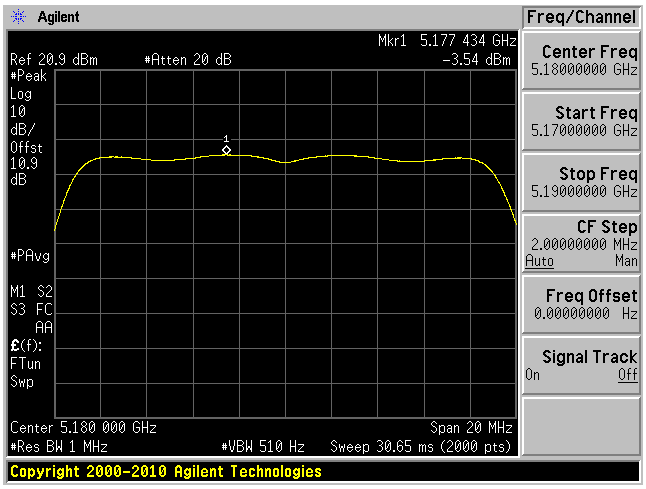


5230 MHz

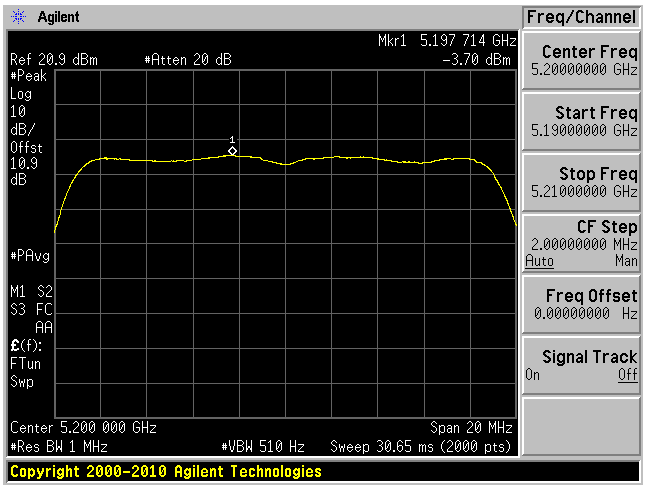


802.11ac20 mode

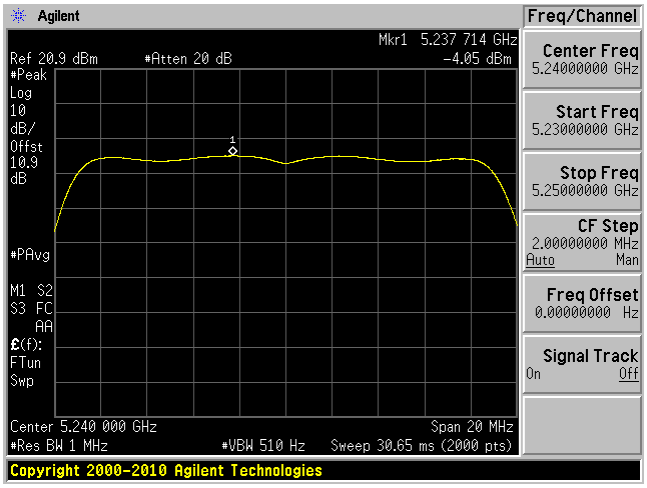
5180 MHz



5200 MHz

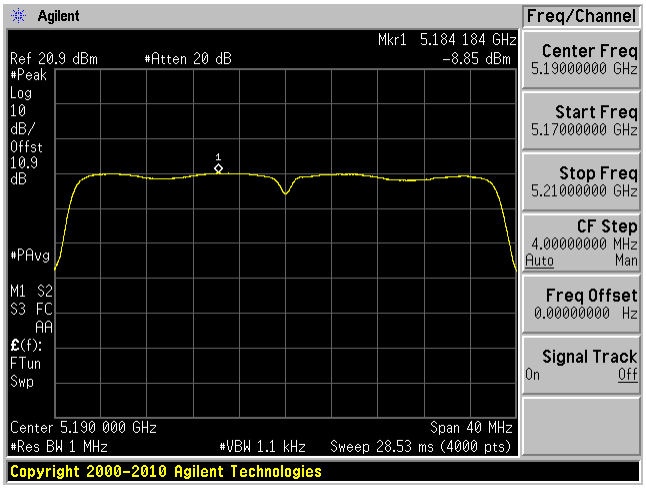


5240 MHz

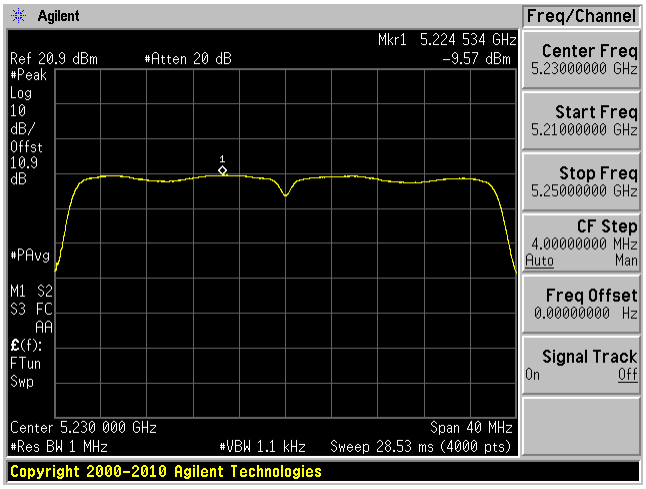


802.11ac40 mode

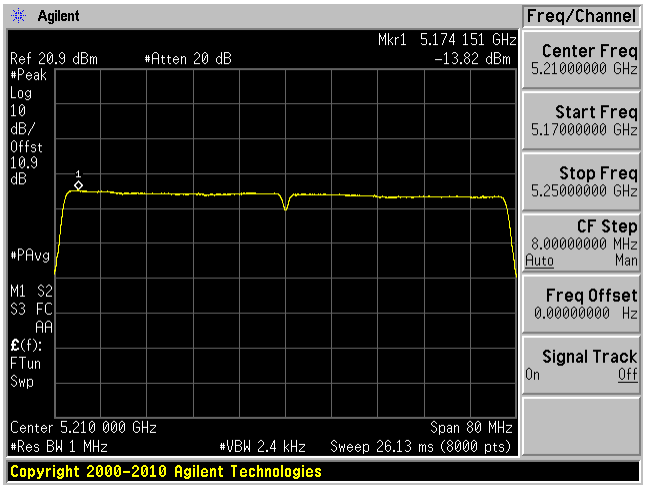
5190 MHz



5230 MHz



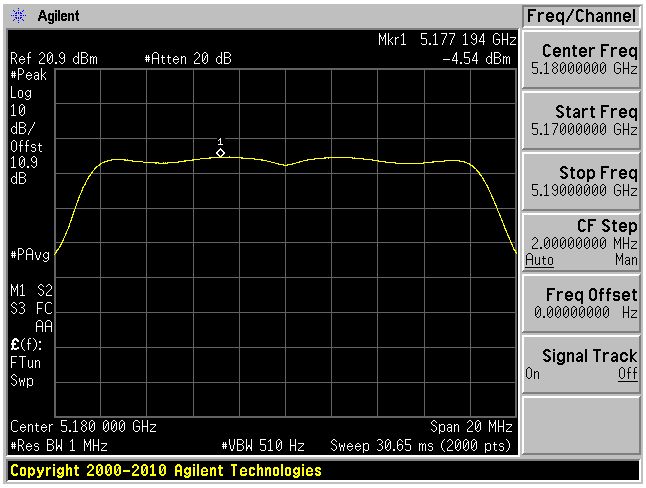
802.11ac80 mode, 5210 MHz



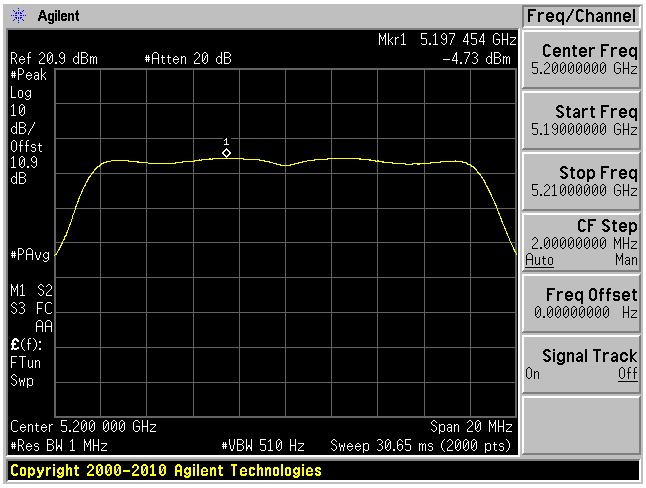
ANT B MIMO

802.11a mode

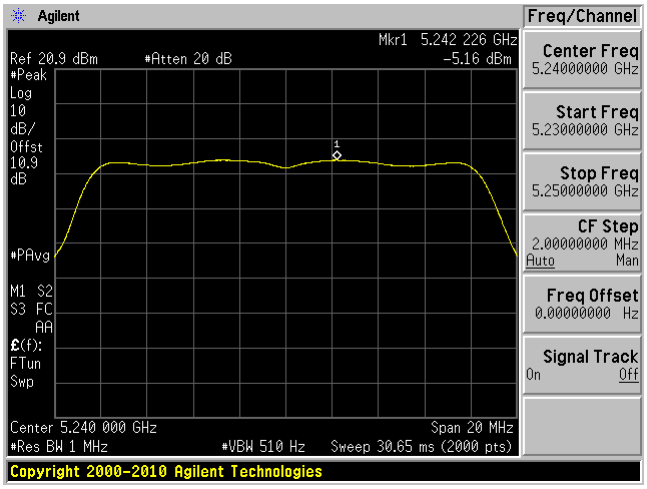
5180 MHz



5200 MHz

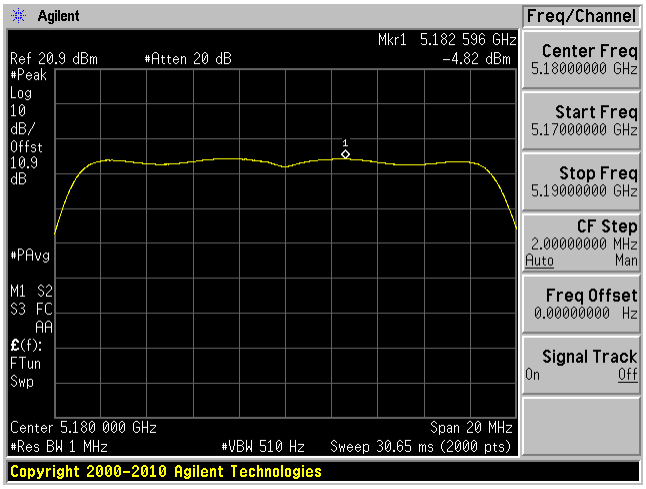


5240 MHz

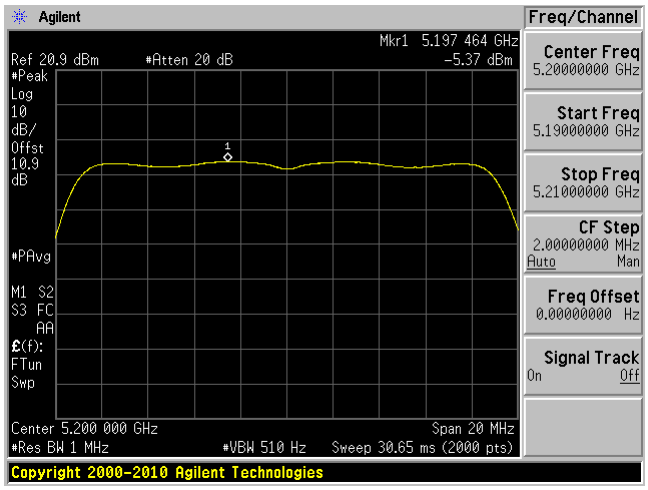


802.11n20 mode

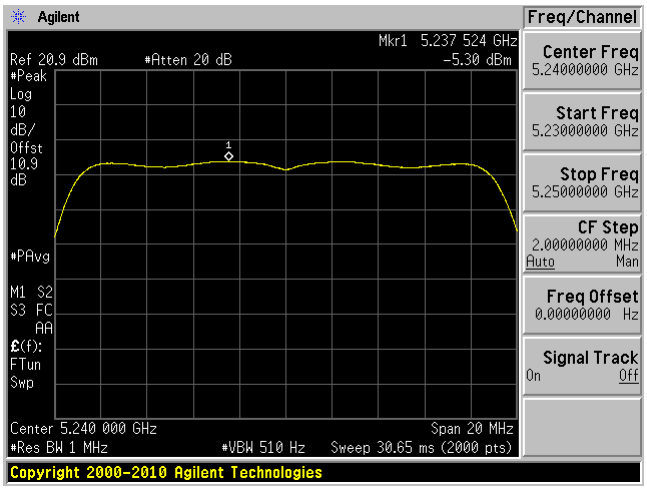
5180 MHz



5200 MHz

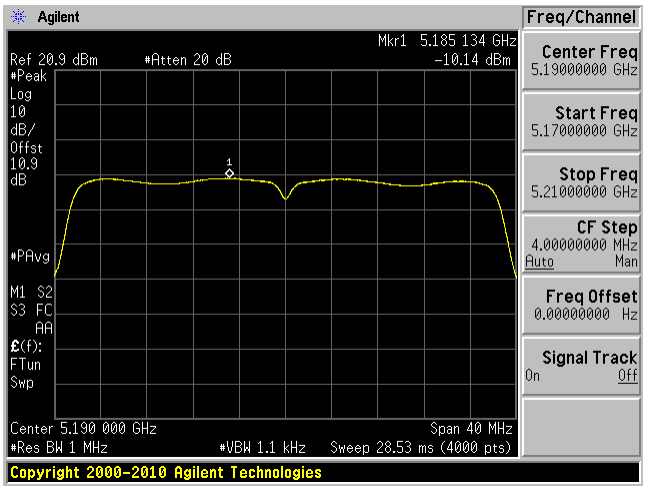


5240 MHz

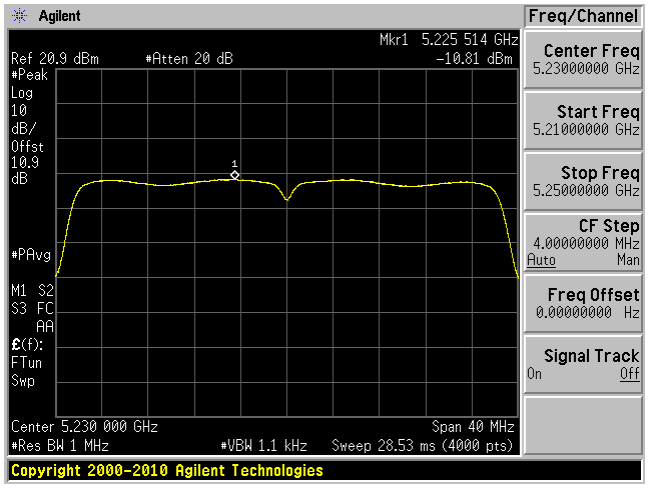


802.11n40 mode

5190 MHz

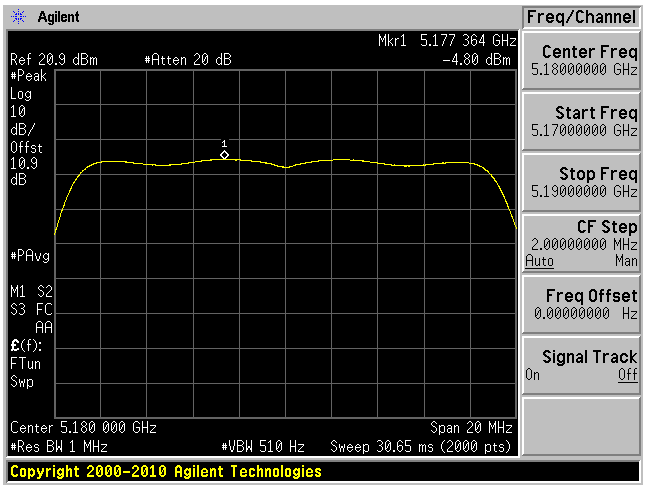


5230 MHz

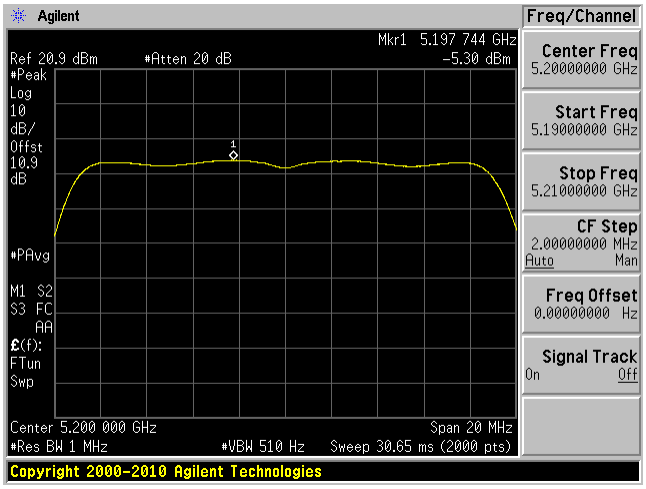


802.11ac20 mode

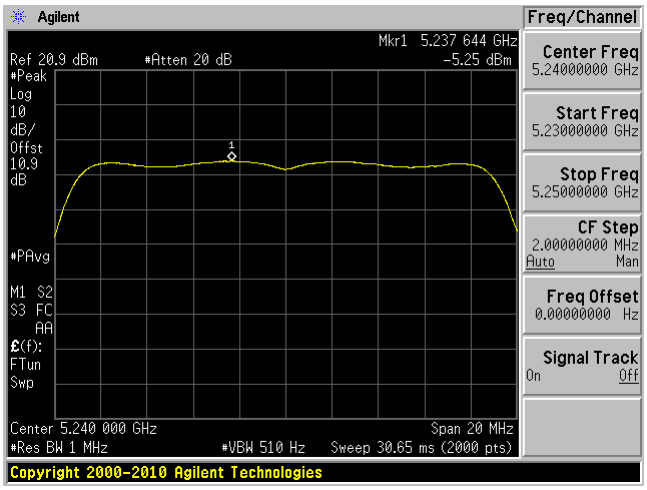
5180 MHz



5200 MHz

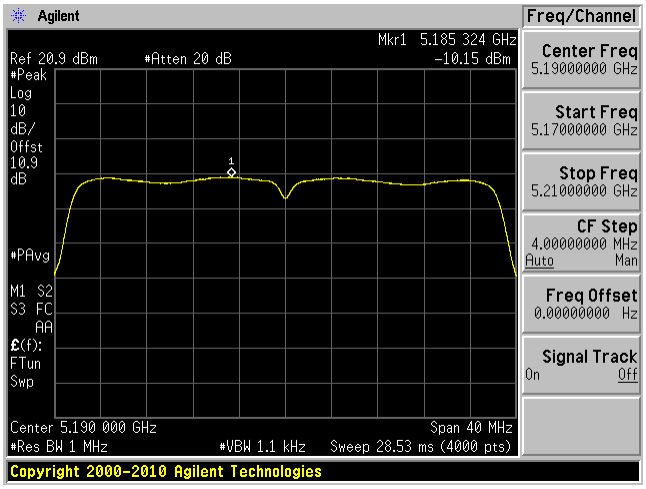


5240 MHz

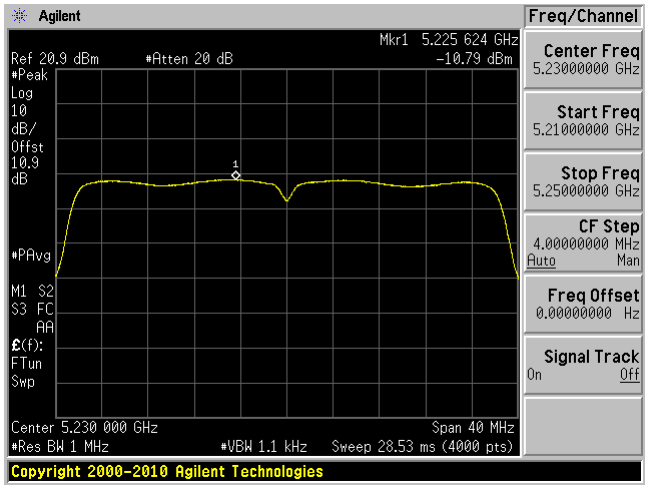


802.11ac40 mode

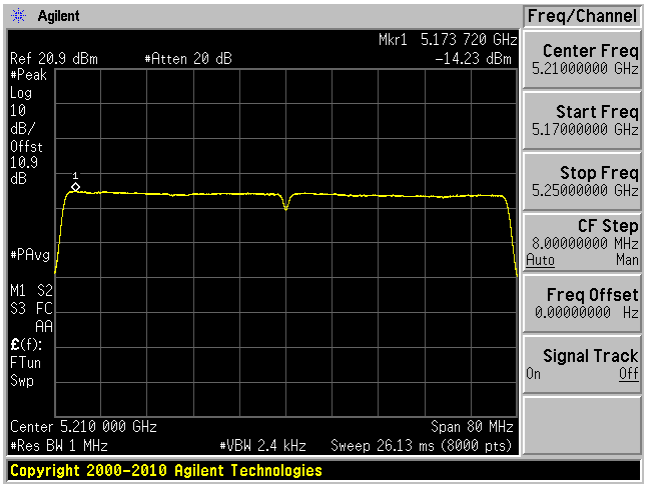
5190 MHz



5230 MHz



802.11ac80 mode, 5210 MHz

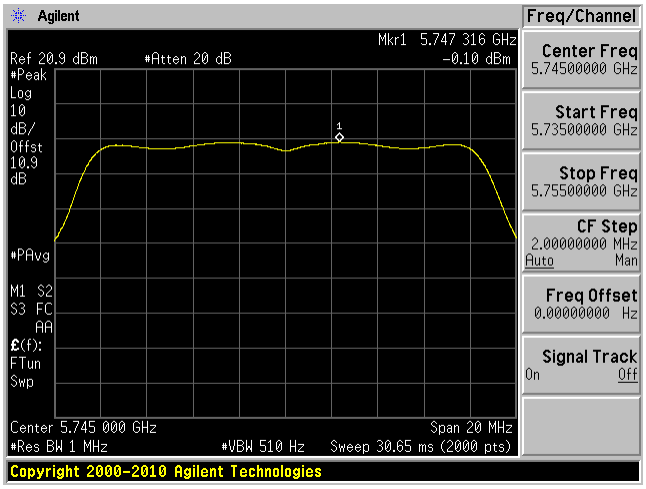


5725 – 5850 MHz

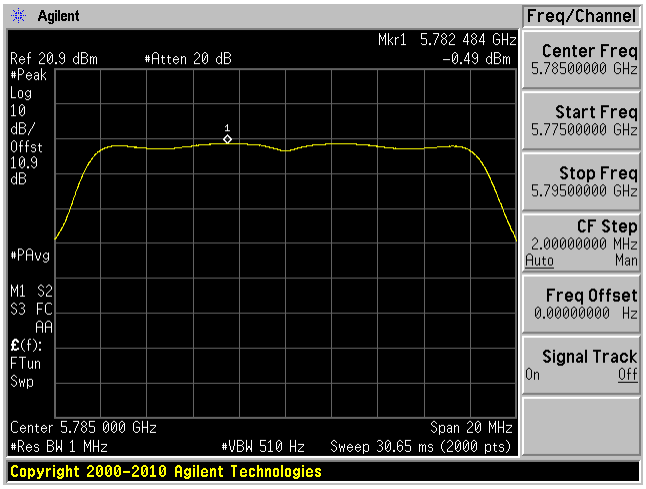
ANT A MIMO

802.11a mode

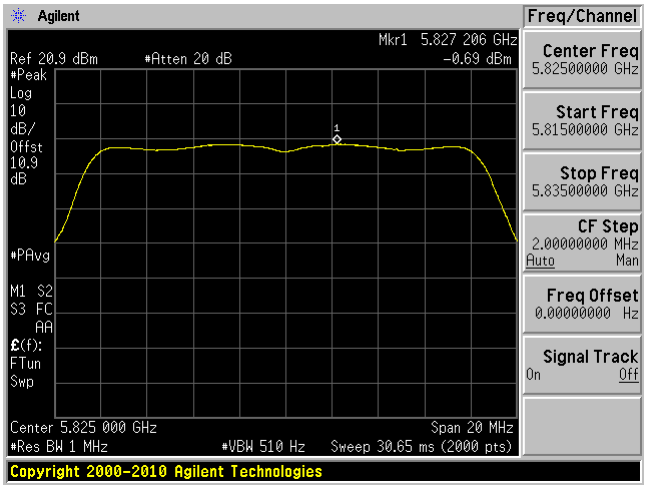
5745 MHz



5785 MHz

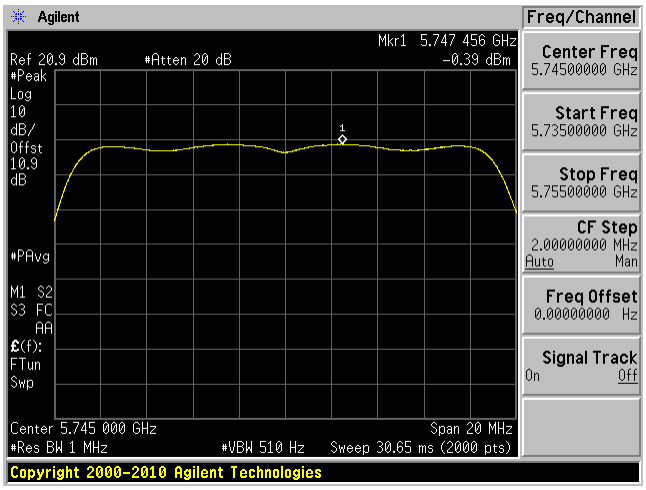


5825 MHz

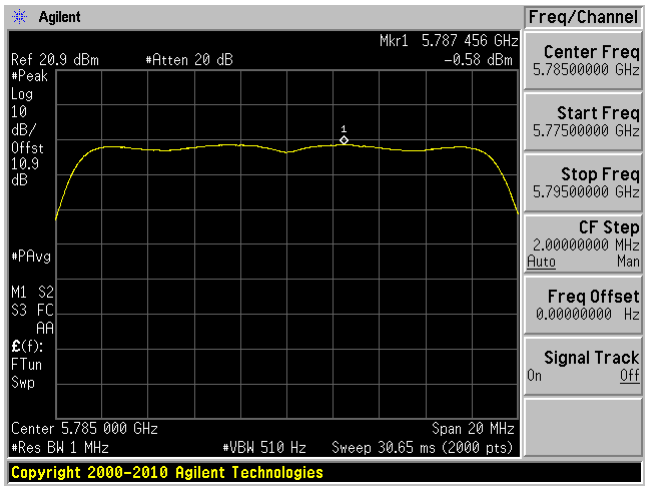


802.11n20 mode

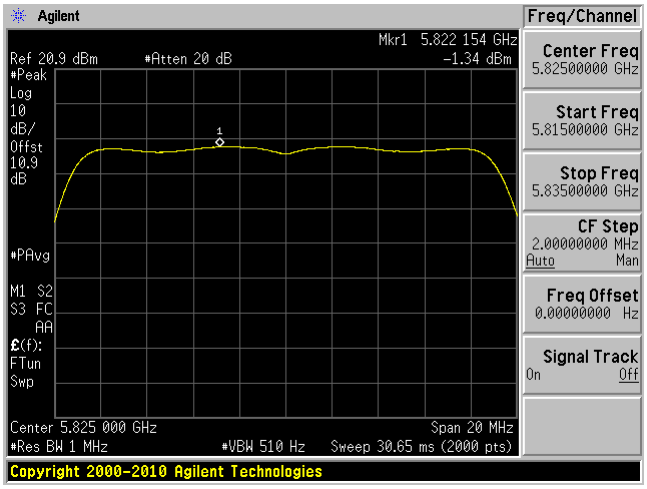
5745 MHz



5785 MHz

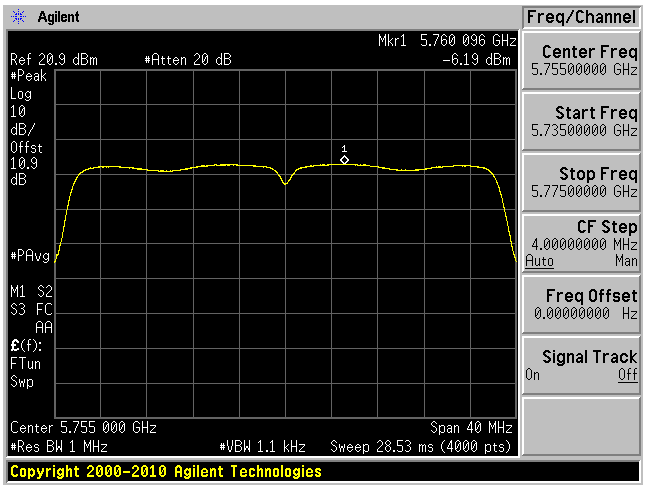


5825 MHz

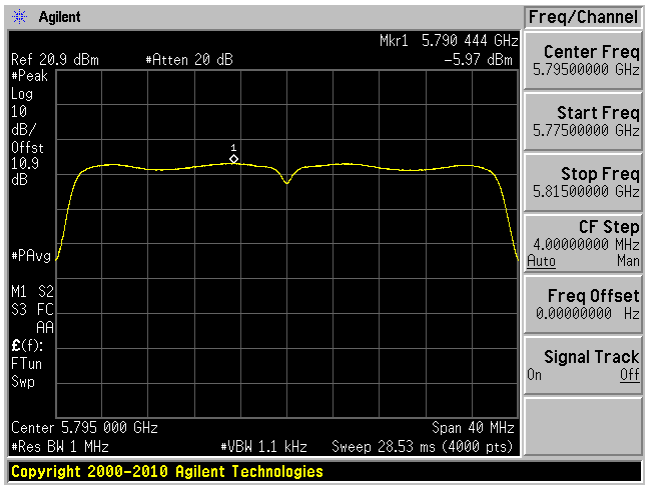


802.11n40 mode

5755 MHz

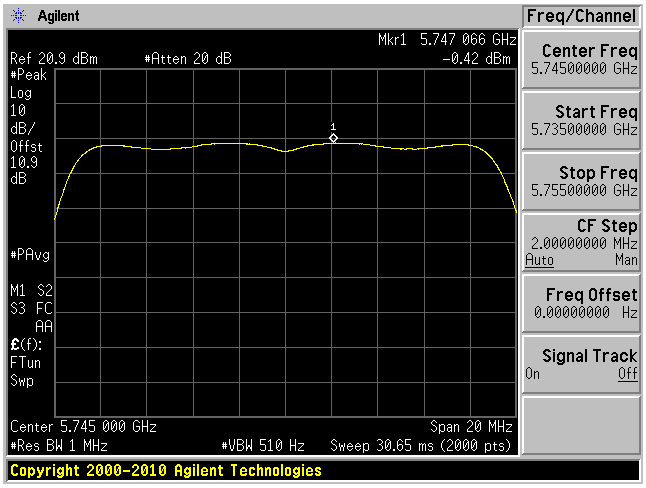


5795 MHz

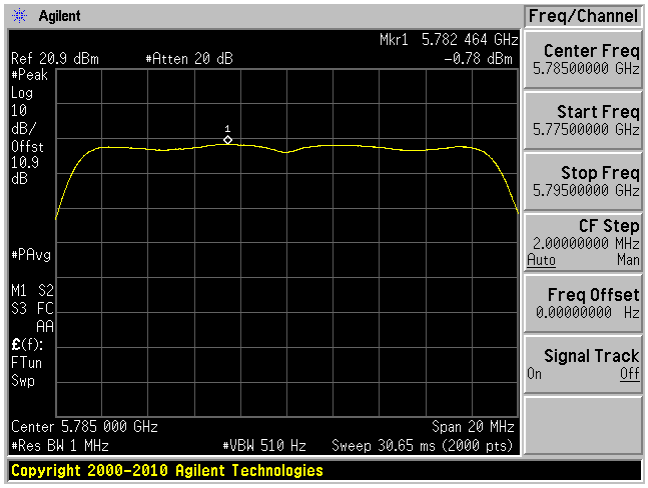


802.11ac20 mode

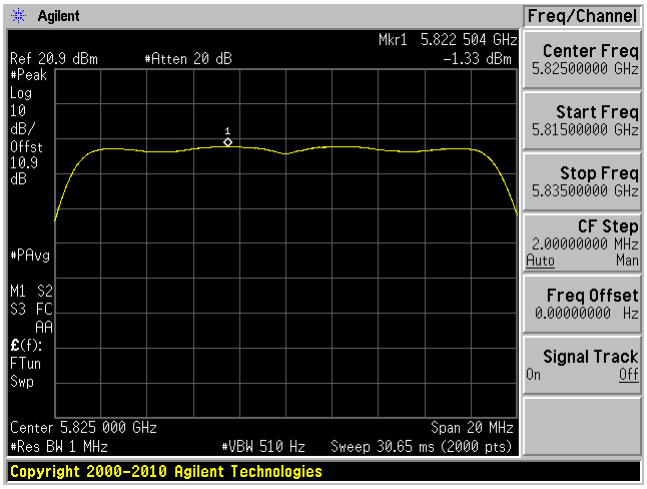
5745 MHz



5785 MHz

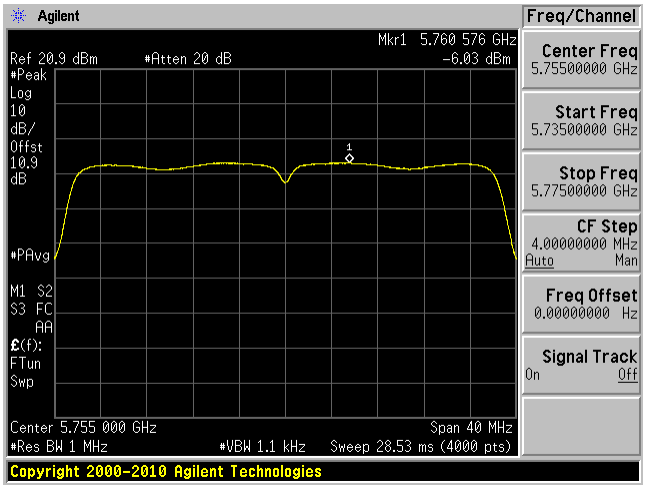


5825 MHz

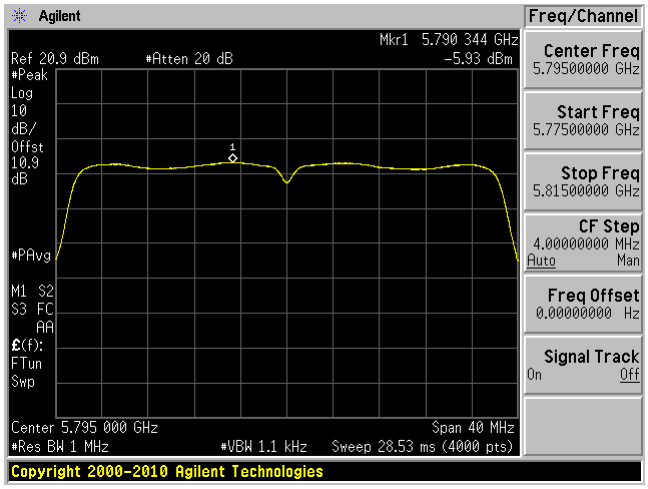


802.11ac40 mode

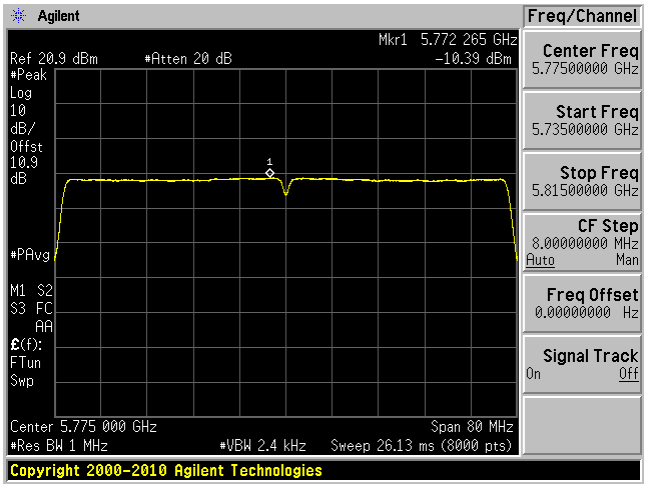
5755 MHz



5795 MHz



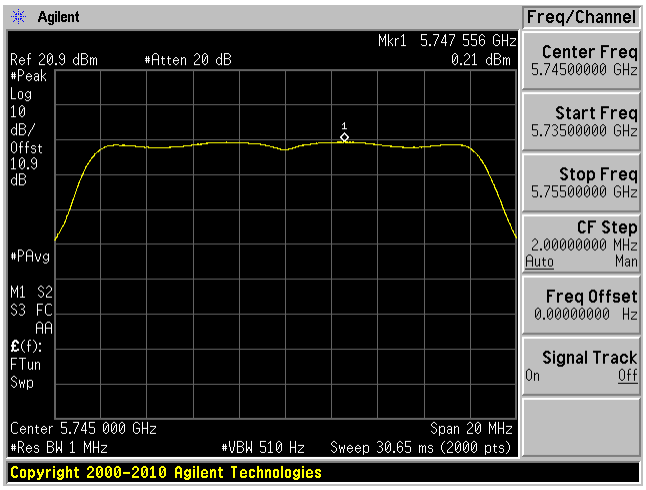
802.11ac80 mode, 5775 MHz



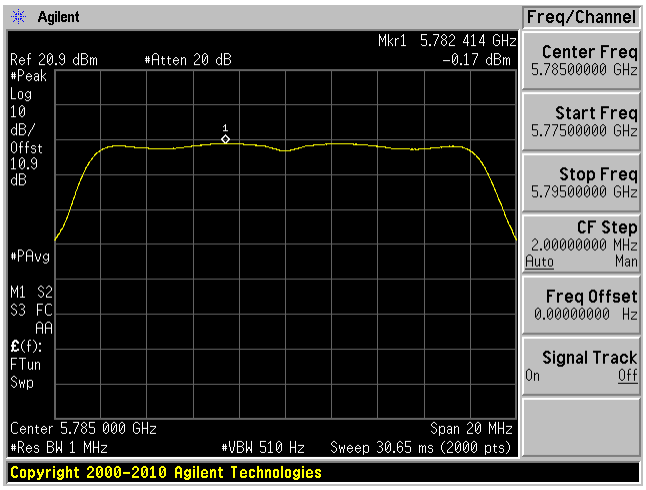
ANT B MIMO

802.11a mode

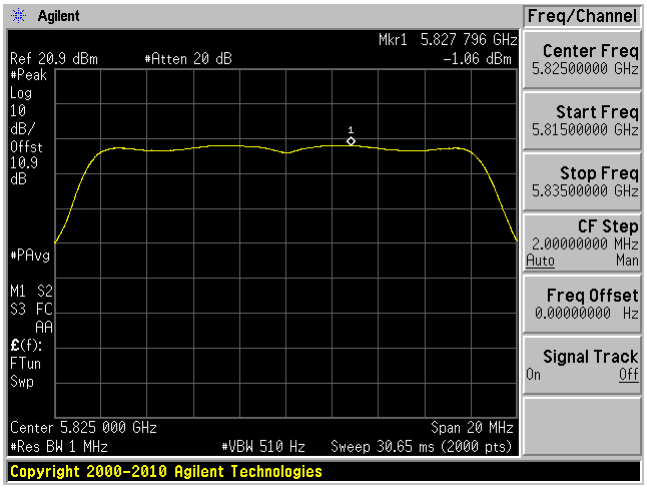
5745 MHz



5785 MHz

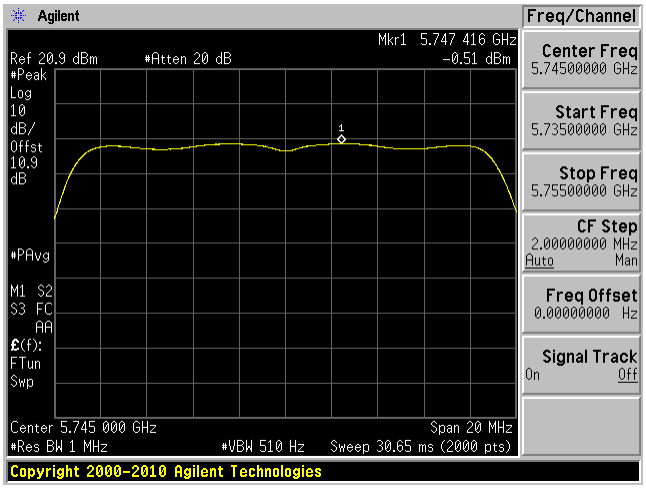


5825 MHz

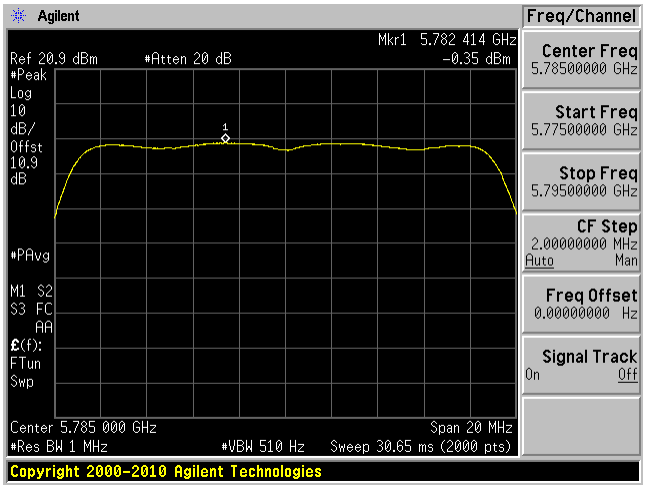


802.11n20 mode

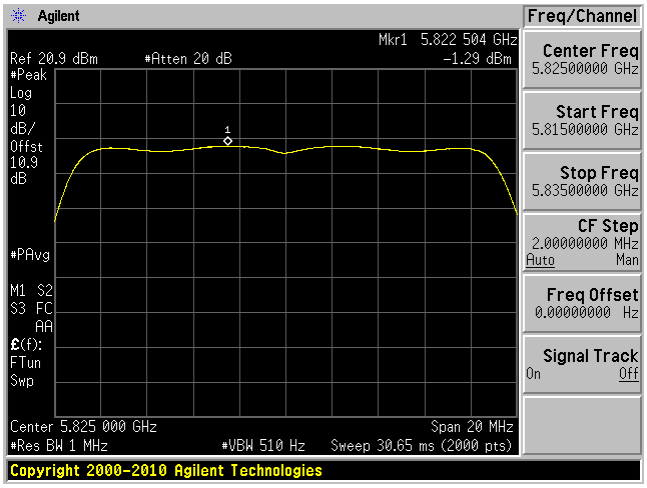
5745 MHz



5785 MHz

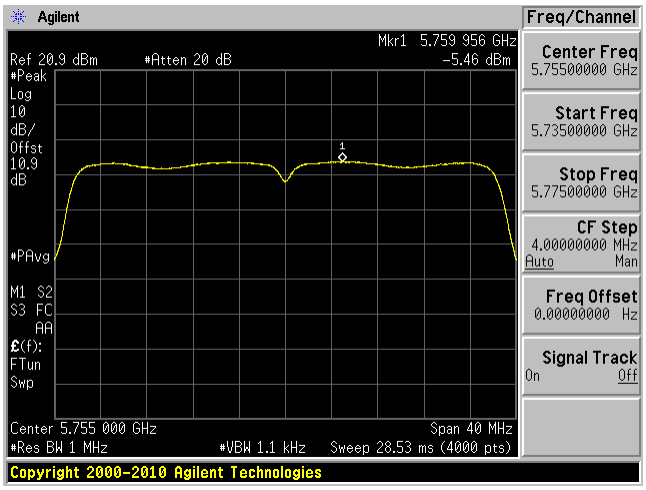


5825 MHz

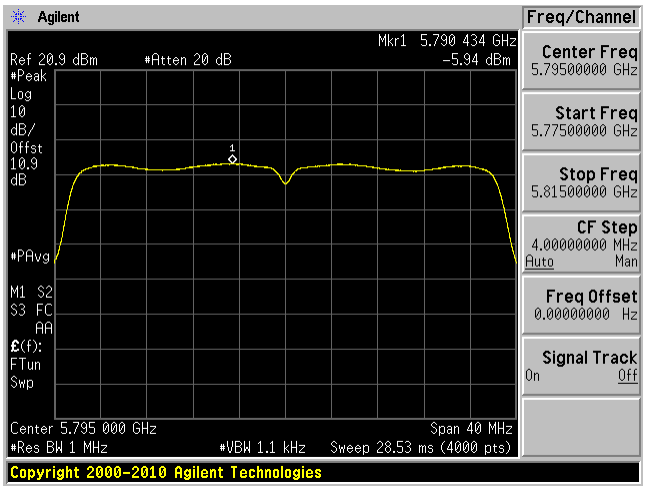


802.11n40 mode

5755 MHz

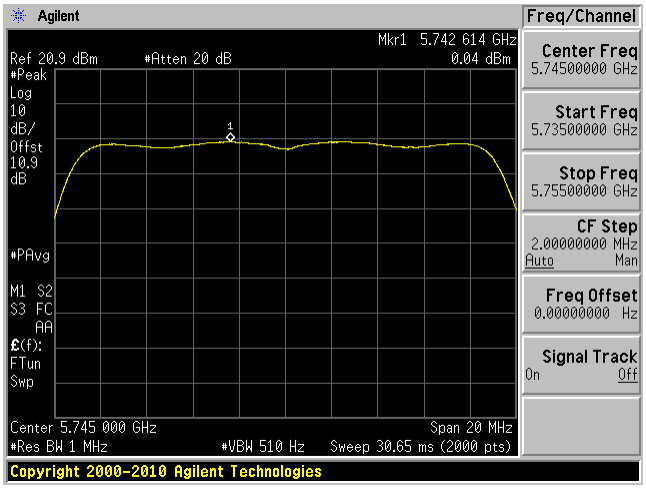


5795 MHz

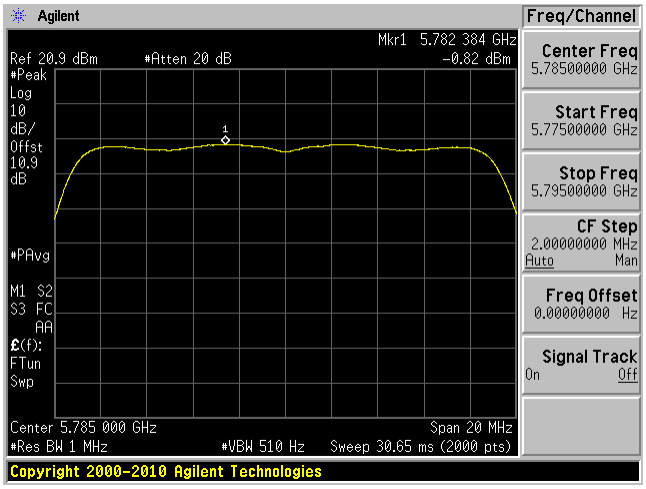


802.11ac20 mode

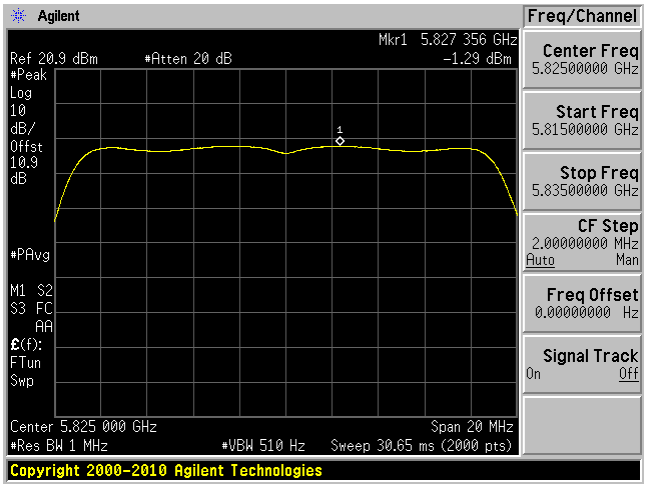
5745 MHz



5785 MHz

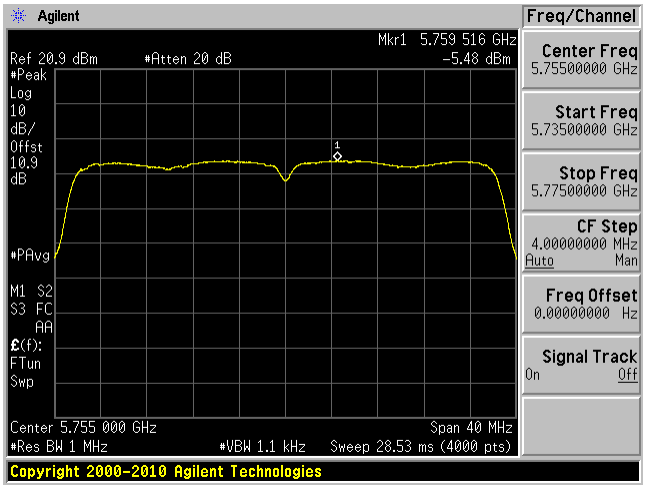


5825 MHz

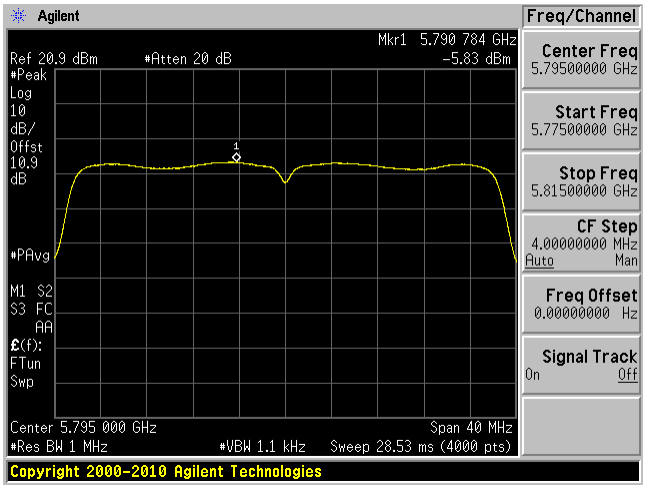


802.11ac40 mode

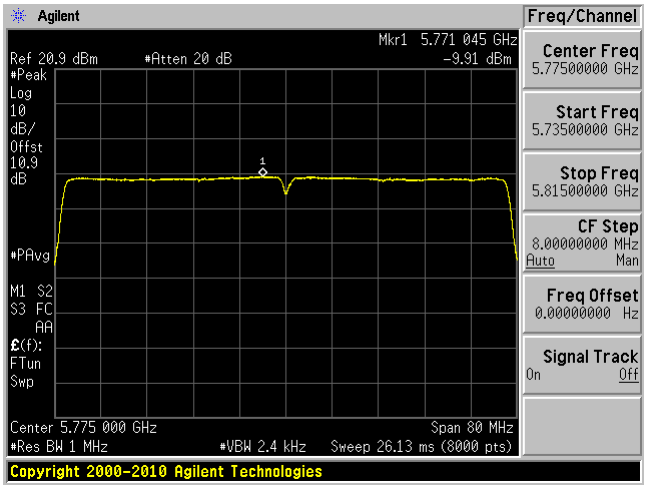
5755 MHz



5795 MHz



802.11ac80 mode, 5775 MHz



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

10.1 Applicable Standards

According to FCC §15.407(a):

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

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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

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

The measurements are based on FCC KDB 789033 D02 General U-NII Test Procedures New Rules v02r01: F. Maximum Power Spectral Density (PSD).

10.3 Test Equipment List and Details

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

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

Note[1]: cables and attenuators included in the test set-up will be checked each time before testing.

10.4 Test Environmental Conditions

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

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

10.5 Test Results

5150 - 5250 MHz

FCC Results

Frequency (MHz)	Mode	TX Paths	Ant-A (dBm/MHz)	Ant-B (dBm/MHz)	Total Conducted Average Power (dBm/MHz)	Limit (dBm / MHz)
5180	802.11a	2	-3.24	-4.54	-0.83	11.00
	802.11n20	2	-3.50	-4.82	-1.10	11.00
	802.11ac20	2	-3.54	-4.80	-1.11	11.00
5200	802.11a	2	-3.69	-4.73	-1.17	11.00
	802.11n20	2	-3.74	-5.37	-1.47	11.00
	802.11ac20	2	-3.70	-5.30	-1.42	11.00
5240	802.11a	2	-3.81	-5.16	-1.42	11.00
	802.11n20	2	-4.10	-5.30	-1.65	11.00
	802.11ac20	2	-4.05	-5.25	-1.60	11.00
5190	802.11n40	2	-8.98	-10.14	-6.51	11.00
	802.11ac40	2	-8.85	-10.15	-6.44	11.00
5230	802.11n40	2	-9.45	-10.81	-7.07	11.00
	802.11ac40	2	-9.57	-10.79	-7.13	11.00
5210	802.11ac80	2	-13.82	-14.23	-11.01	11.00

Note: 5150-5250 MHz band is FCC use only

5725 - 5850 MHz

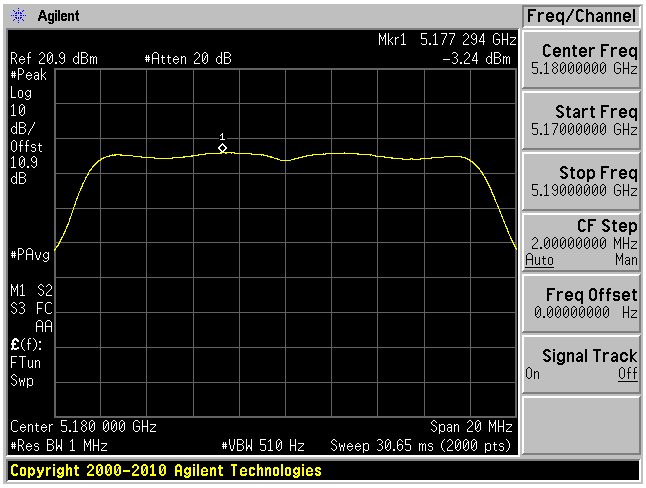
Frequency (MHz)	Mode	TX Paths	Ant-A (dBm/ MHz)	Ant-B (dBm/ MHz)	Total Conducted Average Power (dBm / MHz)	Corrected (dBm / 500 kHz)	Limit (dBm / 500 kHz)
5745	802.11a	2	-0.10	0.21	3.07	0.06	30.00
	802.11n20	2	-0.39	-0.51	2.56	-0.45	30.00
	802.11ac20	2	-0.42	0.04	2.83	-0.18	30.00
5785	802.11a	2	-0.49	-0.17	2.68	-0.33	30.00
	802.11n20	2	-0.58	-0.35	2.55	-0.46	30.00
	802.11ac20	2	-0.78	-0.82	2.21	-0.80	30.00
5825	802.11a	2	-0.69	-1.06	2.14	-0.87	30.00
	802.11n20	2	-1.34	-1.29	1.70	-1.31	30.00
	802.11ac20	2	-1.33	-1.29	1.70	-1.31	30.00
5755	802.11n40	2	-6.19	-5.46	-2.80	-5.81	30.00
	802.11ac40	2	-6.03	-5.48	-2.74	-5.75	30.00
5795	802.11n40	2	-5.97	-5.94	-2.94	-5.95	30.00
	802.11ac40	2	-5.93	-5.83	-2.87	-5.88	30.00
5775	802.11ac80	2	-10.39	-9.91	-7.13	-10.14	30.00

5150 – 5250 MHz

ANT A MIMO

802.11a mode

5180 MHz



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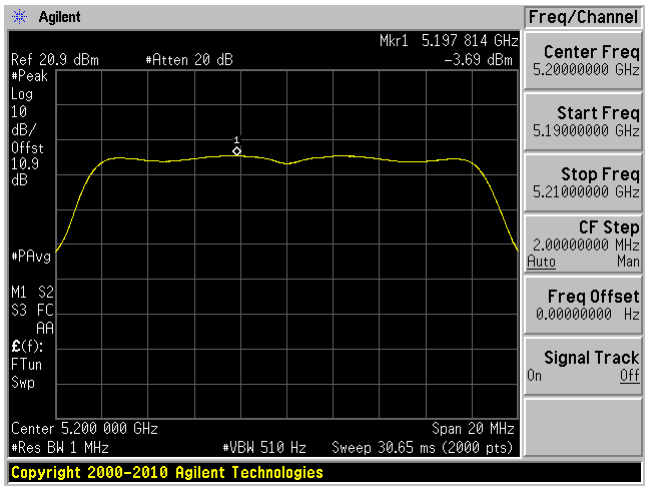

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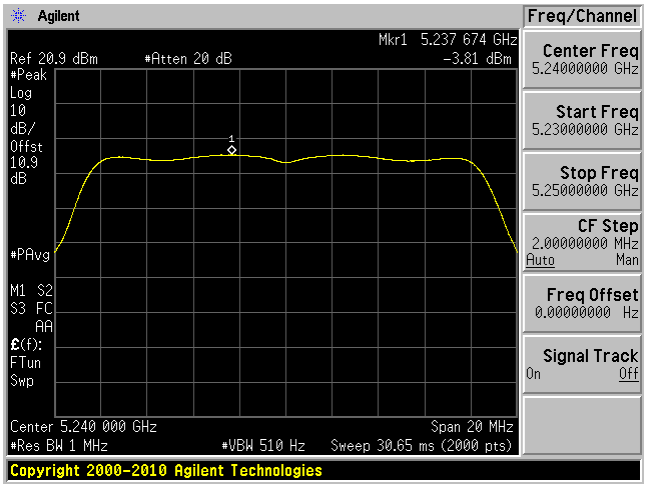

802.11n20 mode

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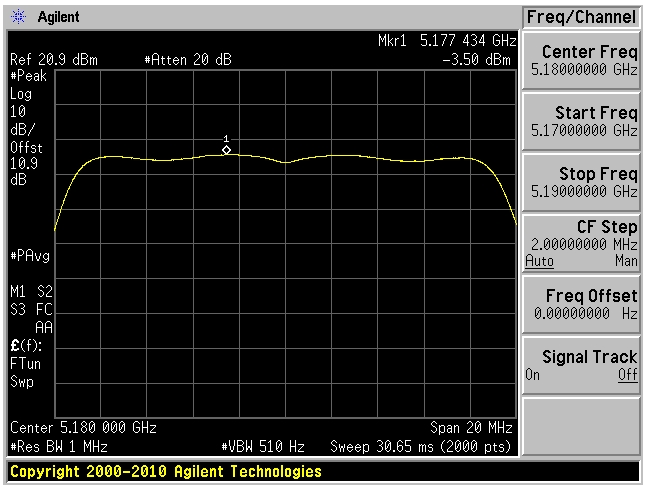

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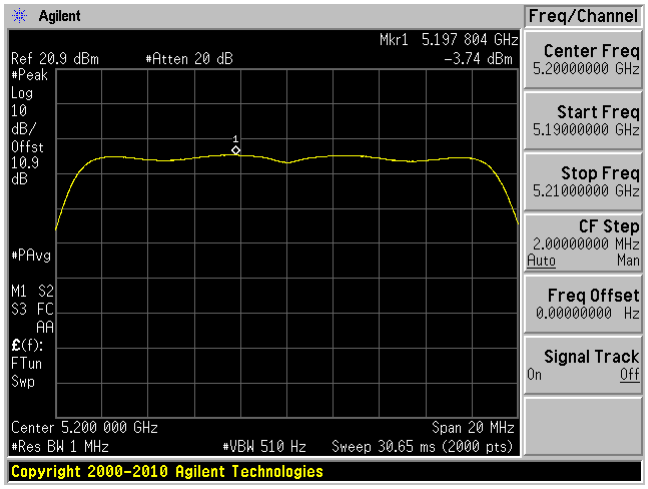

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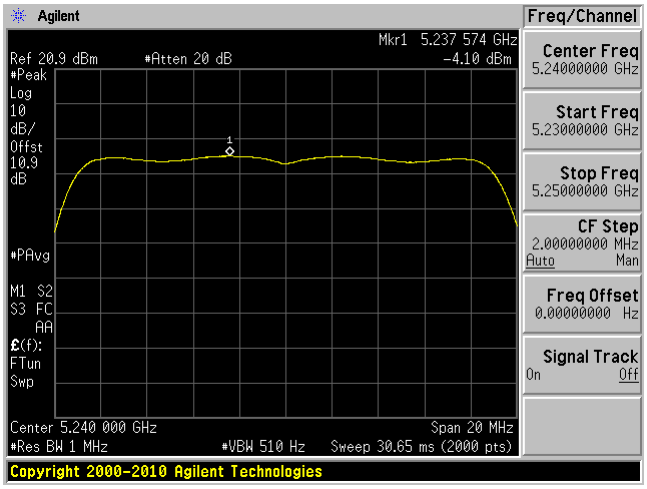
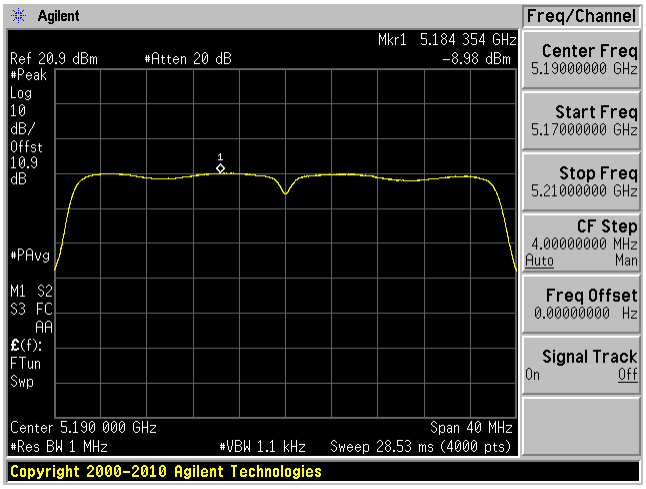
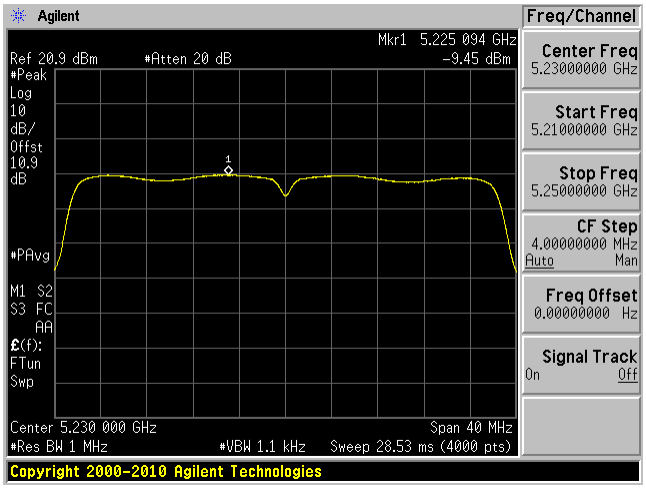


802.11n40 mode

5190 MHz

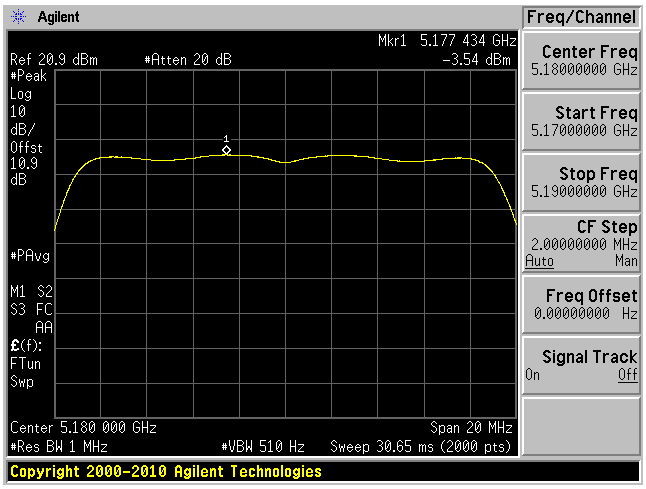


5230 MHz



802.11ac20 mode

5180 MHz



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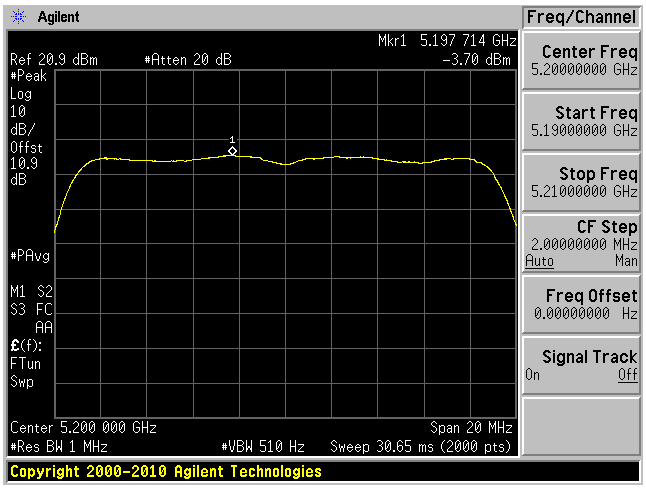

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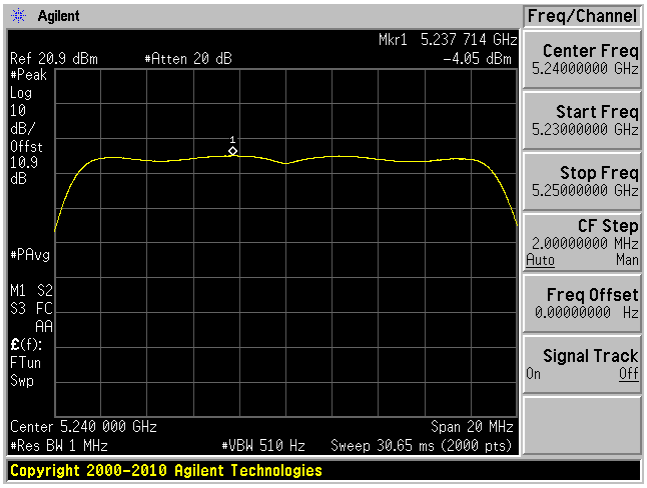
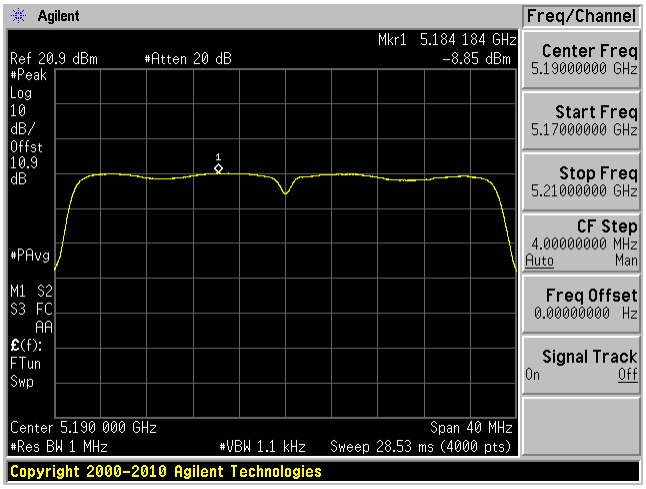
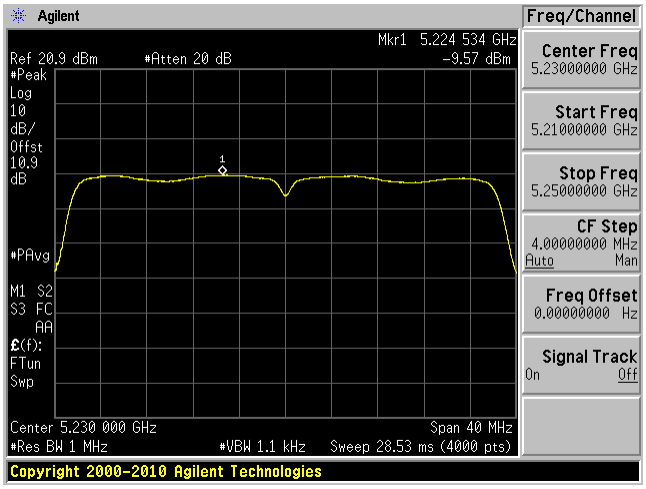


802.11ac40 mode

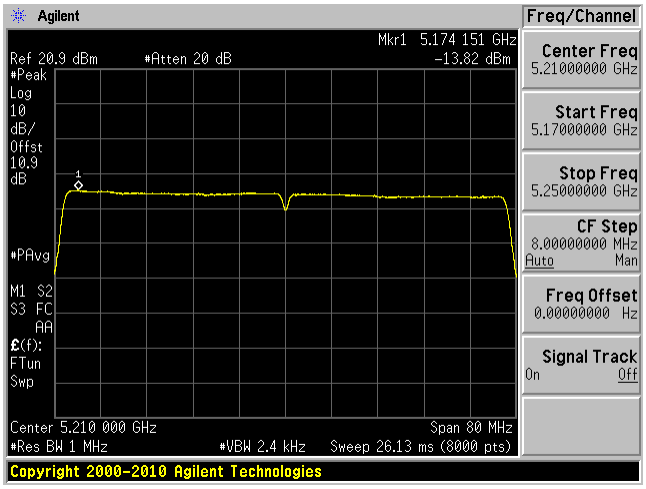
5190 MHz



5230 MHz



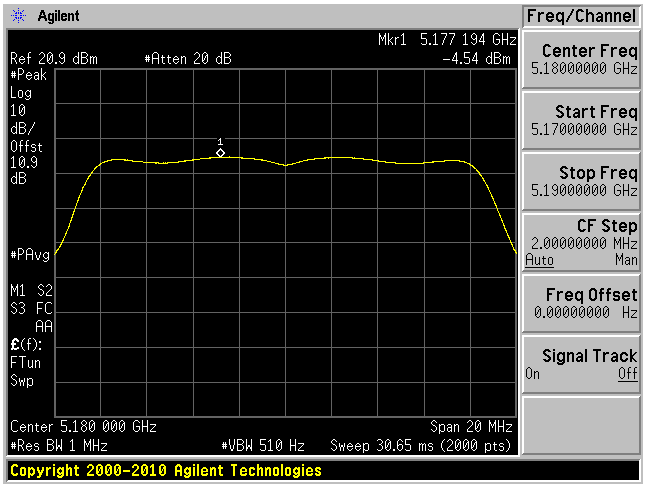
802.11ac80 mode, 5210 MHz



ANT B MIMO

802.11a mode

5180 MHz



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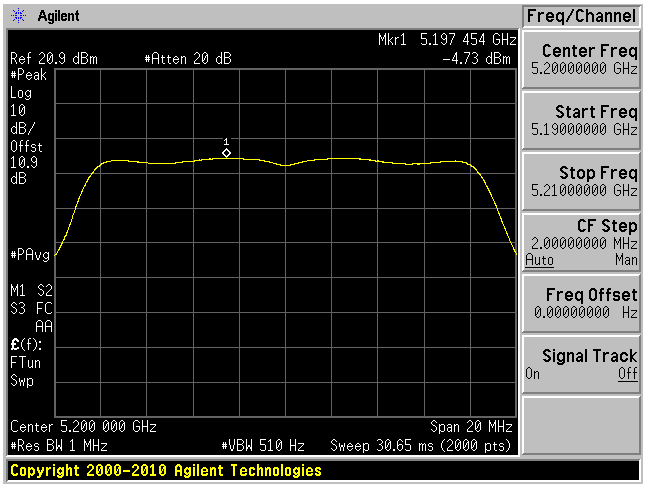
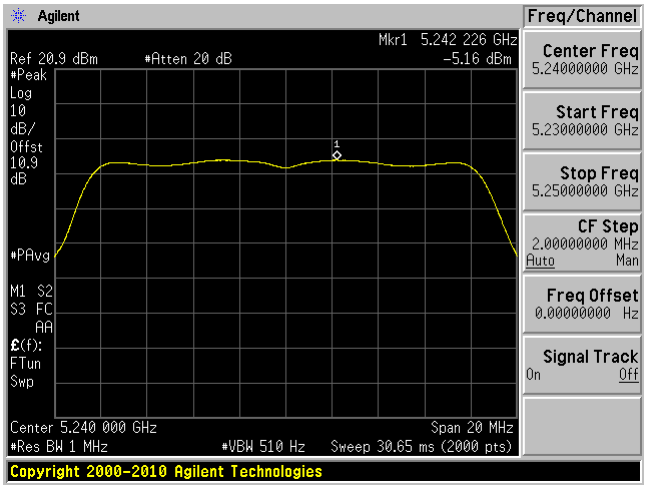
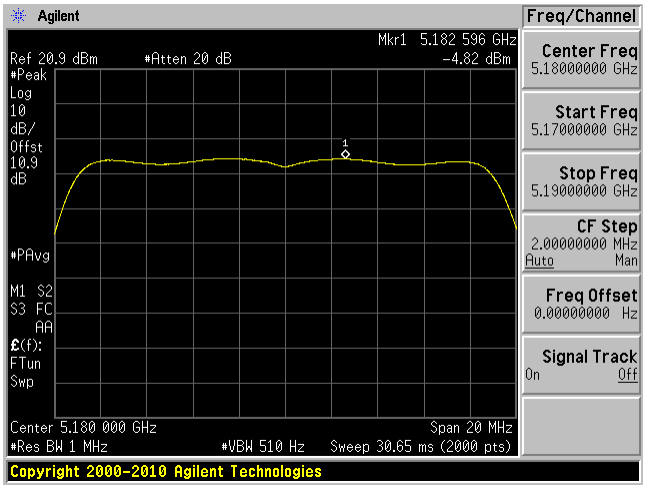


5240 MHz

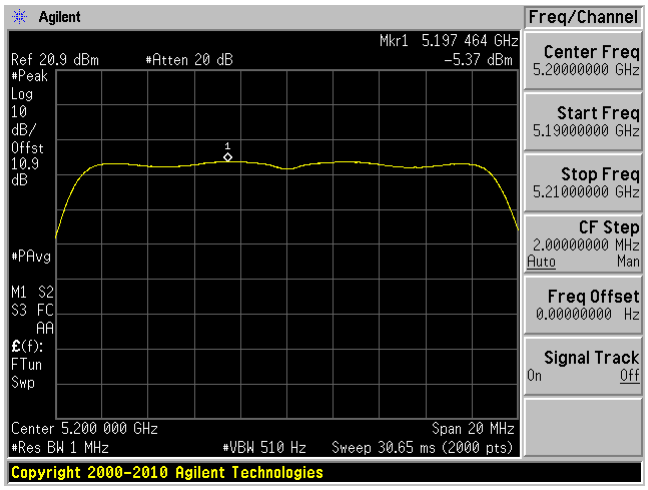


802.11n20 mode

5180 MHz



5200 MHz



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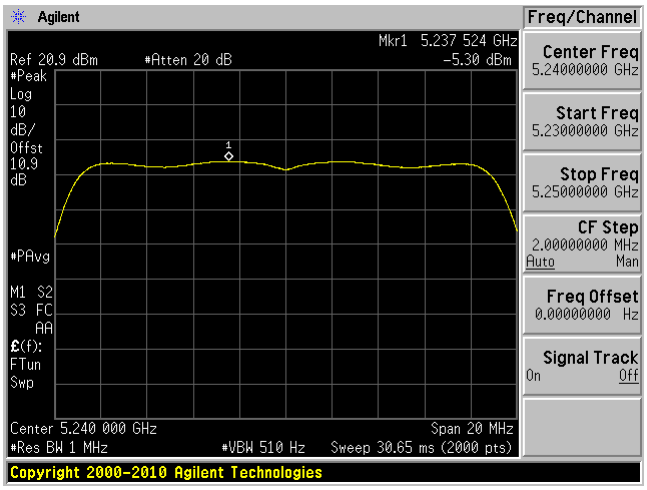
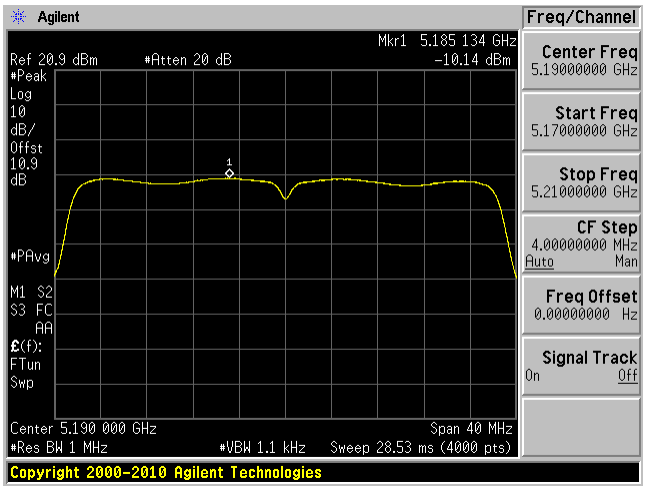
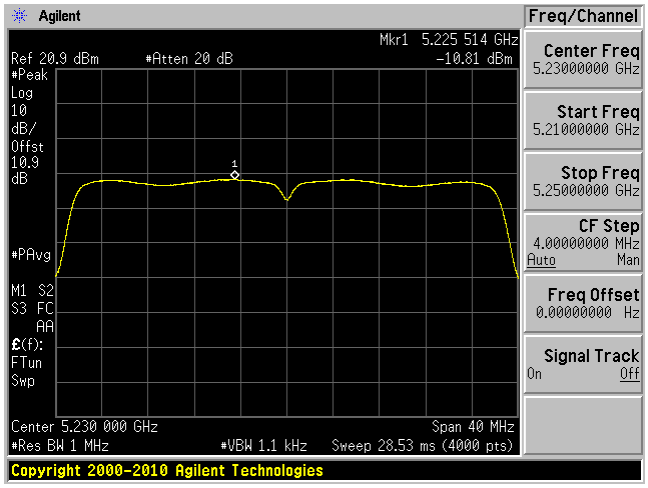


802.11n40 mode

5190 MHz

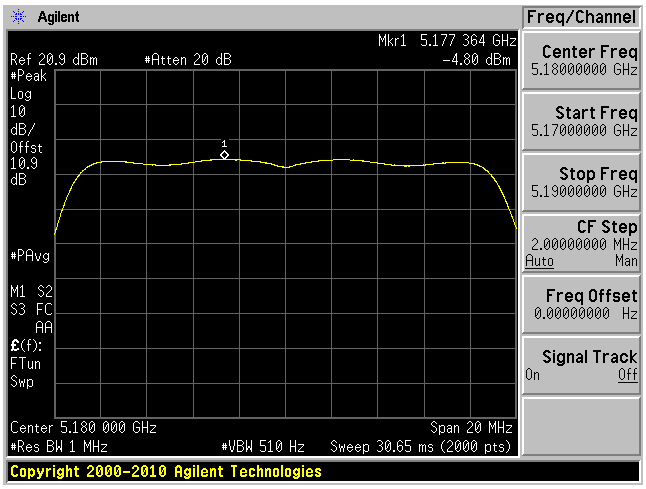


5230 MHz

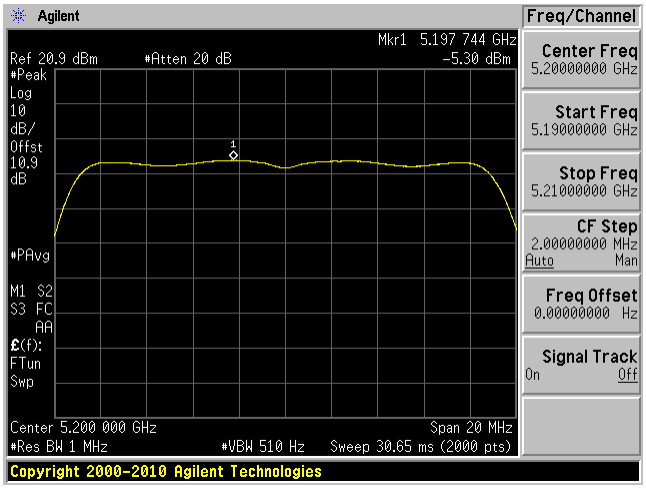


802.11ac20 mode

5180 MHz



5200 MHz



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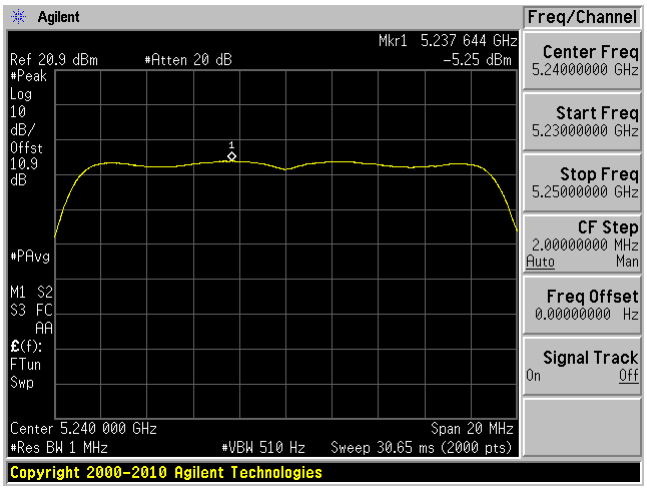
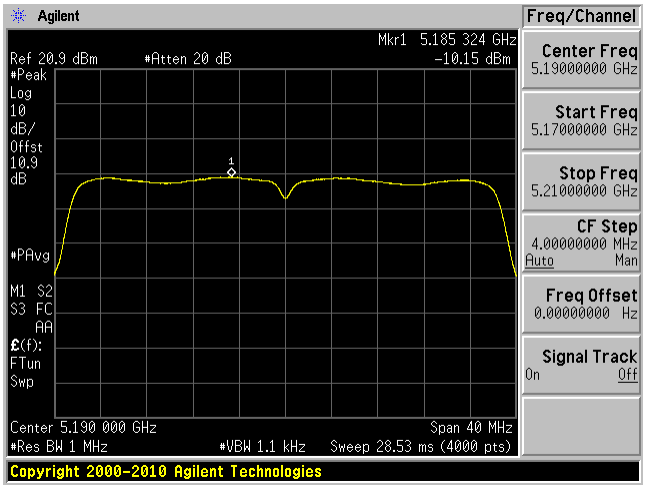
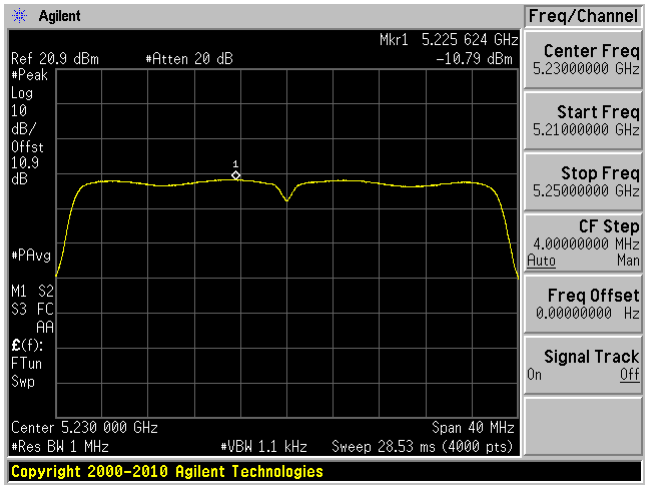


802.11ac40 mode

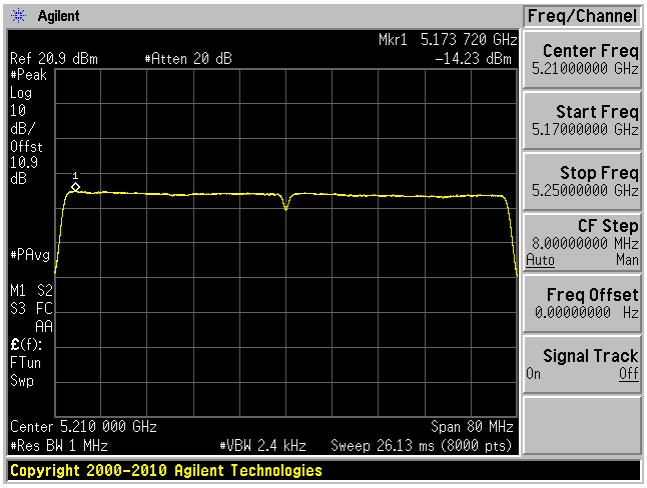
5190 MHz



5230 MHz



802.11ac80 mode, 5210 MHz

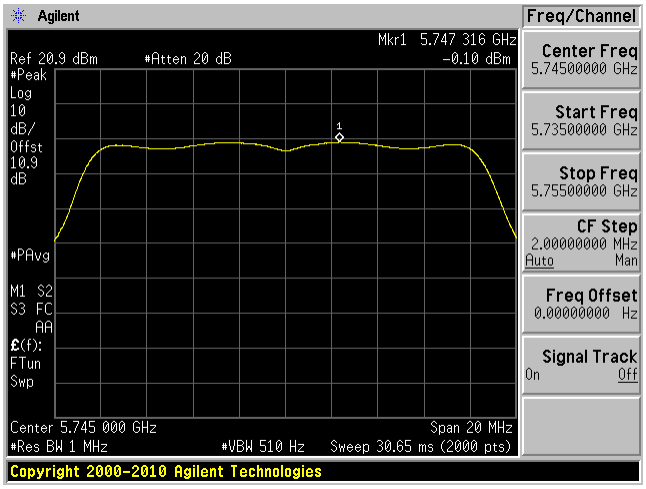


5725 – 5850 MHz

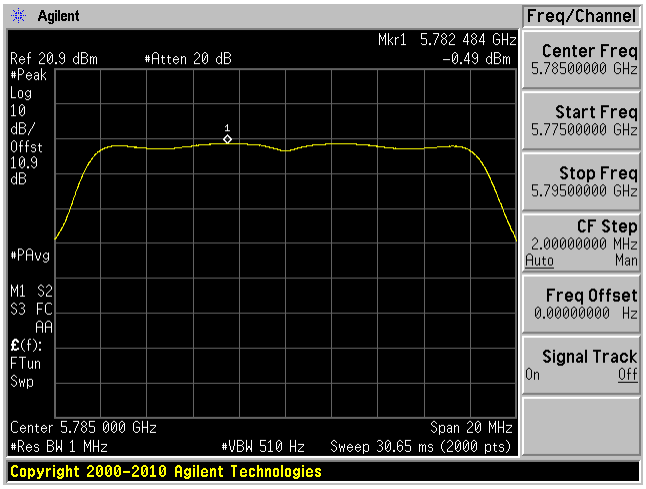
ANT A MIMO

802.11a mode

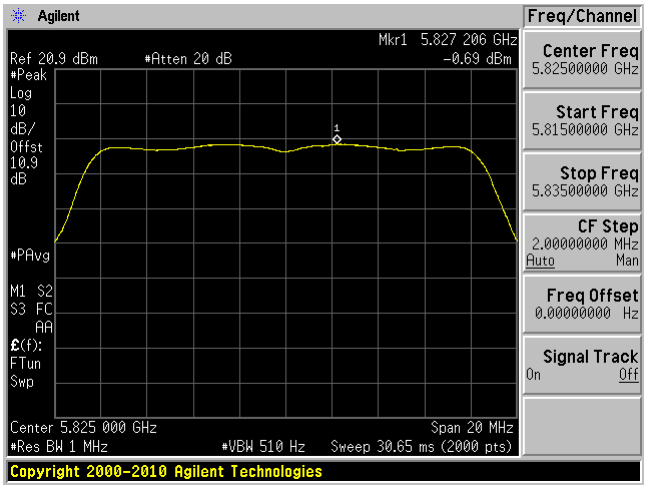
5745 MHz



5785 MHz

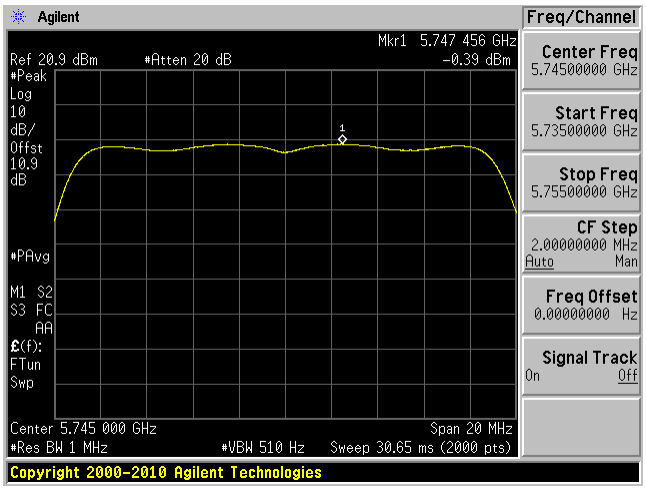


5825 MHz

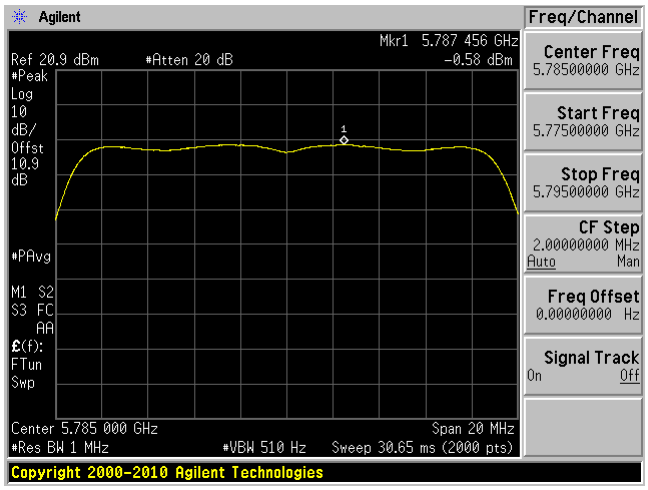


802.11n20 mode

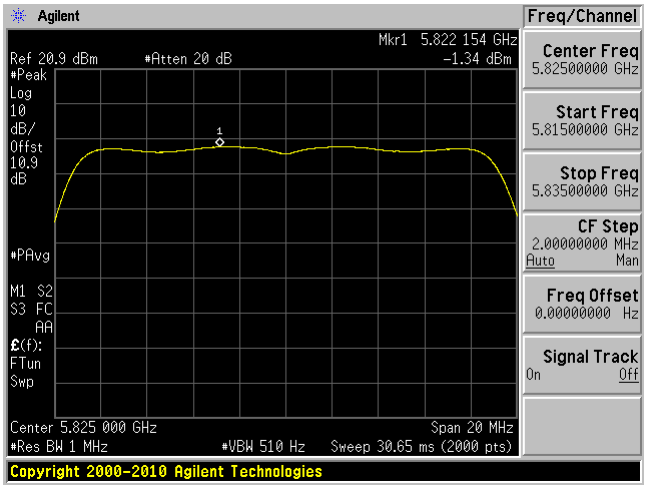
5745 MHz



5785 MHz

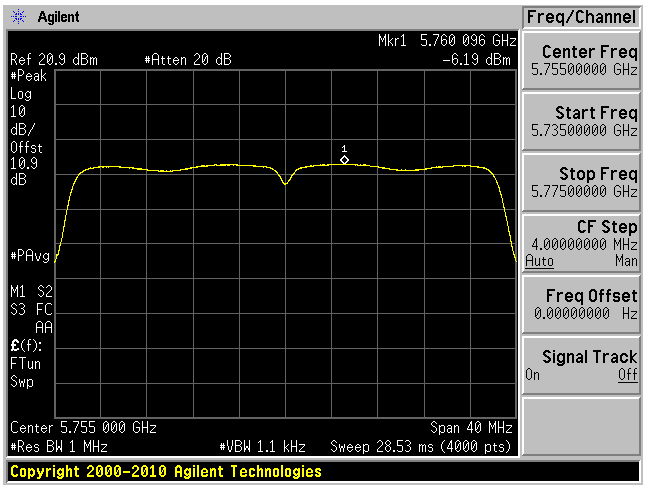


5825 MHz

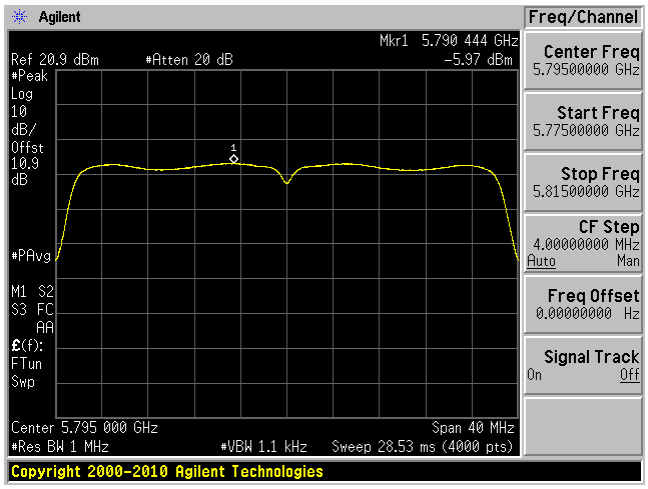


802.11n40 mode

5755 MHz

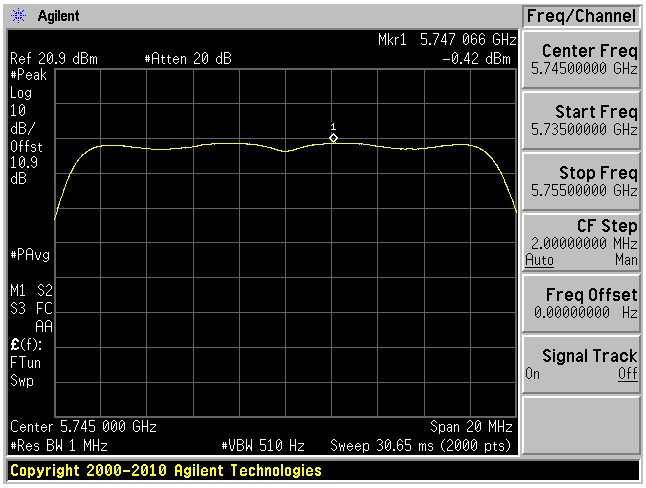


5795 MHz

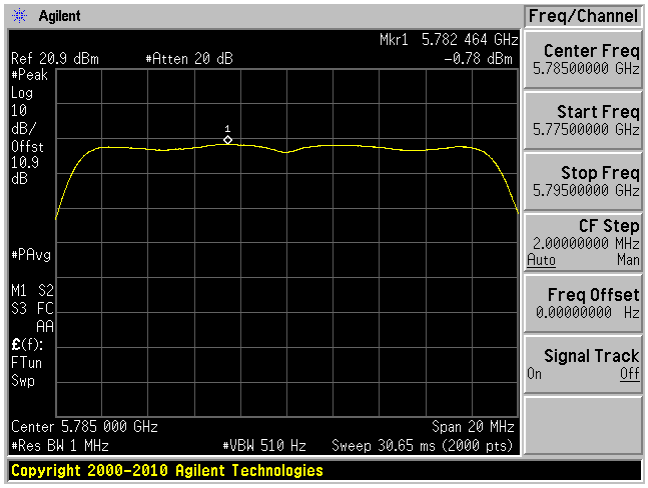


802.11ac20 mode

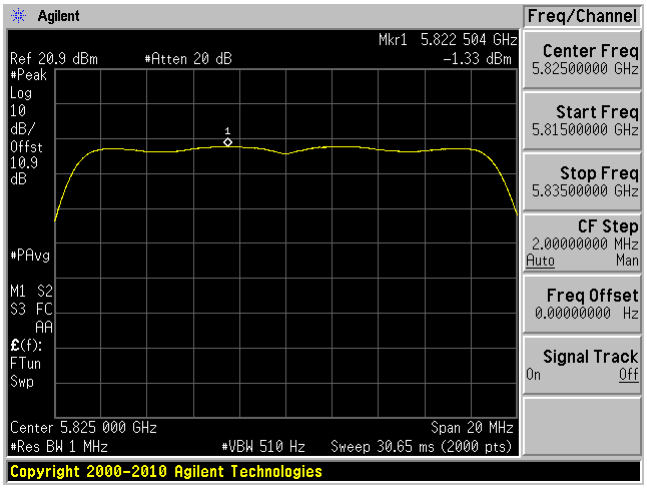
5745 MHz



5785 MHz

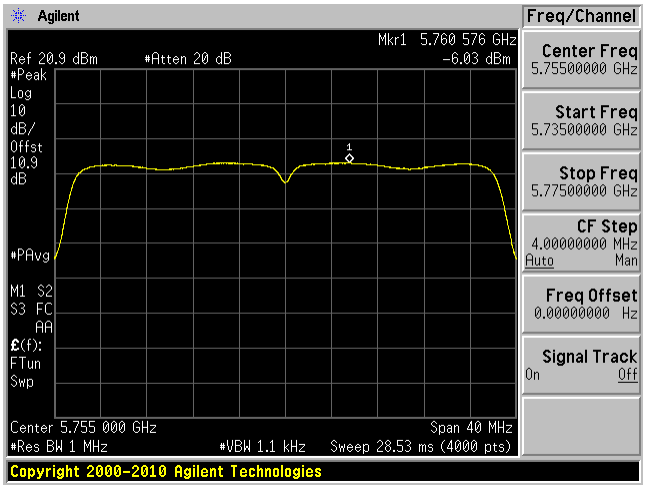


5825 MHz

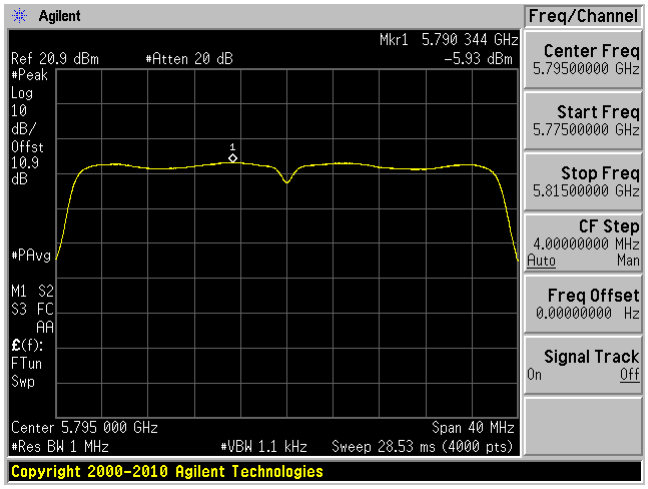


802.11ac40 mode

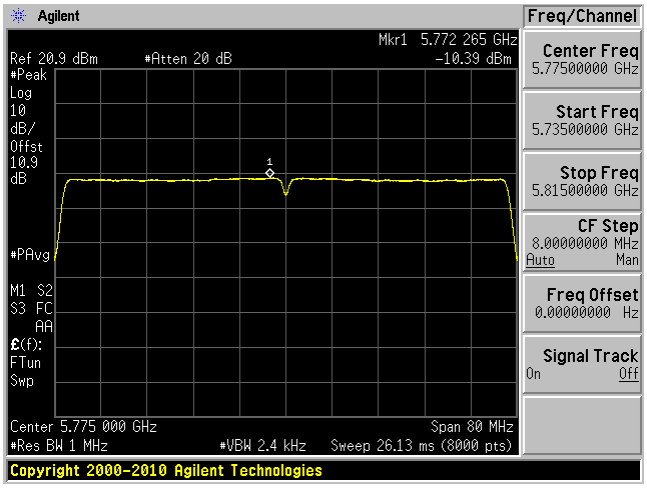
5755 MHz



5795 MHz



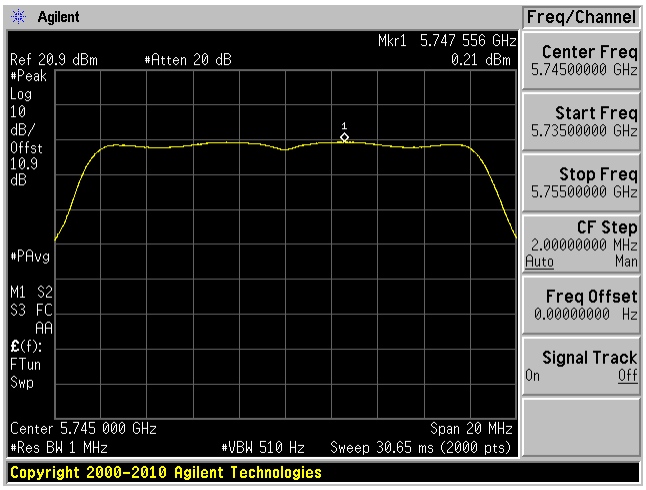
802.11ac80 mode, 5775 MHz



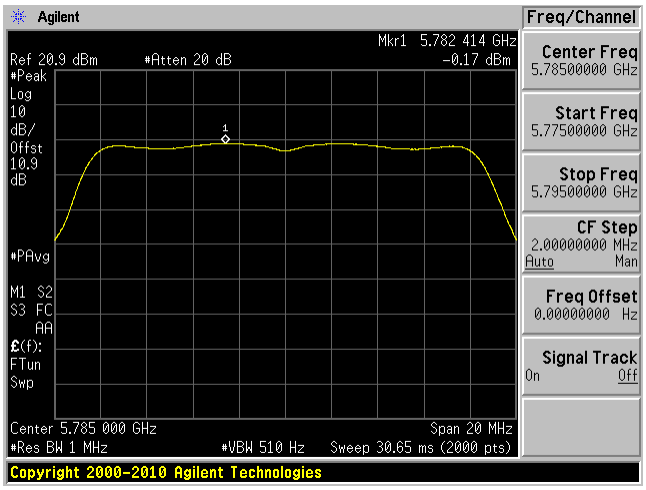
ANT B MIMO

802.11a mode

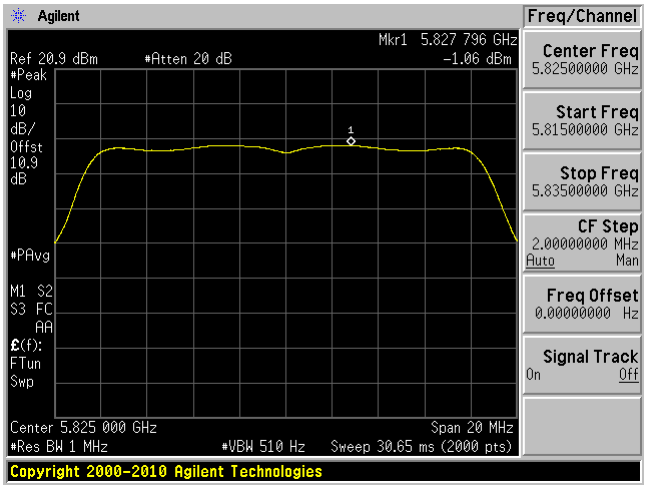
5745 MHz



5785 MHz

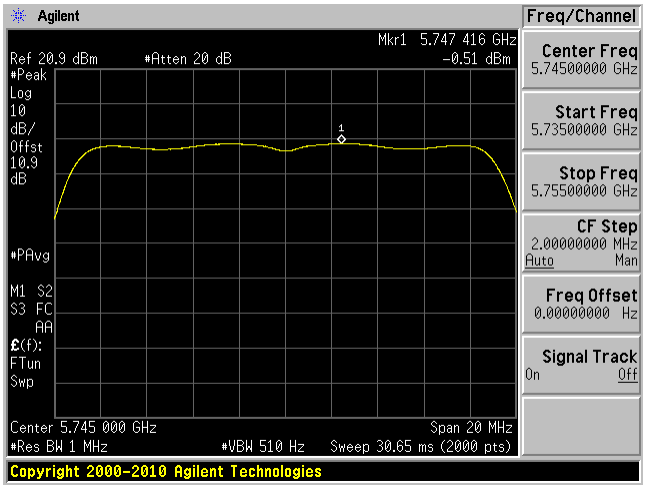


5825 MHz

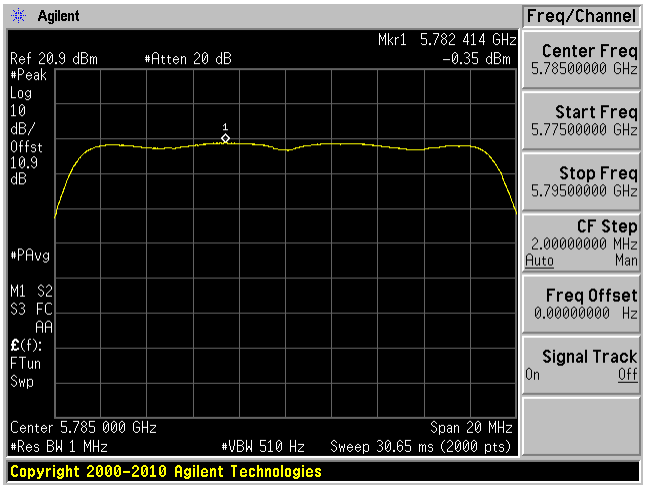


802.11n20 mode

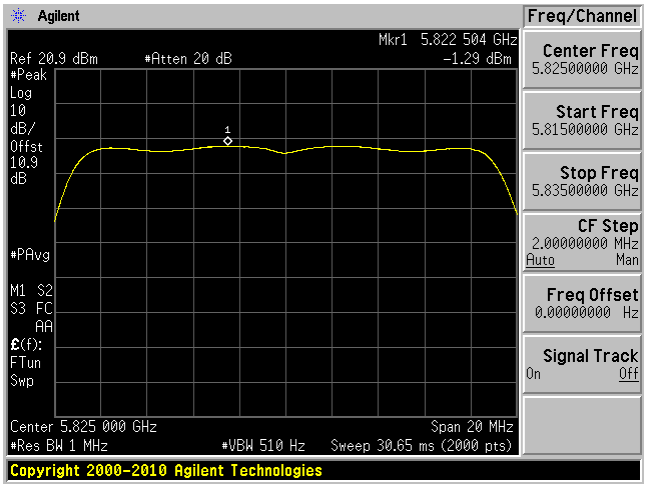
5745 MHz



5785 MHz

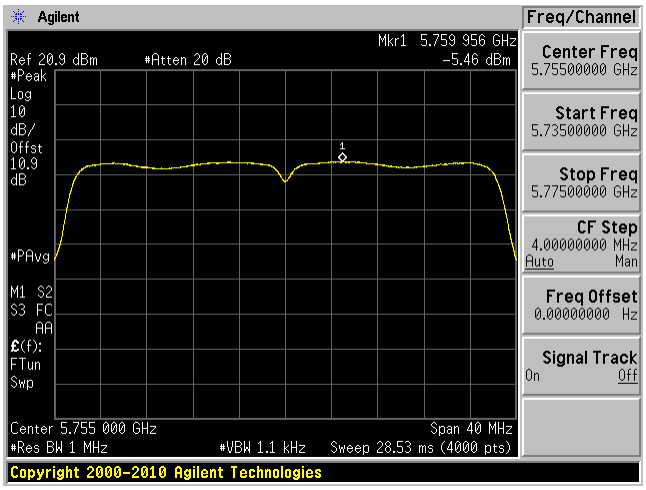


5825 MHz

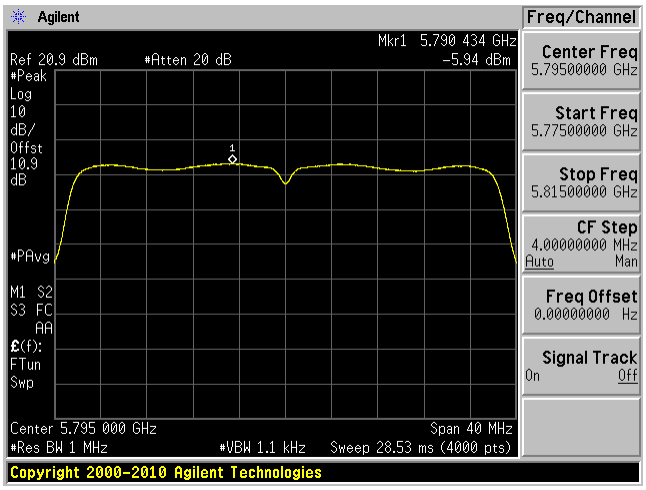


802.11n40 mode

5755 MHz

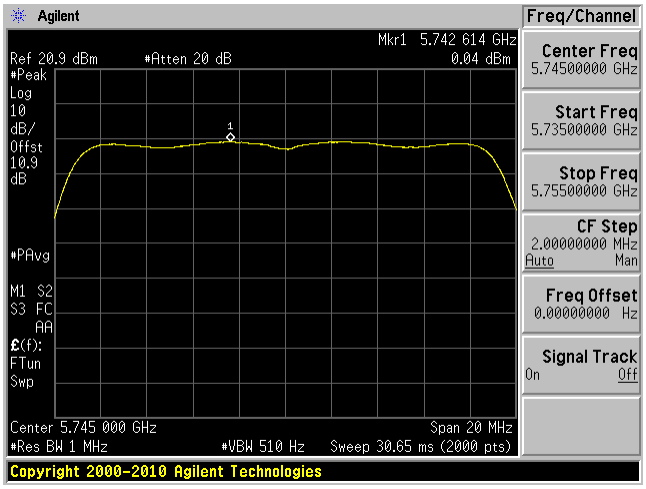


5795 MHz

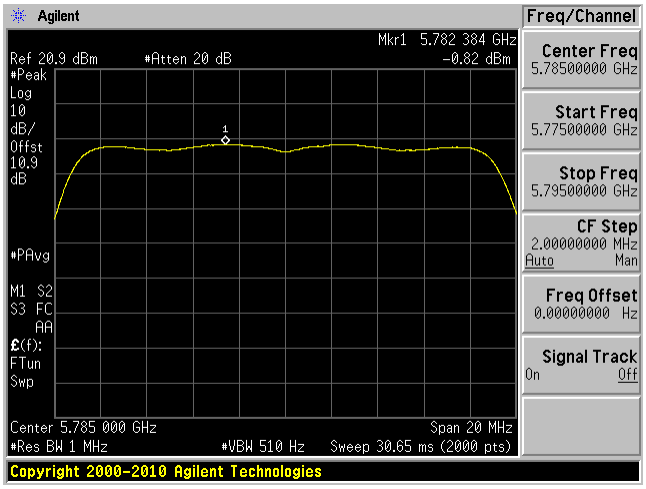


802.11ac20 mode

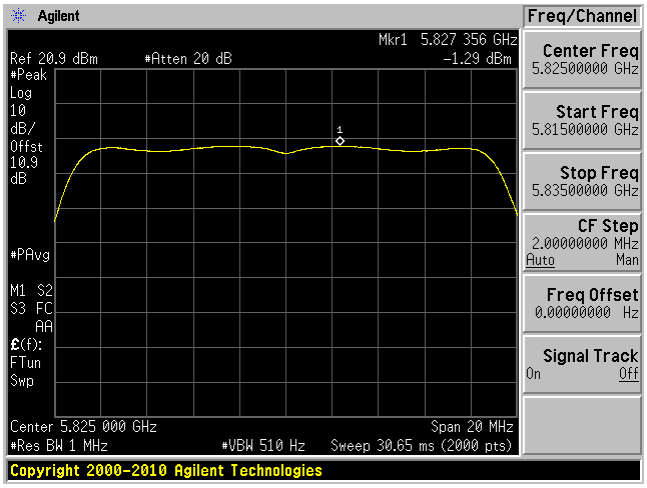
5745 MHz



5785 MHz

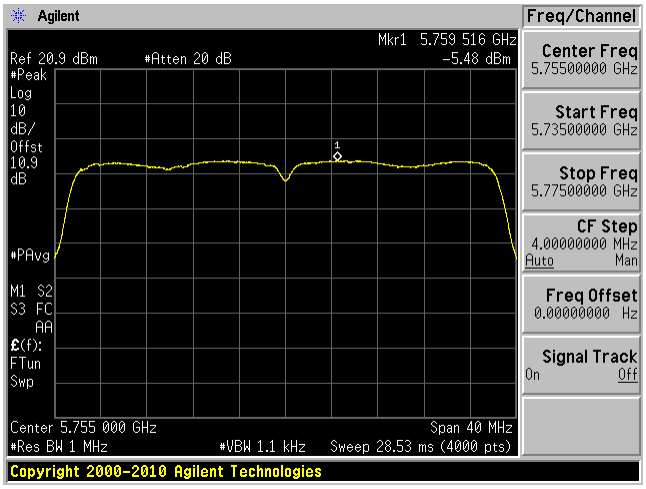


5825 MHz

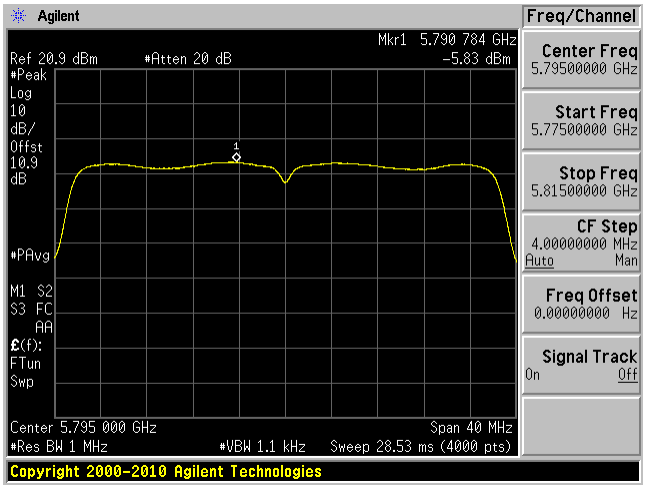


802.11ac40 mode

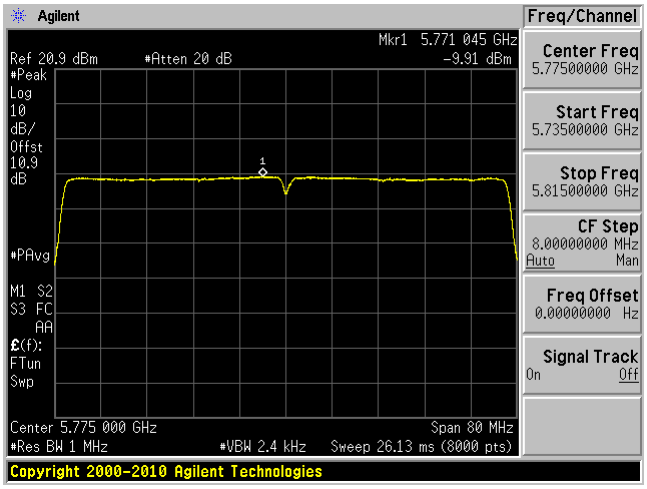
5755 MHz



5795 MHz



802.11ac80 mode, 5775 MHz



11 §15.407(b) - 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.

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	E4446A	US44300386	2017-04-20	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 of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

11.4 Test Environmental Conditions

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

The testing was performed by Vincent Licata on 2018-03-21 to 2018-03-23 at RF site.

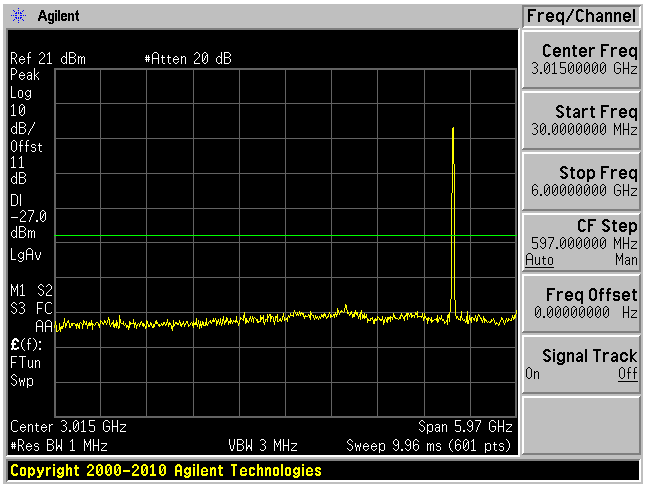
11.5 Test Results

Please refer to the following plots

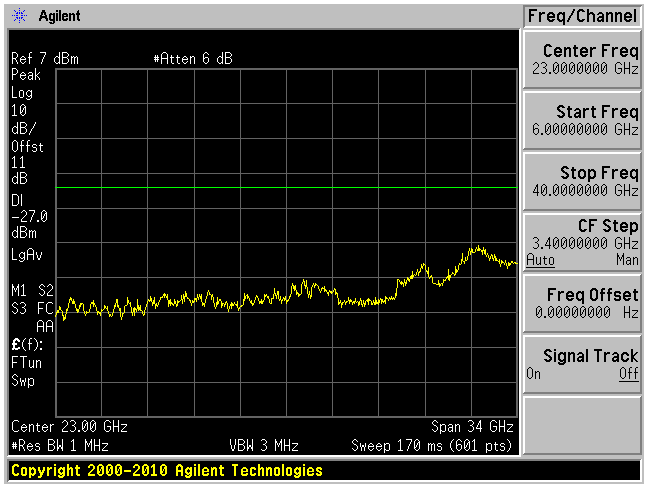
5150 - 5250 MHz

802.11a mode ANT A

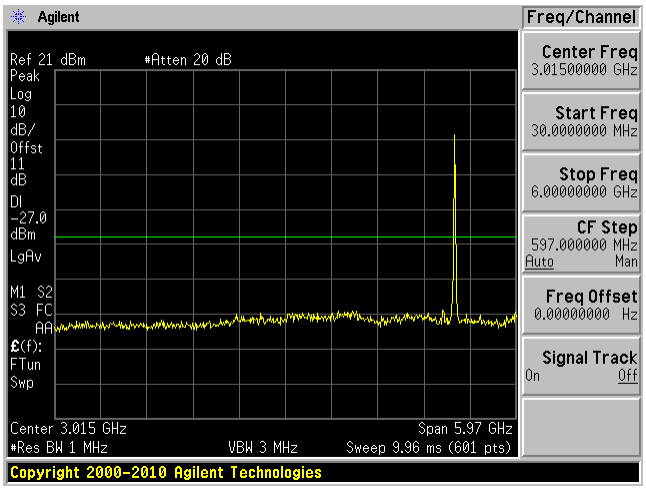
Low Channel 5180MHz (30MHz-6GHz)



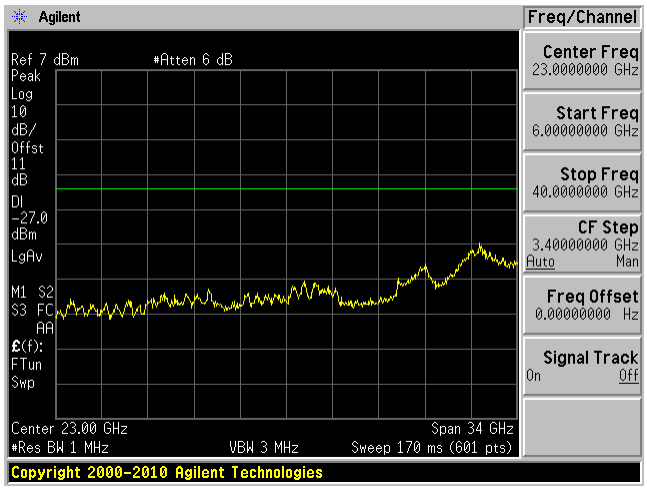
Low Channel 5180 MHz (6-40GHz)



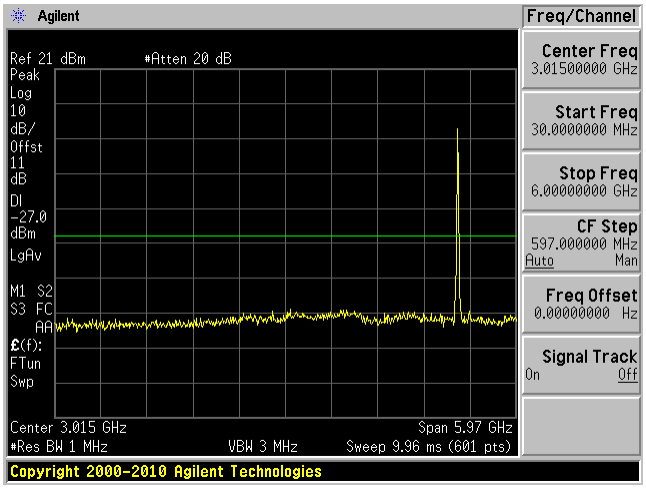
Middle Channel 5200MHz (30MHz-6GHz)



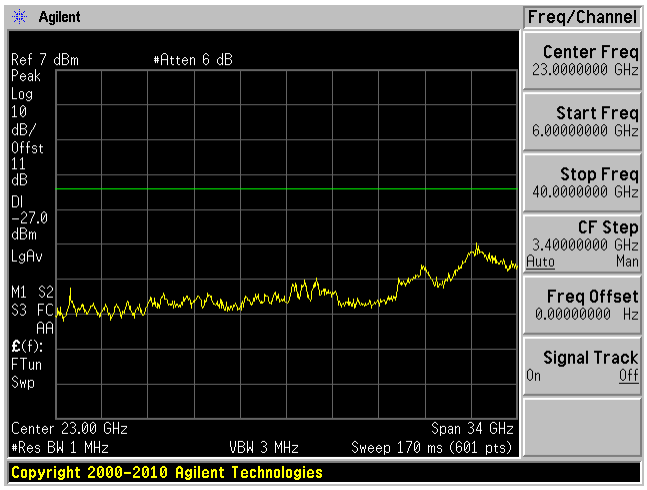
Middle Channel 5200 MHz (6-40GHz)



High Channel 5240MHz (30MHz-6GHz)

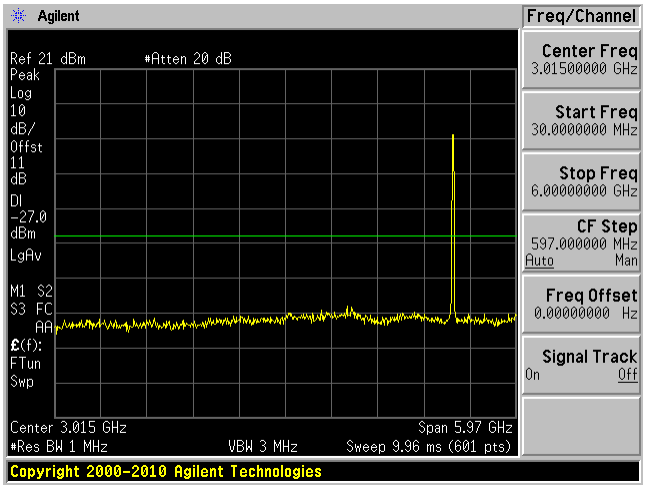


High Channel 5240 MHz (6-40GHz)

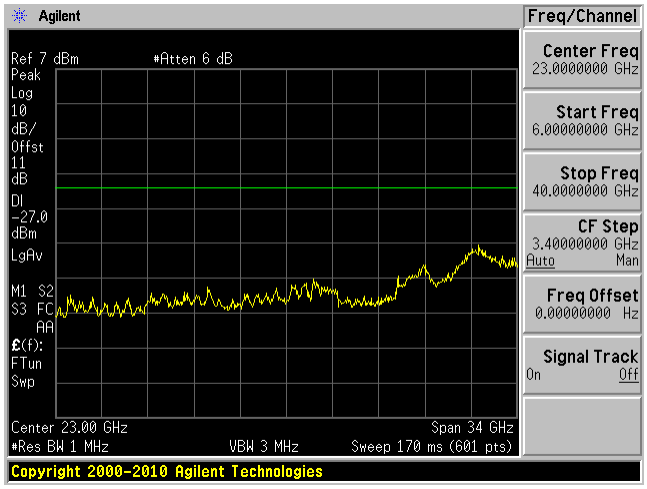


802.11a mode ANT B

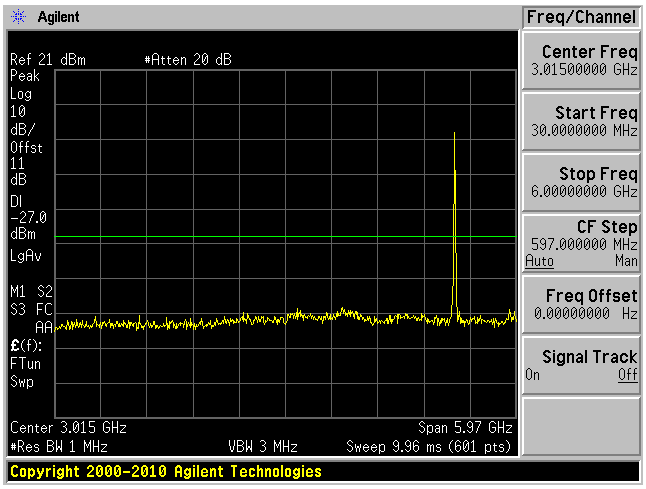
Low Channel 5180MHz (30MHz-6GHz)



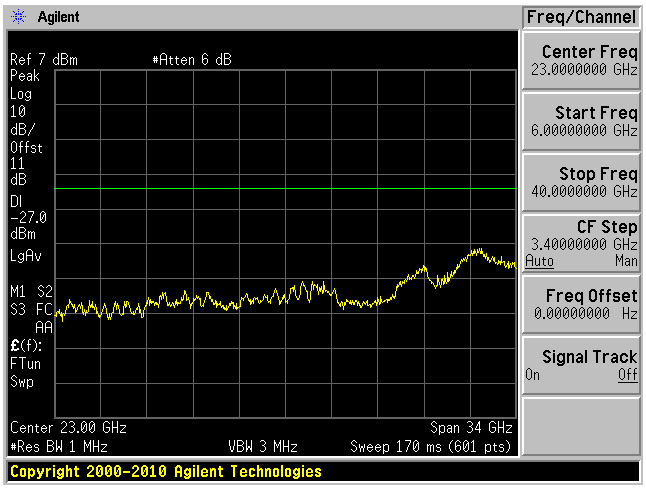
Low Channel 5180 MHz (6-40GHz)



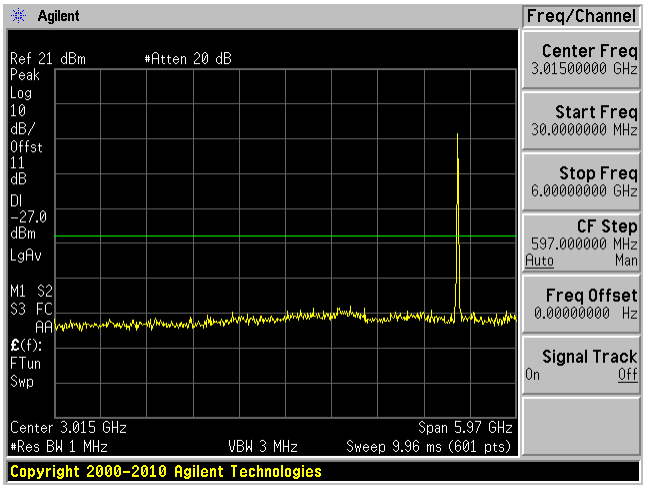
Middle Channel 5200MHz (30MHz-6GHz)



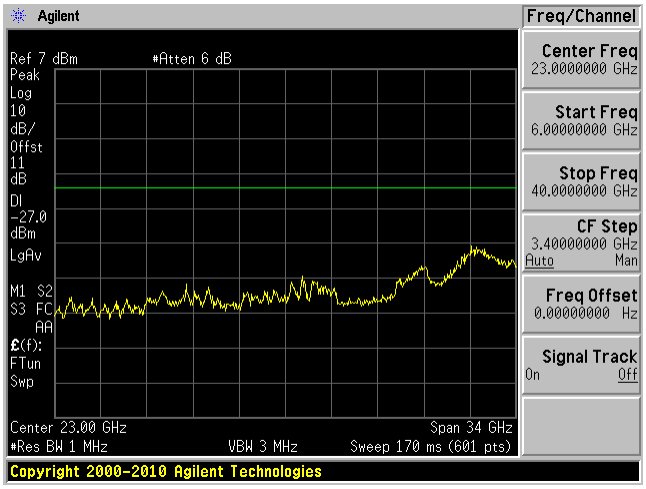
Middle Channel 5200 MHz (6-40GHz)



High Channel 5240MHz (30MHz-6GHz)

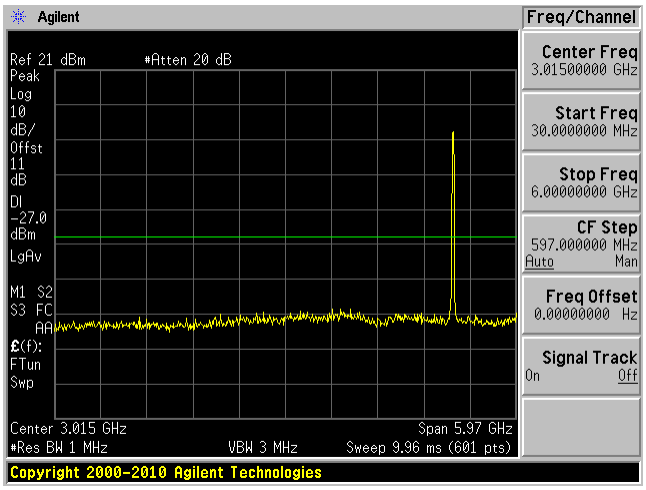


High Channel 5240 MHz (6-40GHz)

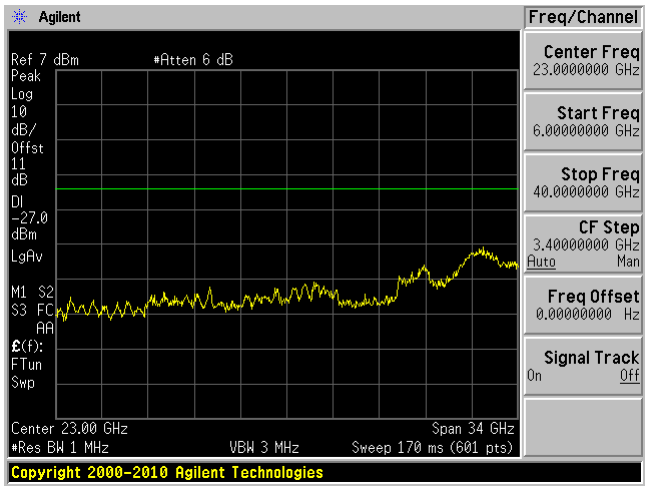


802.11n20 mode ANT A

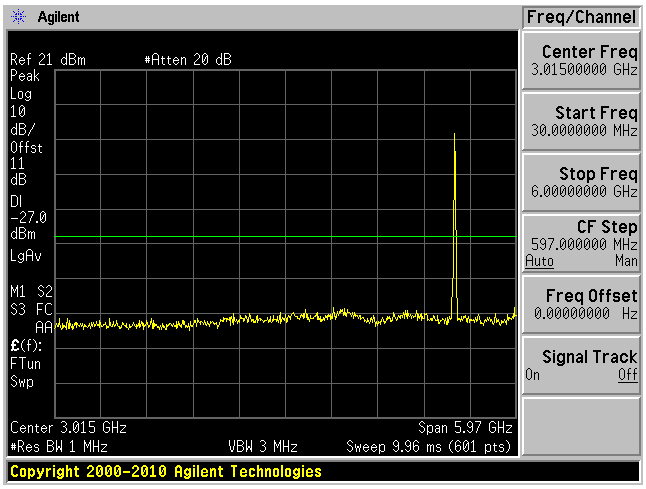
Low Channel 5180MHz (30MHz-6GHz)



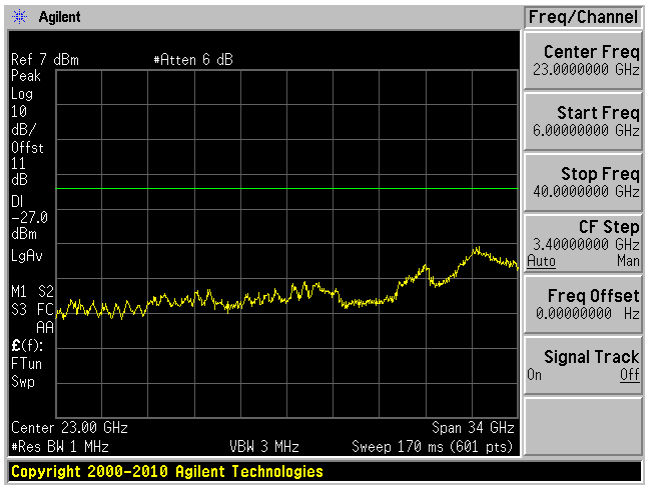
Low Channel 5180 MHz (6-40GHz)



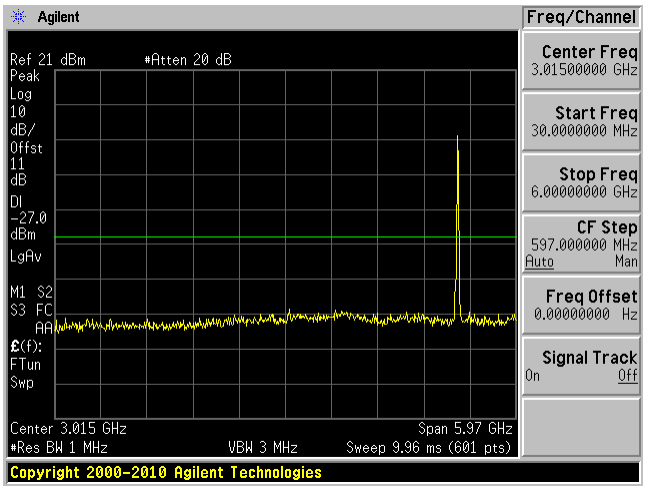
Middle Channel 5200MHz (30MHz-6GHz)



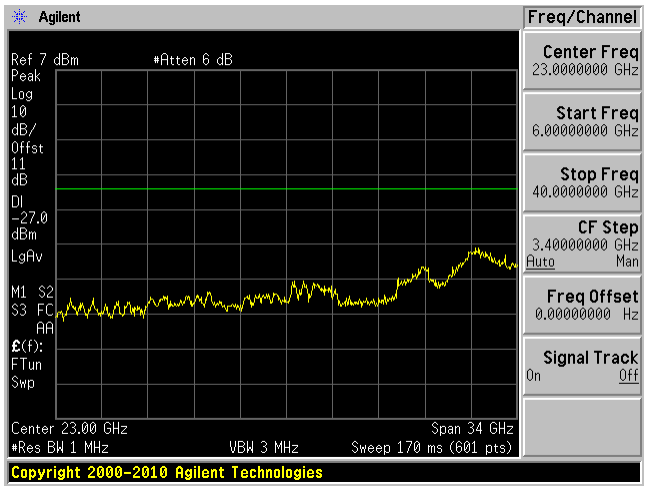
Middle Channel 5200 MHz (6-40GHz)



High Channel 5240MHz (30MHz-6GHz)

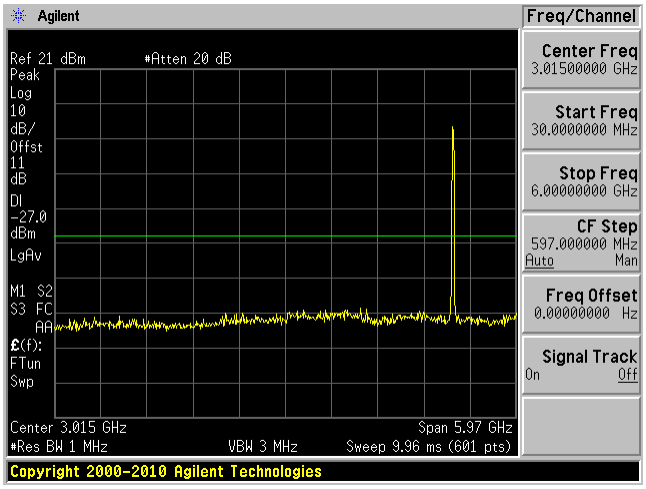


High Channel 5240 MHz (6-40GHz)

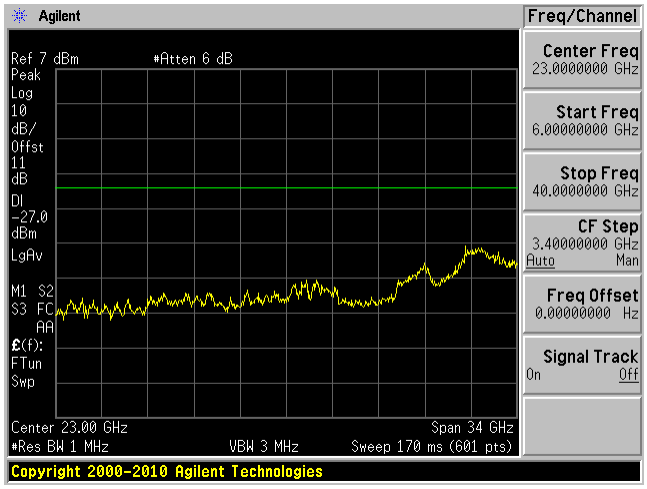


802.11n20 mode ANT B

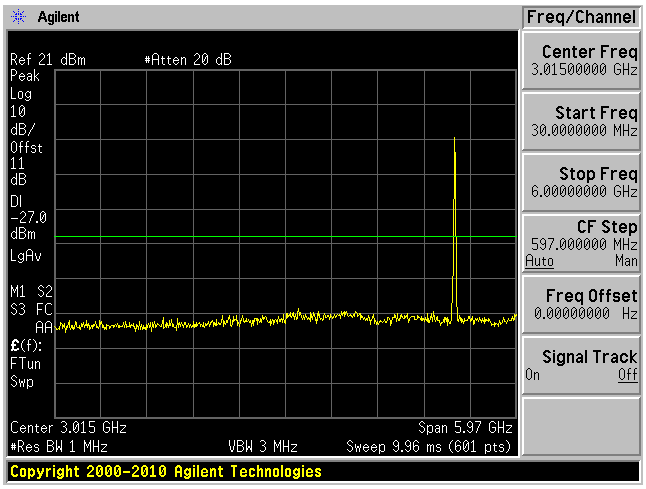
Low Channel 5180MHz (30MHz-6GHz)



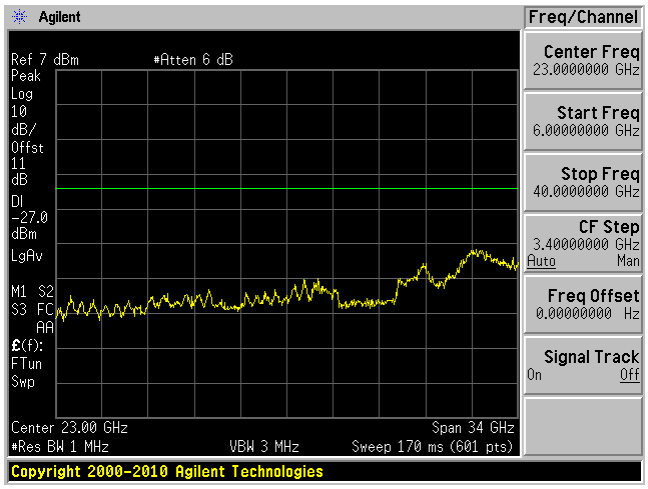
Low Channel 5180 MHz (6-40GHz)



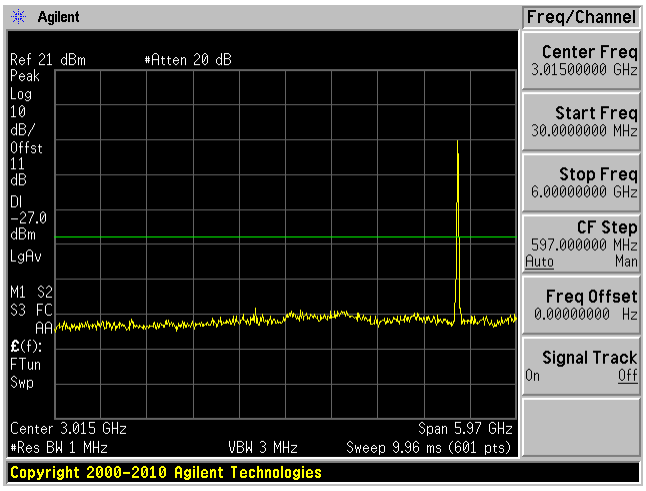
Middle Channel 5200MHz (30MHz-6GHz)



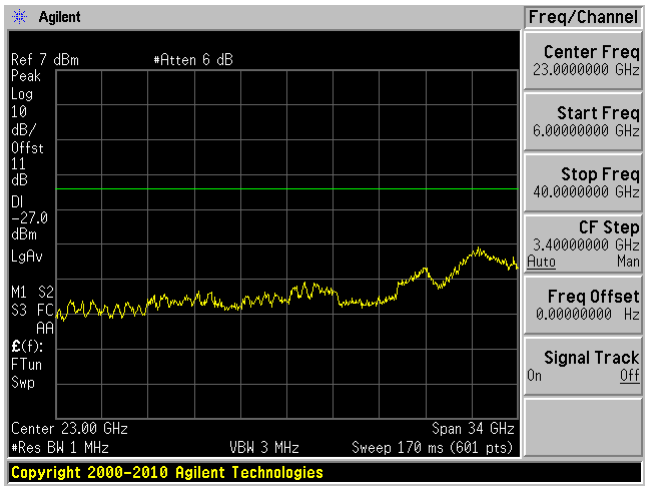
Middle Channel 5200 MHz (6-40GHz)



High Channel 5240MHz (30MHz-6GHz)

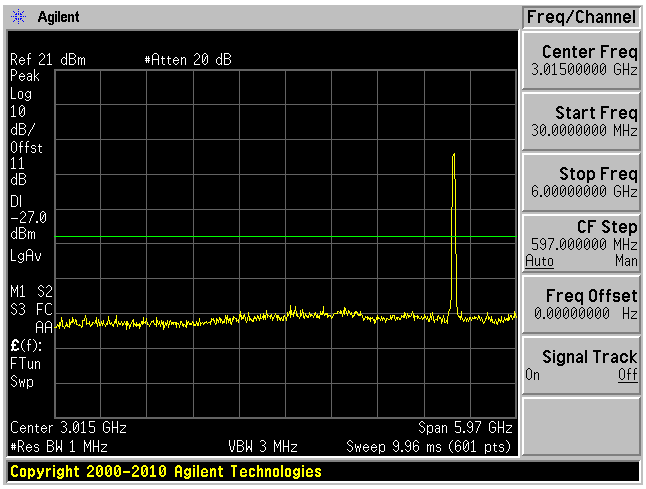


High Channel 5240 MHz (6-40GHz)

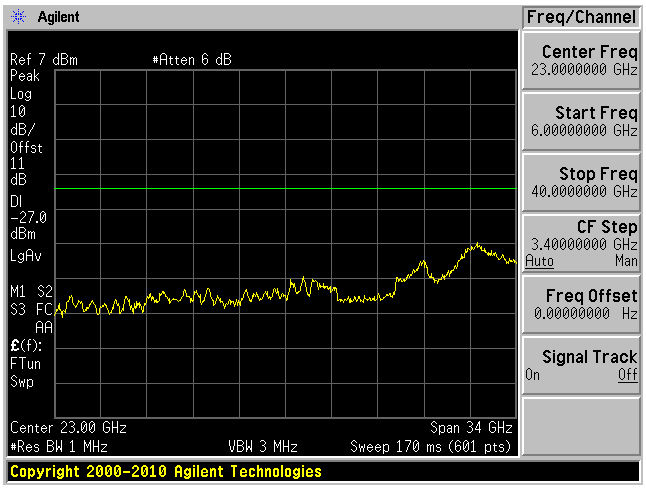


802.11n40 mode ANT A

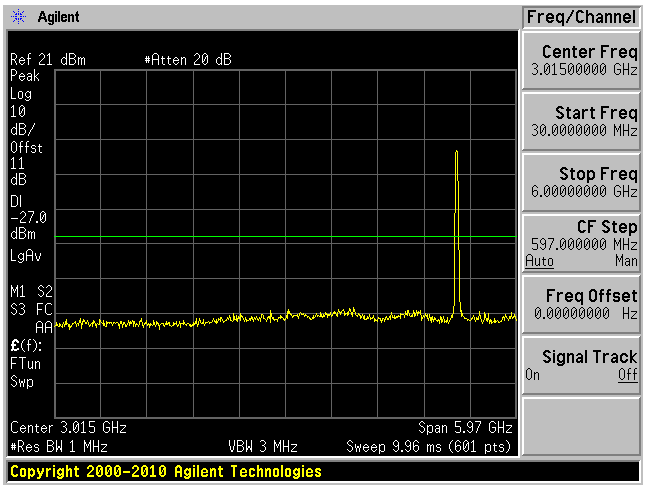
Low Channel 5190MHz (30MHz-6GHz)



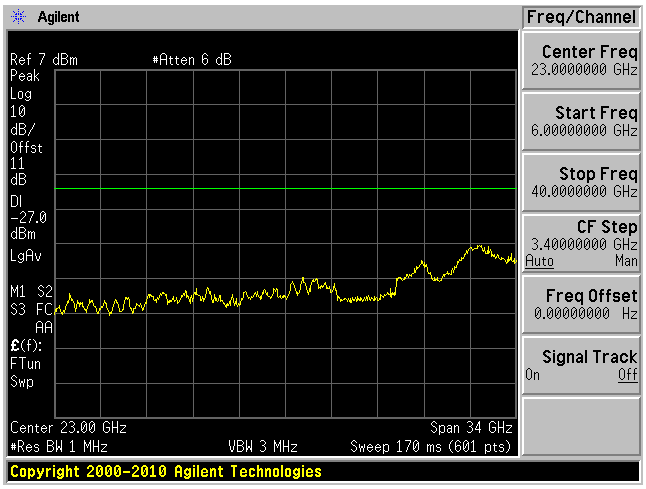
Low Channel 5190 MHz (6-40GHz)



High Channel 5230MHz (30MHz-6GHz)

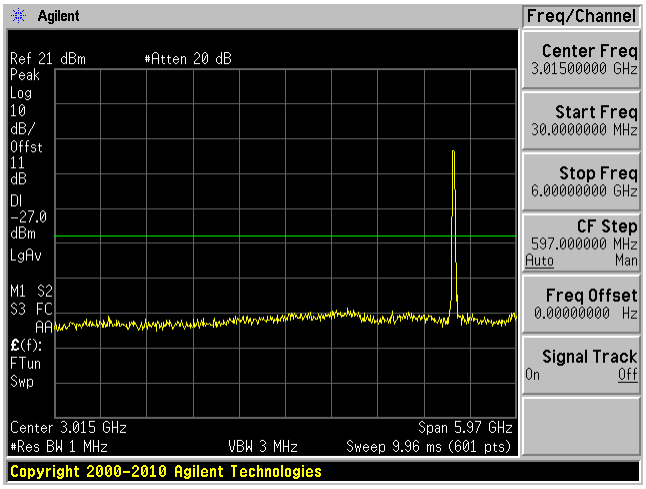


High Channel 5230 MHz (6-40GHz)

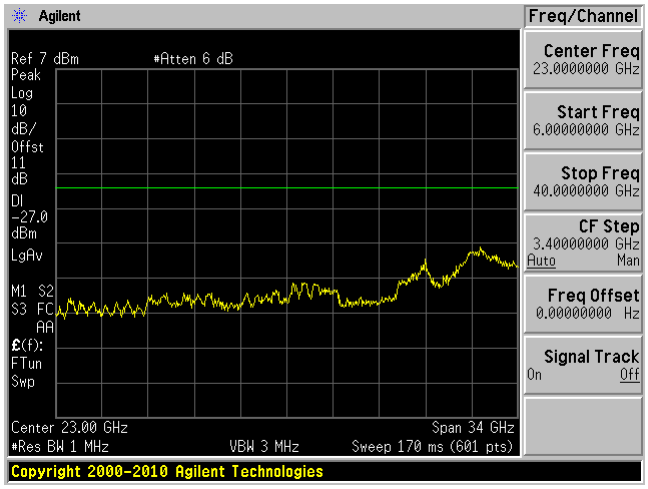


802.11n40 mode ANT B

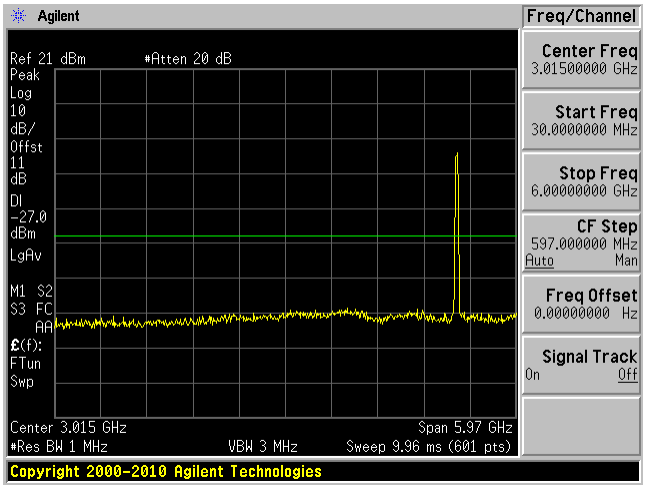
Low Channel 5190MHz (30MHz-6GHz)



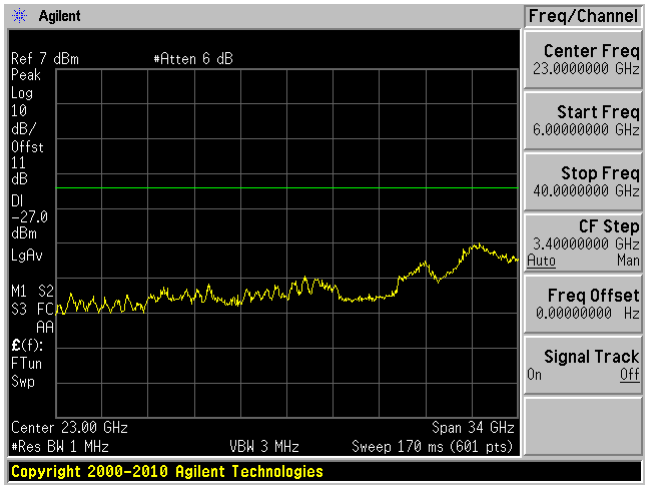
Low Channel 5190 MHz (6-40GHz)



High Channel 5230MHz (30MHz-6GHz)

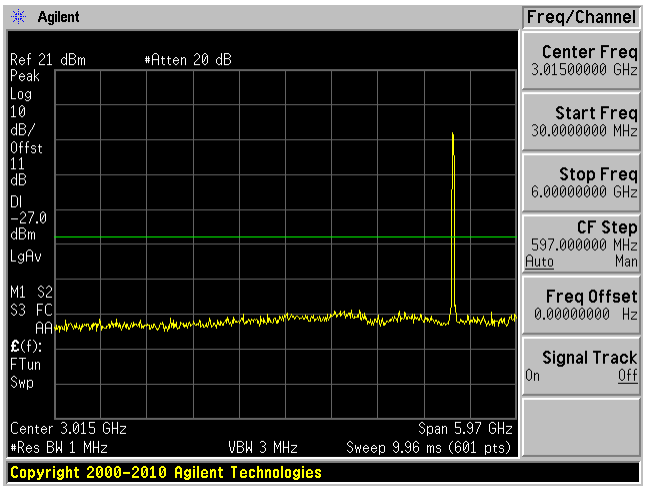


High Channel 5230 MHz (6-40GHz)

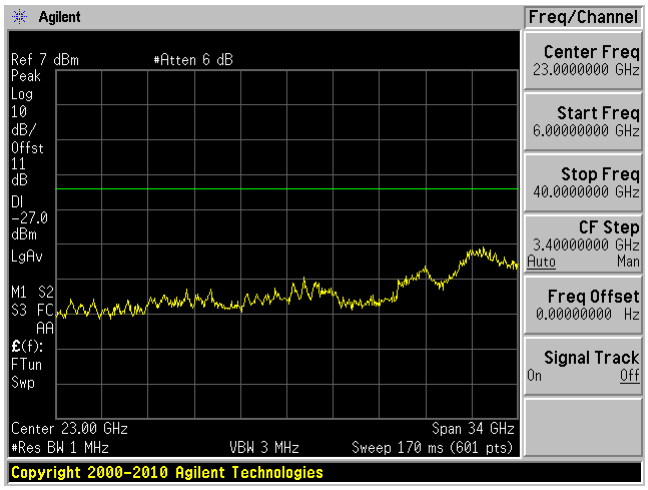


802.11ac20 mode ANT A

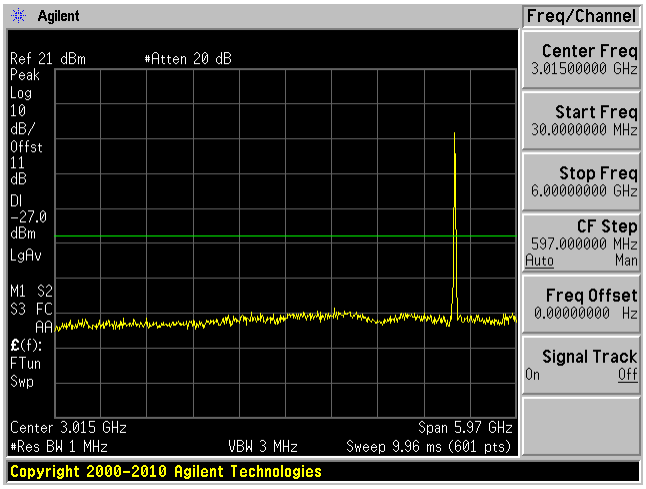
Low Channel 5180MHz (30MHz-6GHz)



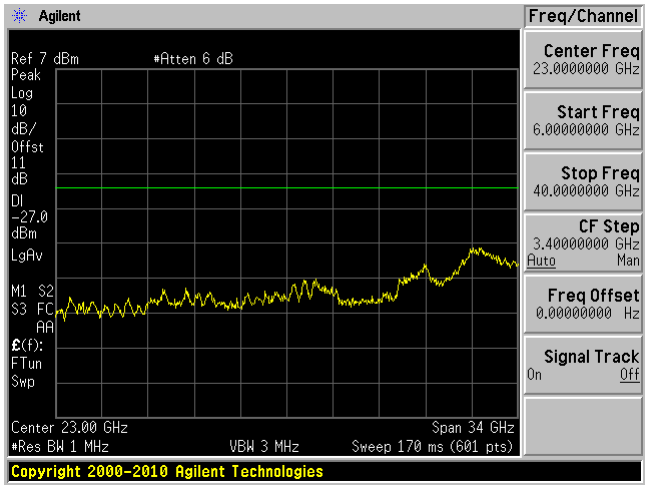
Low Channel 5180 MHz (6-40GHz)



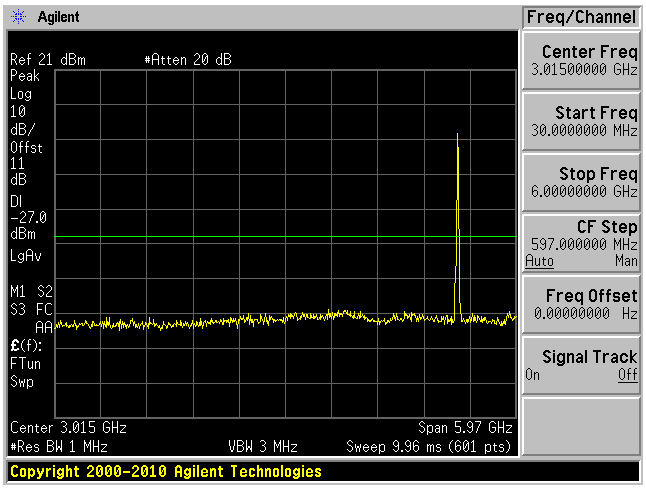
Middle Channel 5200MHz (30MHz-6GHz)



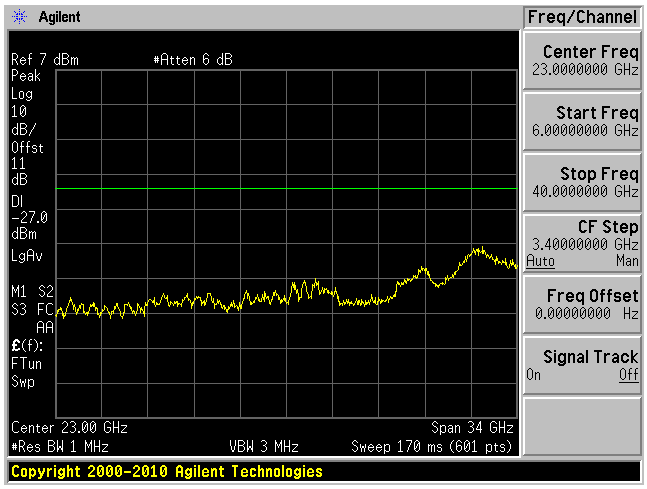
Middle Channel 5200 MHz (6-40GHz)



High Channel 5240MHz (30MHz-6GHz)

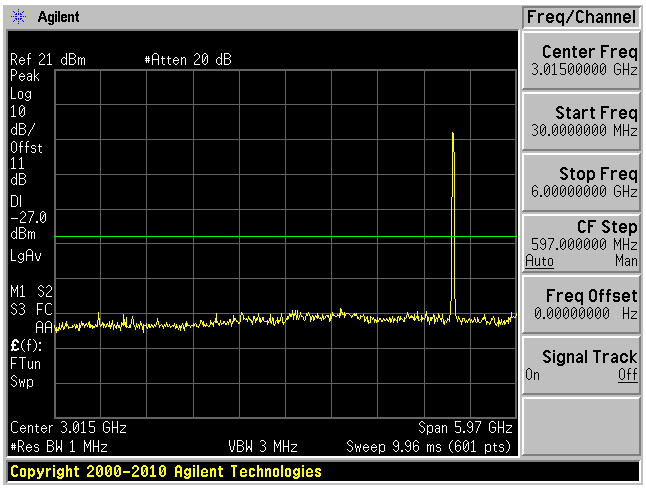


High Channel 5240 MHz (6-40GHz)

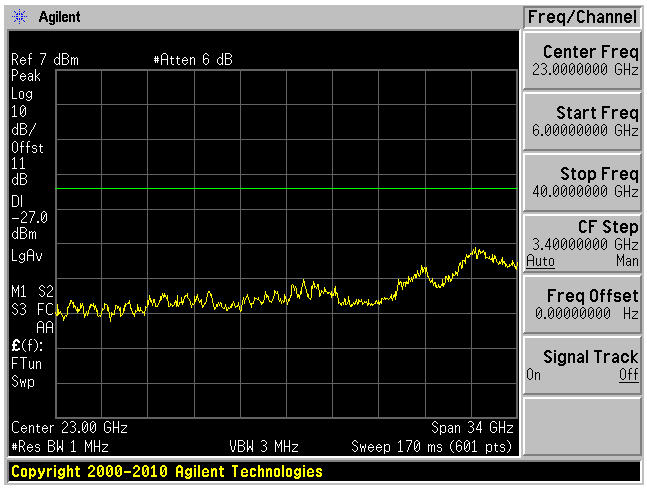


802.11ac20 mode ANT B

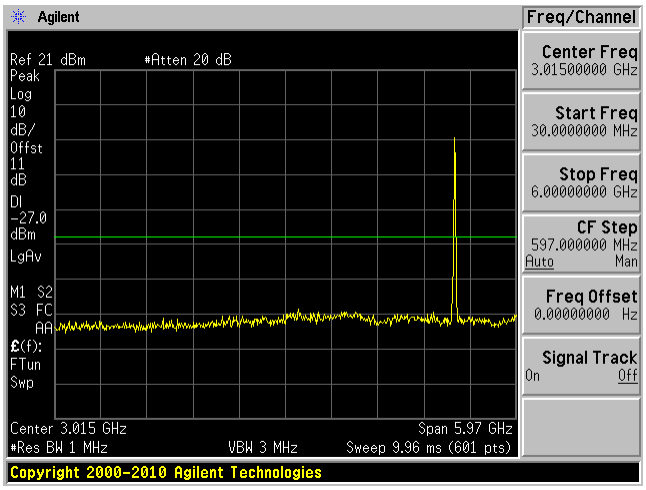
Low Channel 5180MHz (30MHz-6GHz)



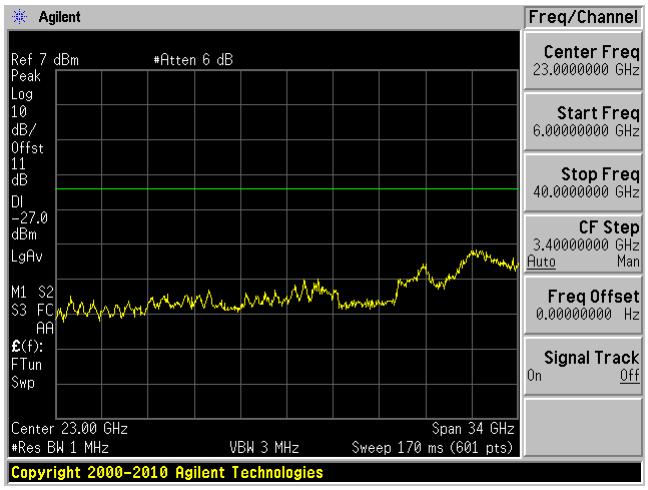
Low Channel 5180 MHz (6-40GHz)



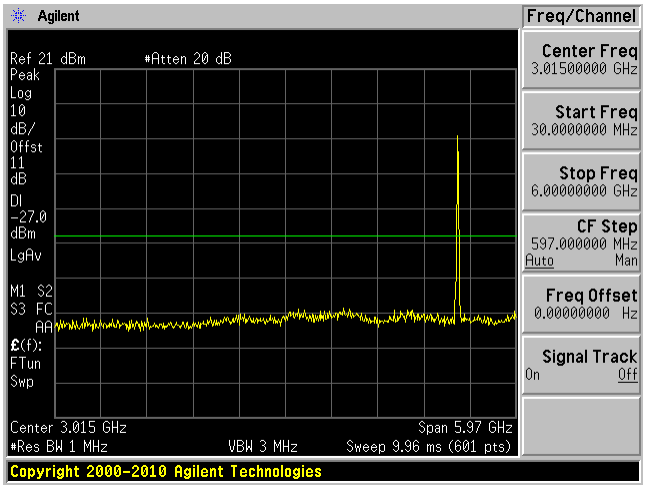
Middle Channel 5200MHz (30MHz-6GHz)



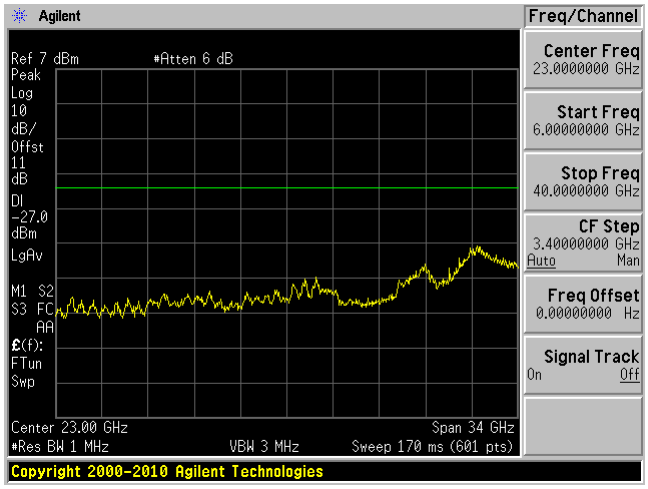
Middle Channel 5200 MHz (6-40GHz)



High Channel 5240MHz (30MHz-6GHz)

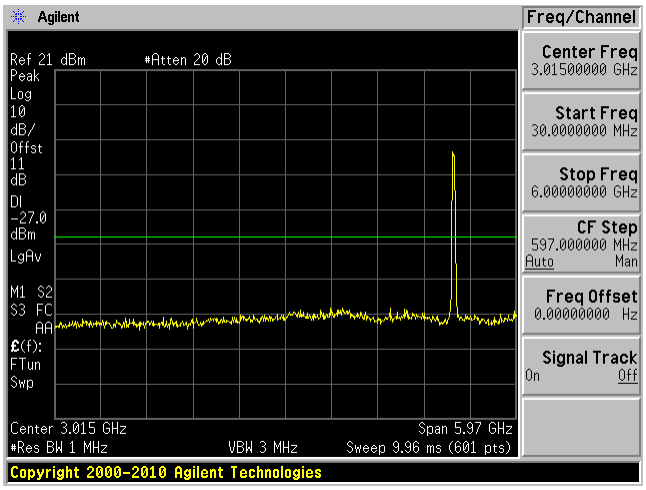


High Channel 5240 MHz (6-40GHz)

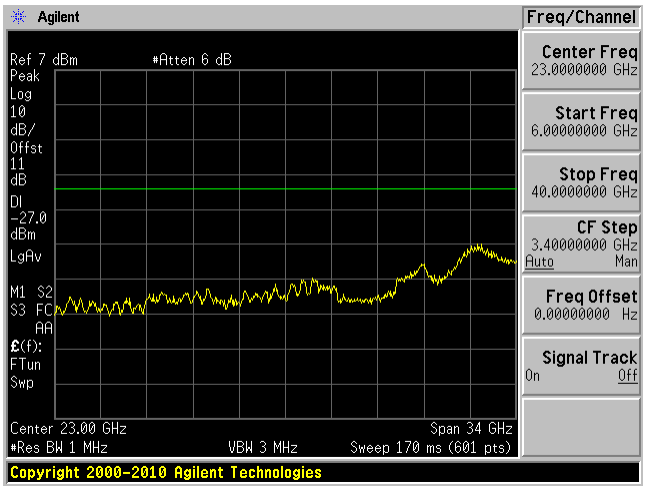


802.11ac40 mode ANT A

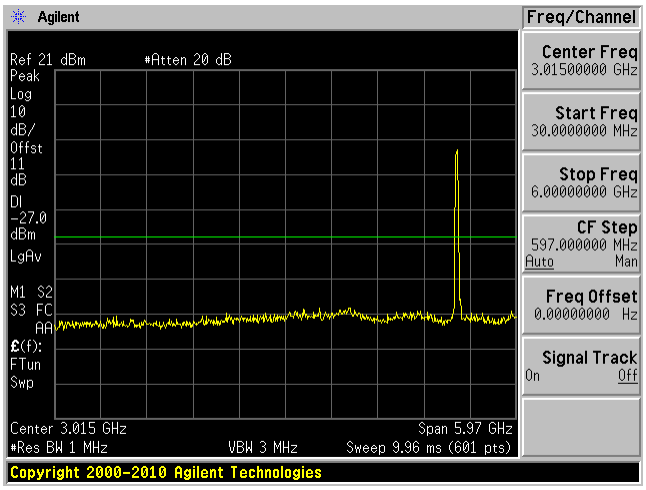
Low Channel 5190MHz (30MHz-6GHz)



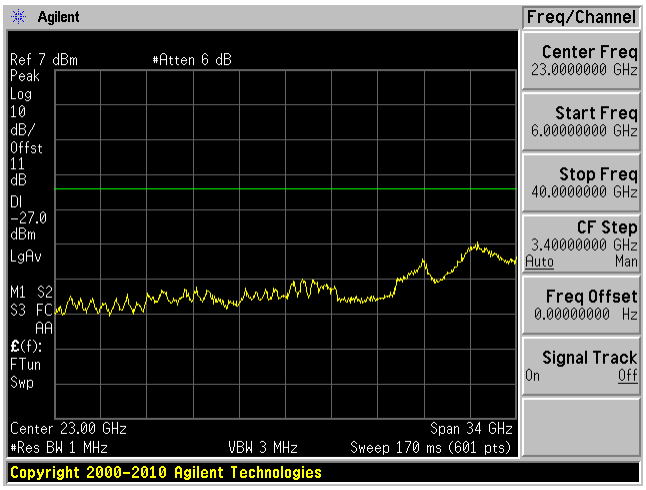
Low Channel 5190 MHz (6-40GHz)



High Channel 5230MHz (30MHz-6GHz)

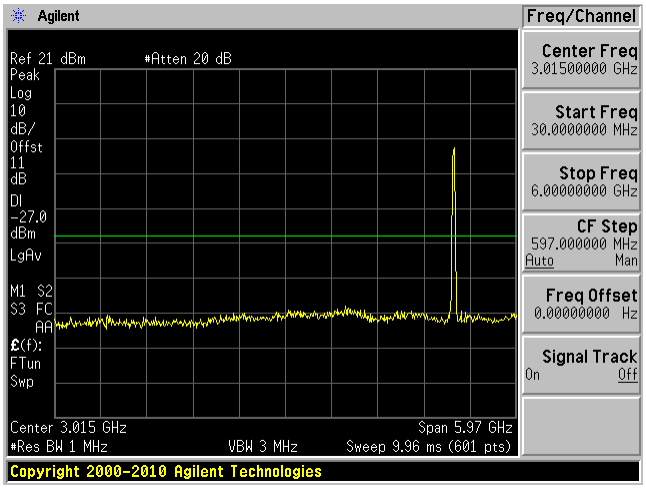


High Channel 5230 MHz (6-40GHz)

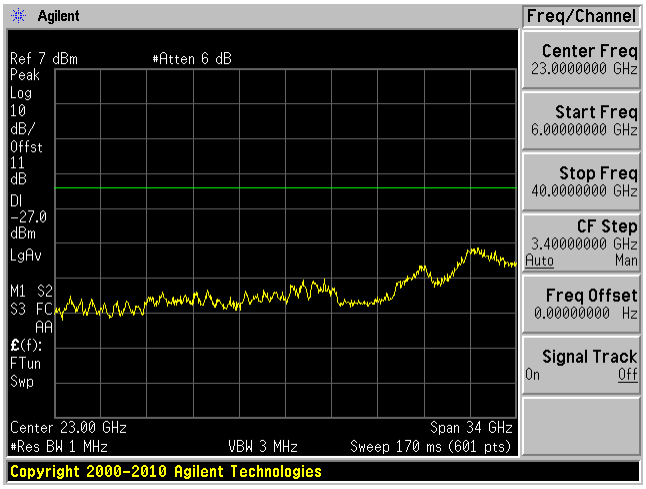


802.11ac40 mode ANT B

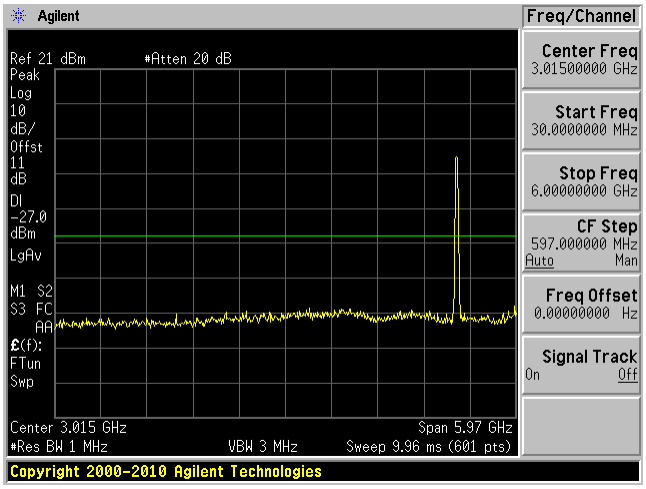
Low Channel 5190MHz (30MHz-6GHz)



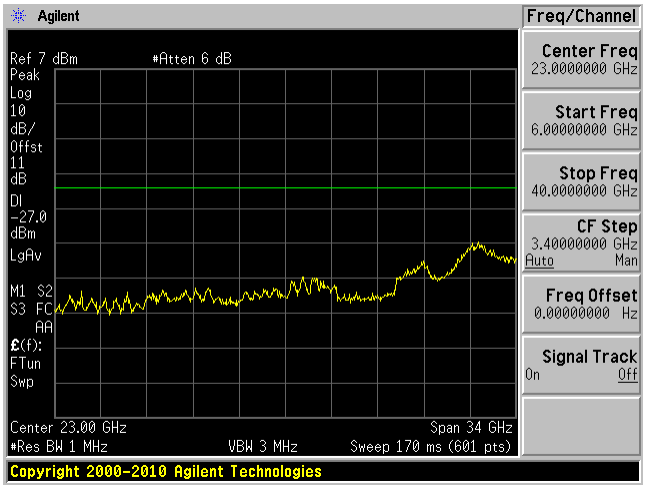
Low Channel 5190 MHz (6-40GHz)



High Channel 5230MHz (30MHz-6GHz)

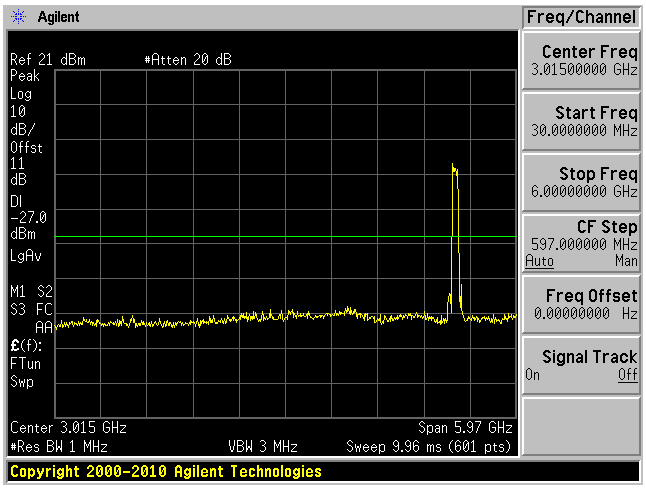


High Channel 5230 MHz (6-40GHz)

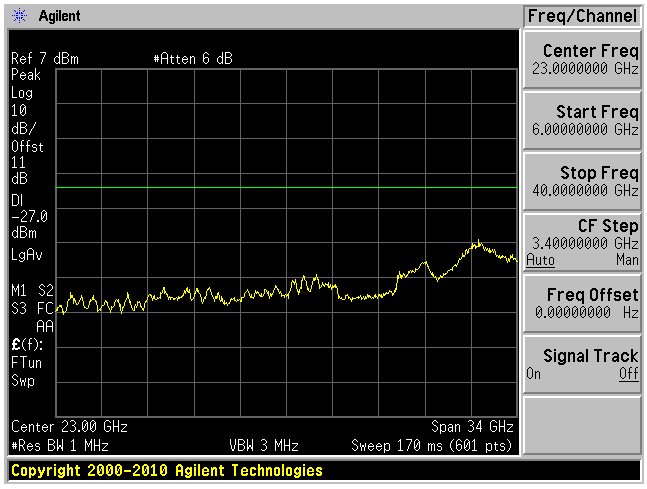


802.11ac80 mode ANT A

Middle Channel 5210MHz (30MHz-6GHz)

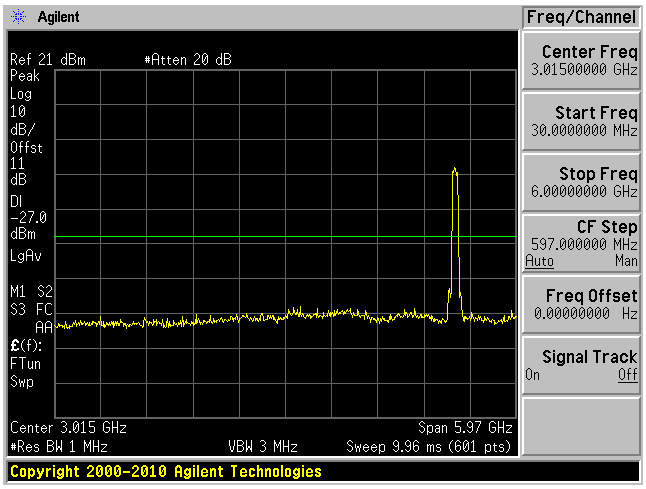


Middle Channel 5210 MHz (6-40GHz)

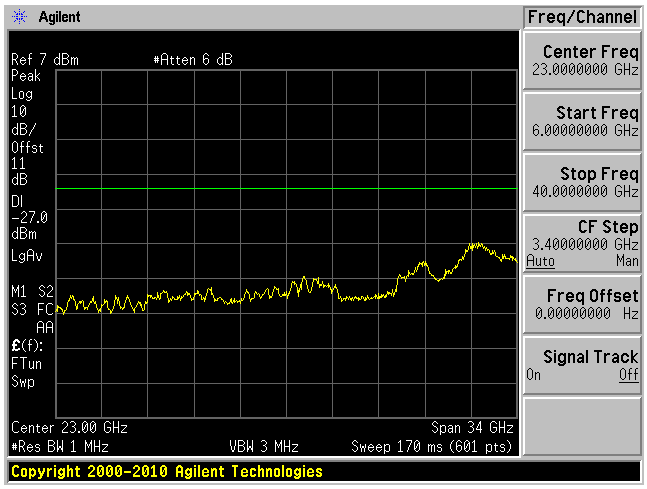


802.11ac80 mode ANT B

Middle Channel 5210MHz (30MHz-6GHz)



Middle Channel 5210 MHz (6-40GHz)

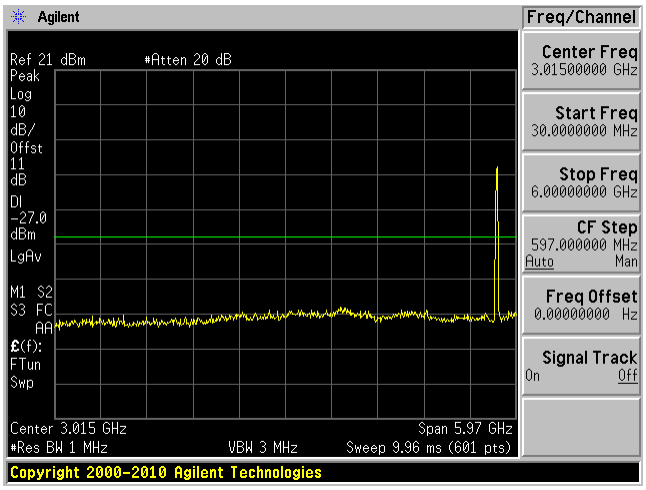


Note: 5150-5250 MHz band is FCC use only

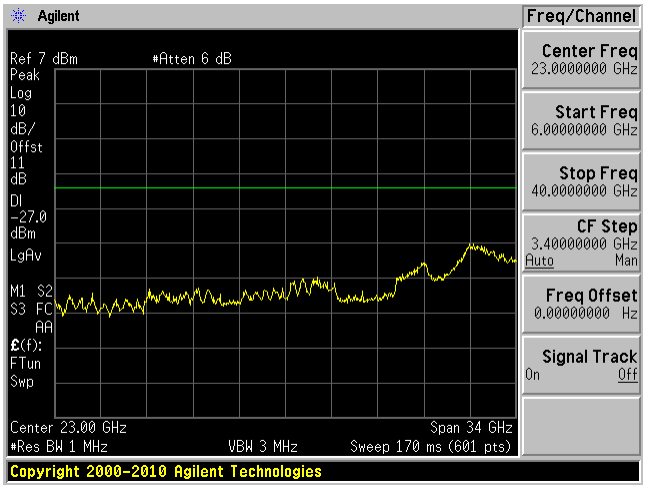
5745 - 5850 MHz

802.11a mode ANT A

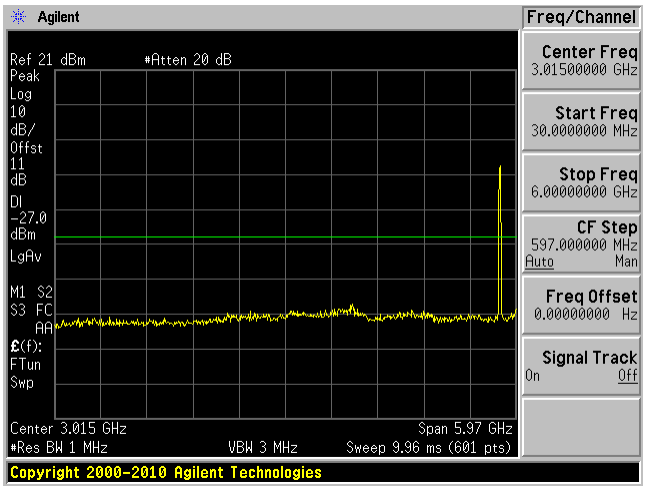
Low Channel 5745 MHz (30MHz-6GHz)



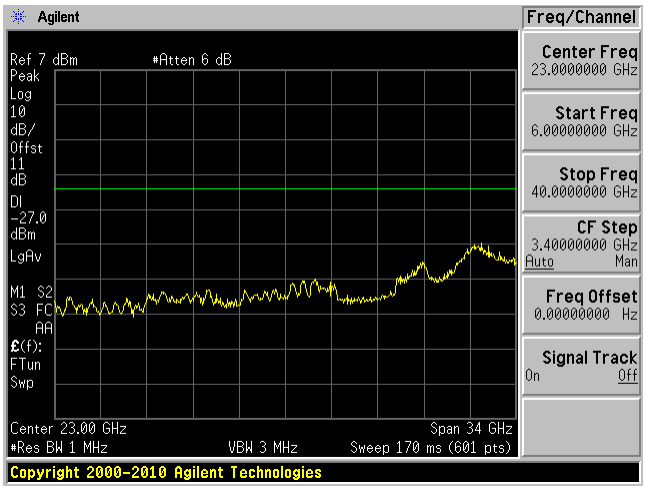
Low Channel 5745 MHz (6-40GHz)



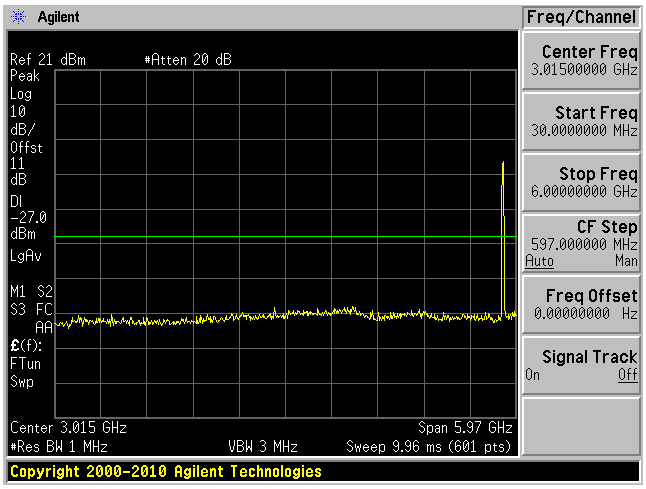
Middle Channel 5785 MHz (30MHz-6GHz)



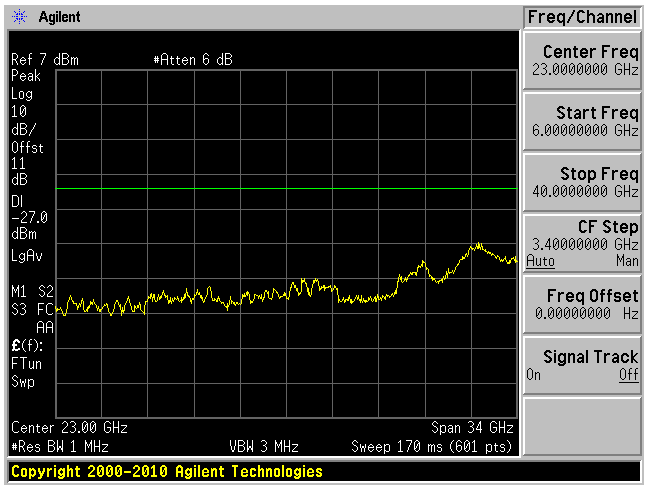
Middle Channel 5785 MHz (6-40GHz)



High Channel 5850 MHz (30MHz-6GHz)

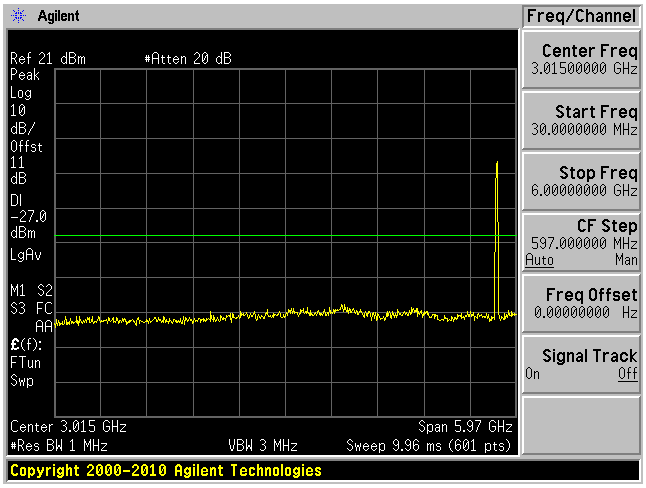


High Channel 5850 MHz (6-40GHz)

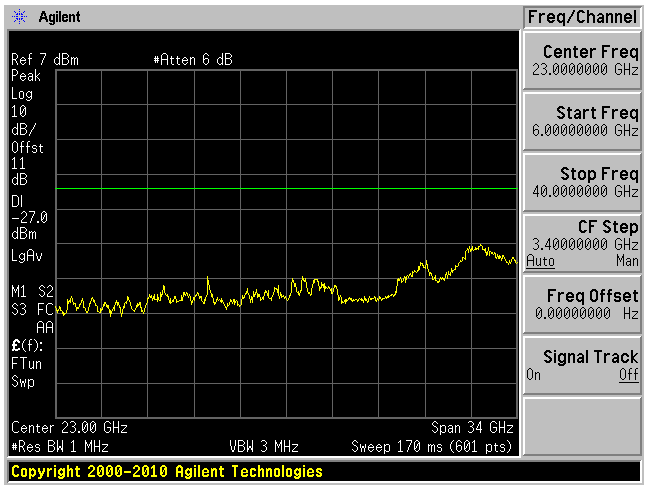


802.11a mode ANT B

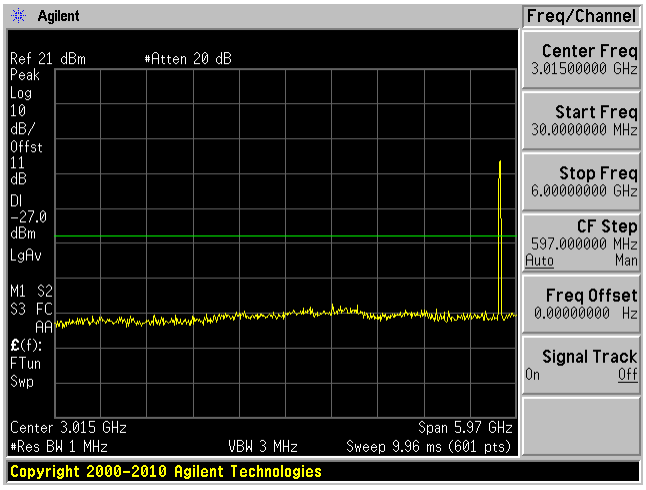
Low Channel 5745 MHz (30MHz-6GHz)



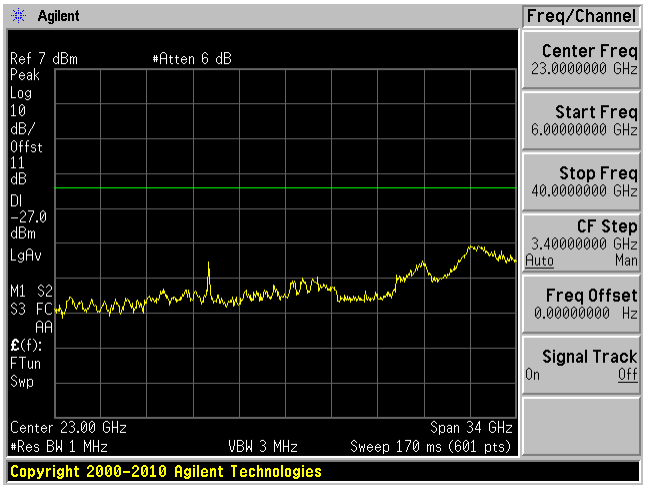
Low Channel 5745 MHz (6-40GHz)



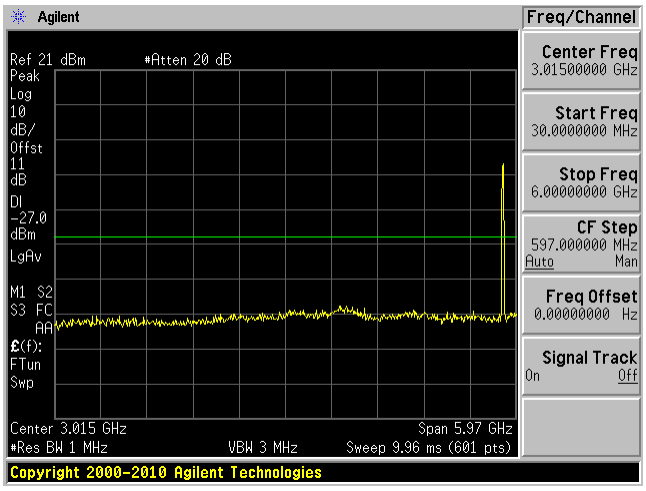
Middle Channel 5785 MHz (30MHz-6GHz)



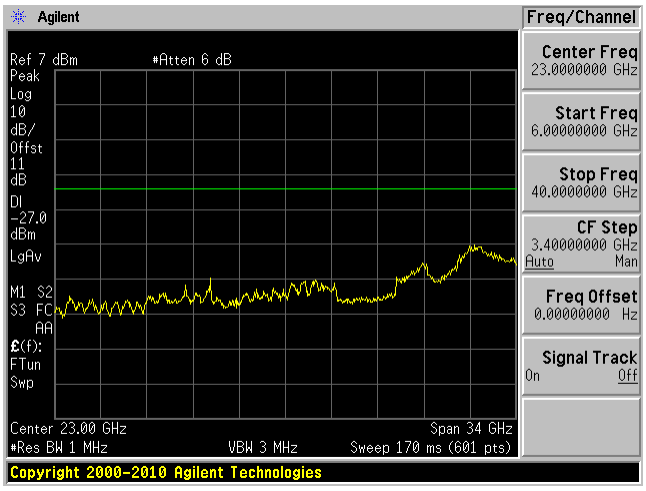
Middle Channel 5785 MHz (6-40GHz)



High Channel 5850 MHz (30MHz-6GHz)

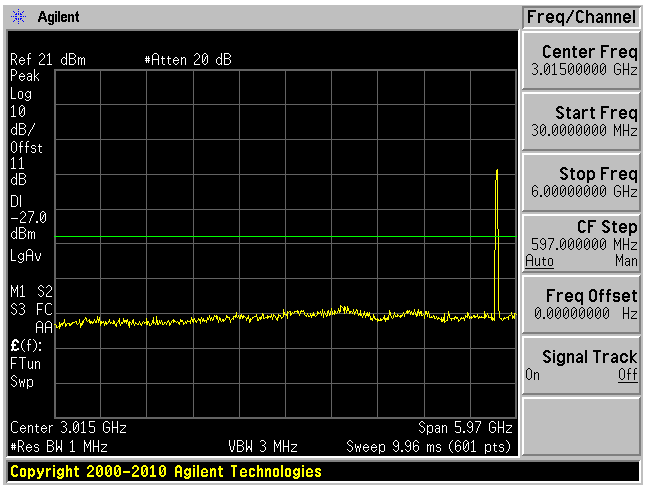


High Channel 5850 MHz (6-40GHz)

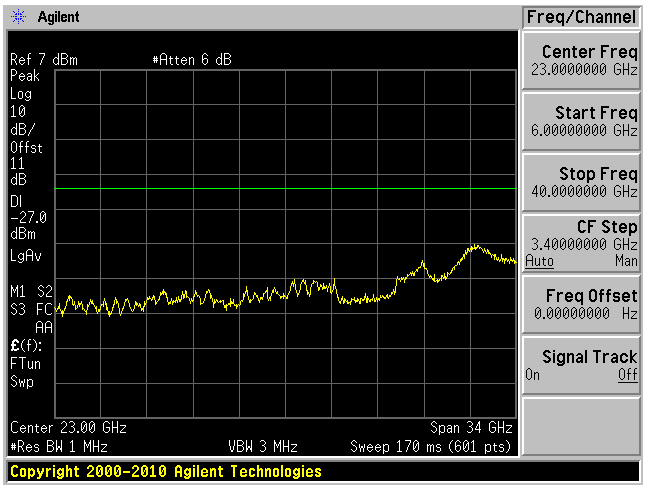


802.11n20 mode ANT A

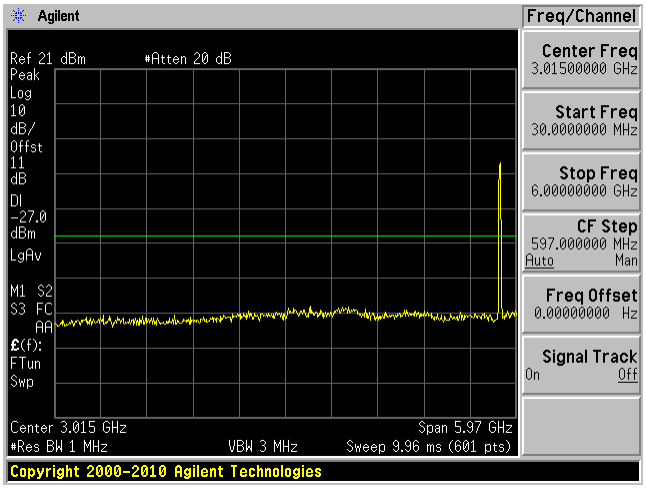
Low Channel 5745 MHz (30MHz-6GHz)



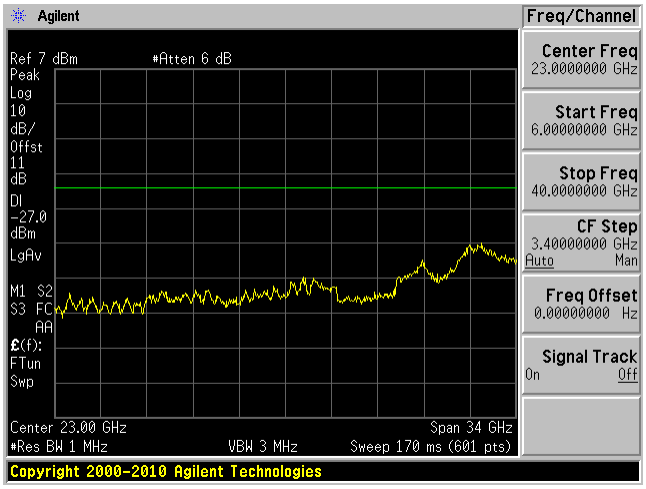
Low Channel 5745 MHz (6-40GHz)



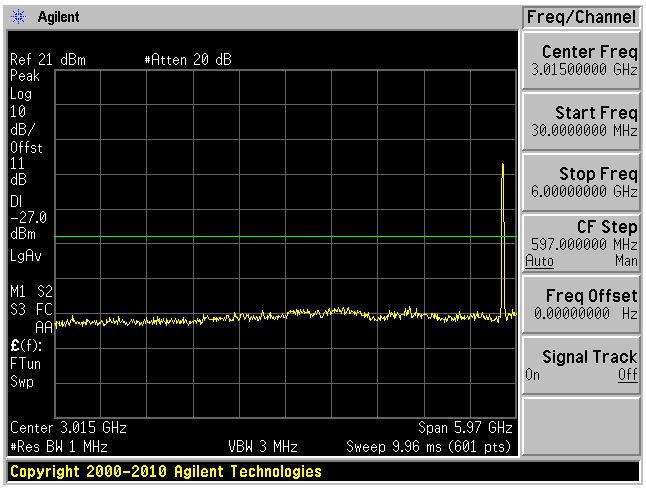
Middle Channel 5785 MHz (30MHz-6GHz)



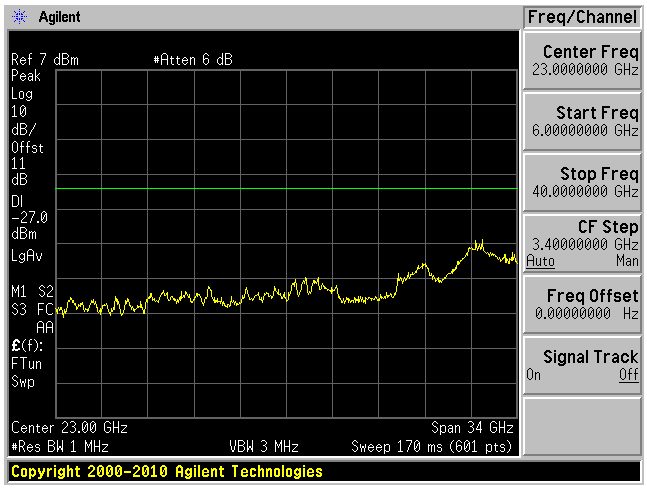
Middle Channel 5785 MHz (6-40GHz)



High Channel 5850 MHz (30MHz-6GHz)

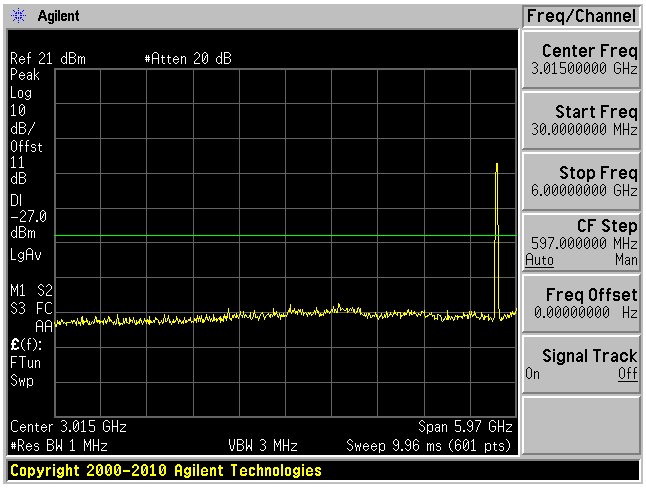


High Channel 5850 MHz (6-40GHz)

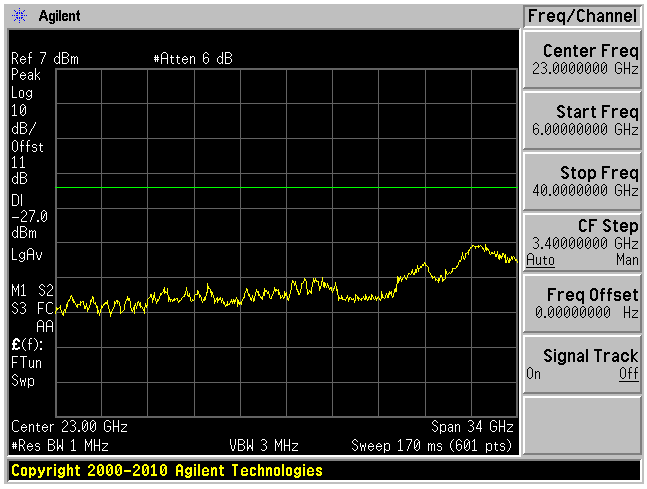


802.11n20 mode ANT B

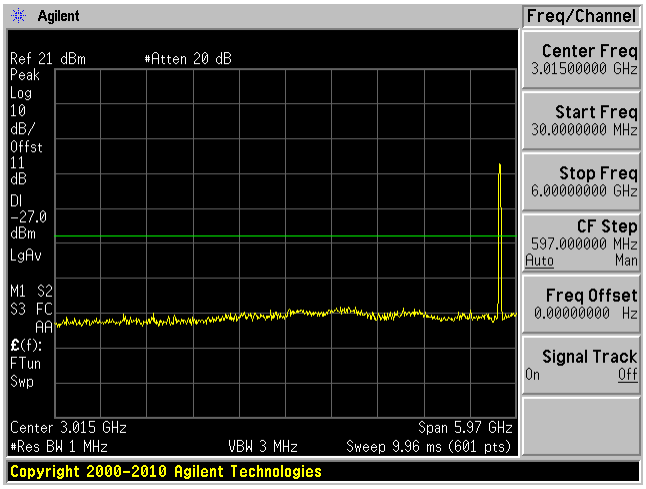
Low Channel 5745 MHz (30MHz-6GHz)



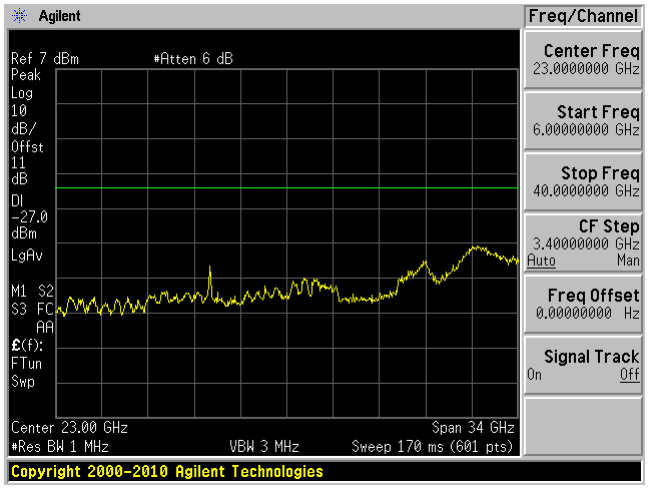
Low Channel 5745 MHz (6-40GHz)



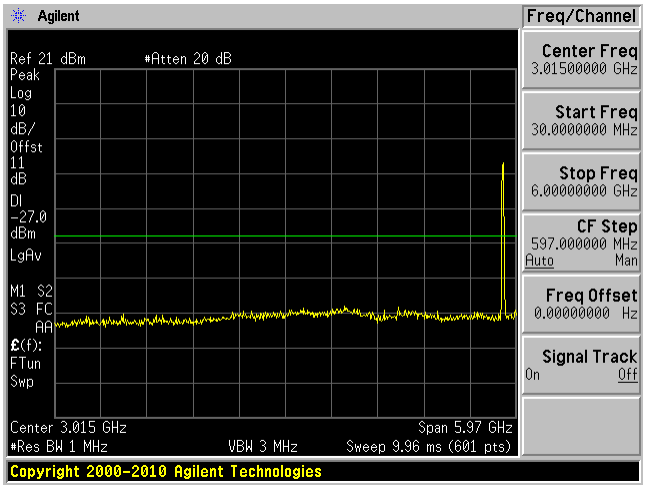
Middle Channel 5785 MHz (30MHz-6GHz)



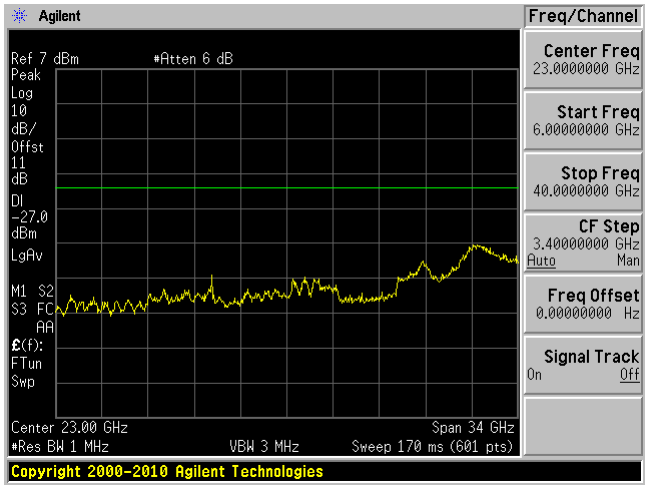
Middle Channel 5785 MHz (6-40GHz)



High Channel 5850 MHz (30MHz-6GHz)

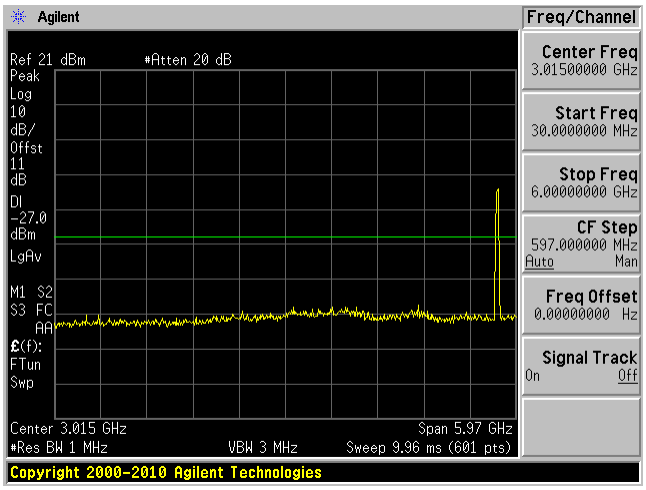


High Channel 5850 MHz (6-40GHz)

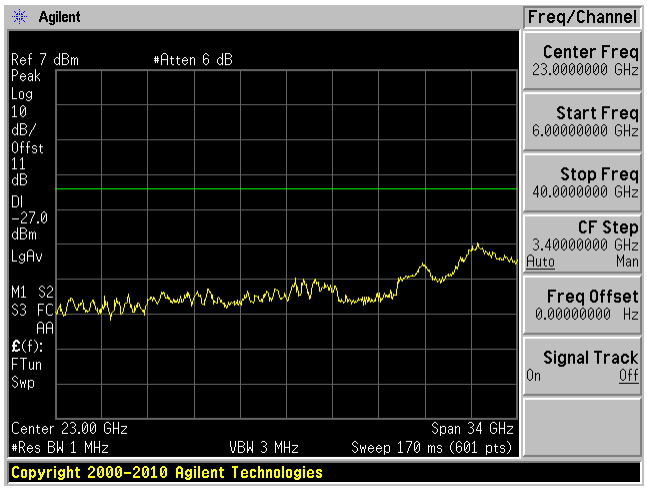


802.11n40 mode ANT A

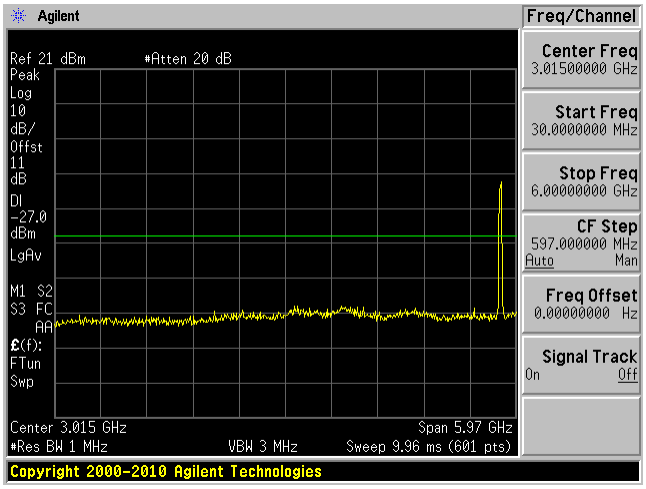
Low Channel 5755 MHz (30MHz-6GHz)



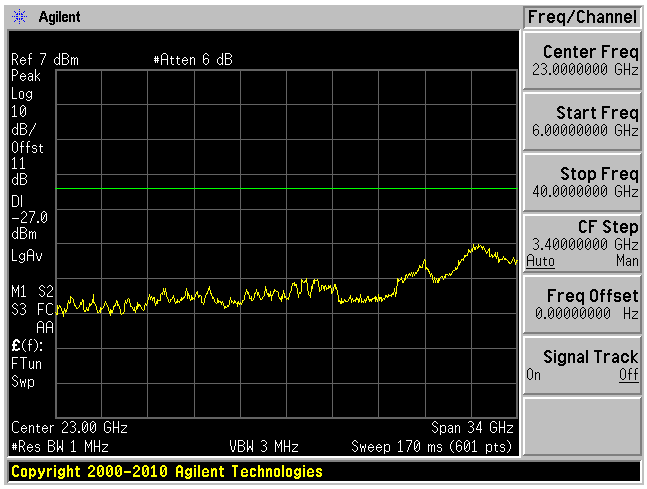
Low Channel 5755 MHz (6-40GHz)



High Channel 5795 MHz (30MHz-6GHz)

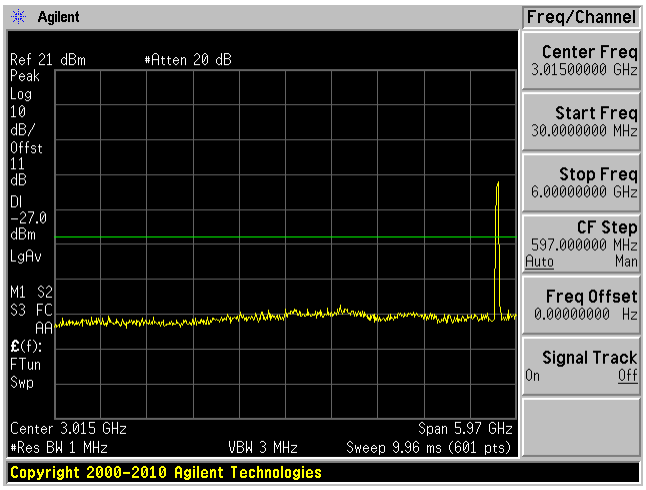


High Channel 5795 MHz (6-40GHz)

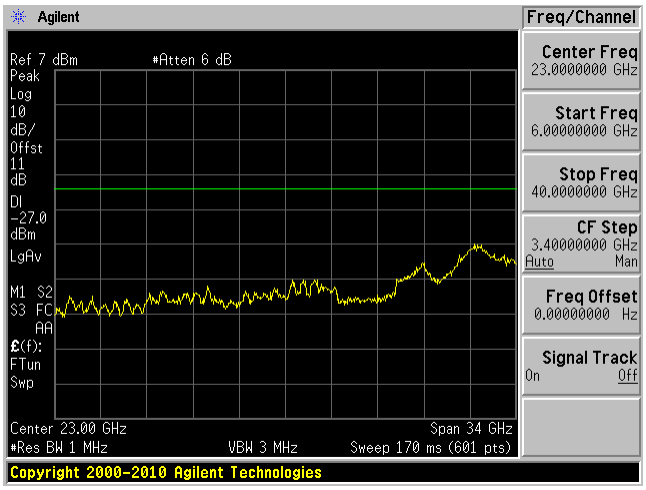


802.11n40 mode ANT B

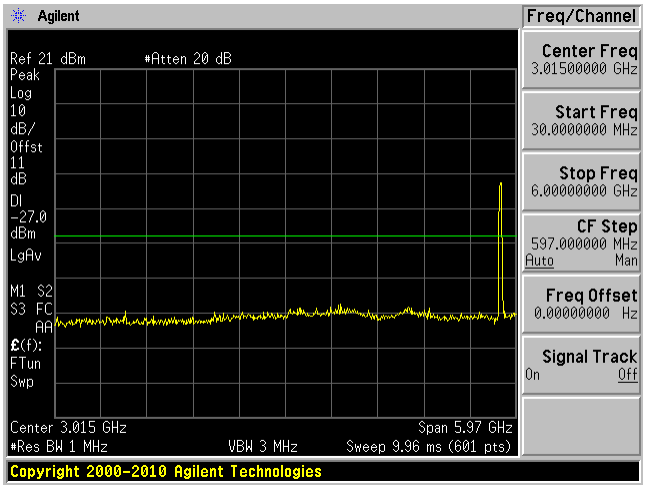
Low Channel 5755 MHz (30MHz-6GHz)



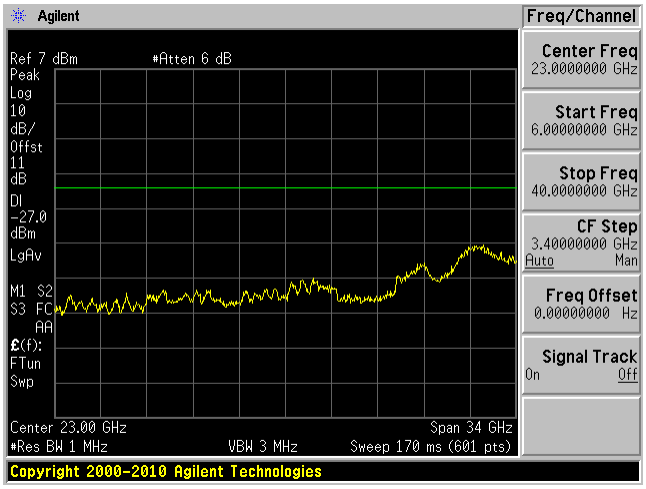
Low Channel 5755 MHz (6-40GHz)



High Channel 5795 MHz (30MHz-6GHz)

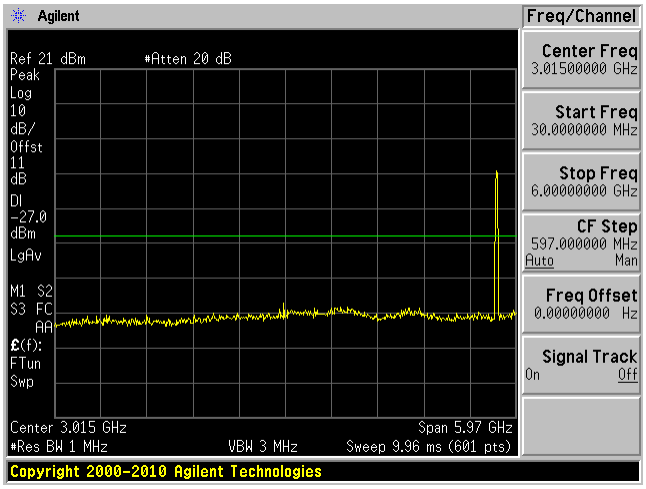


High Channel 5795 MHz (6-40GHz)

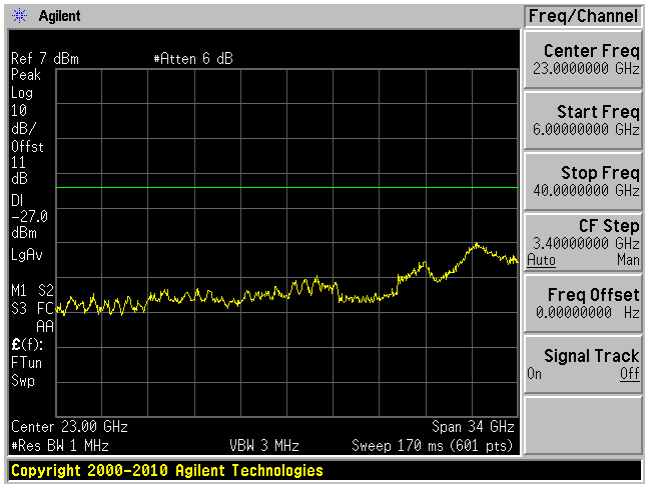


802.11ac20 mode ANT A

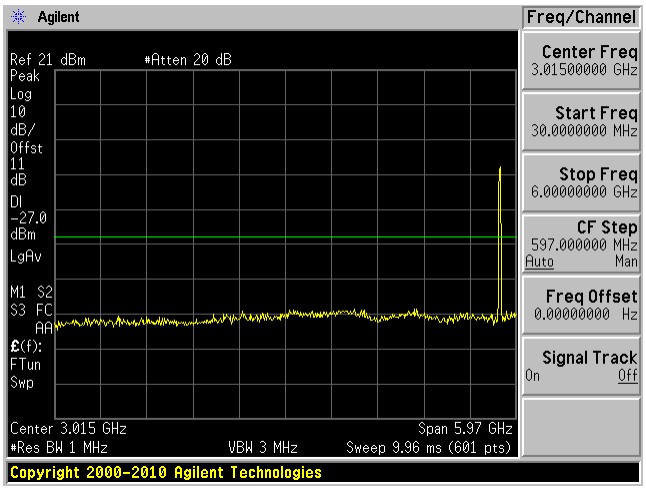
Low Channel 5745 MHz (30MHz-6GHz)



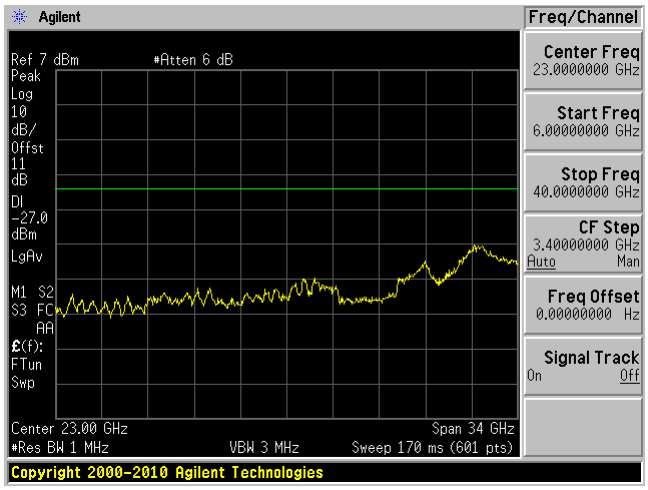
Low Channel 5745 MHz (6-40GHz)



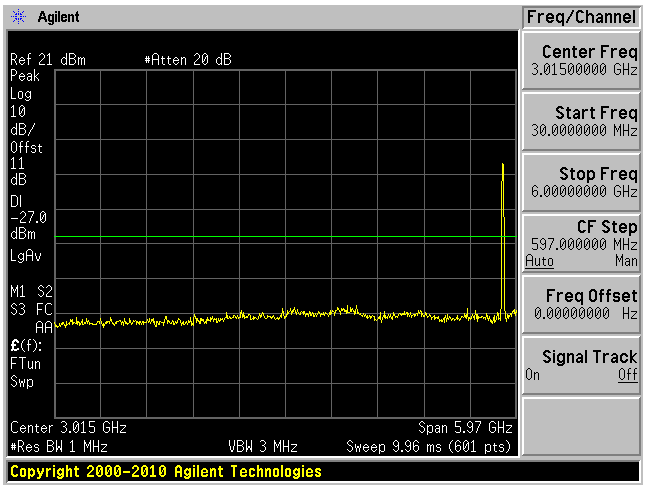
Middle Channel 5785 MHz (30MHz-6GHz)



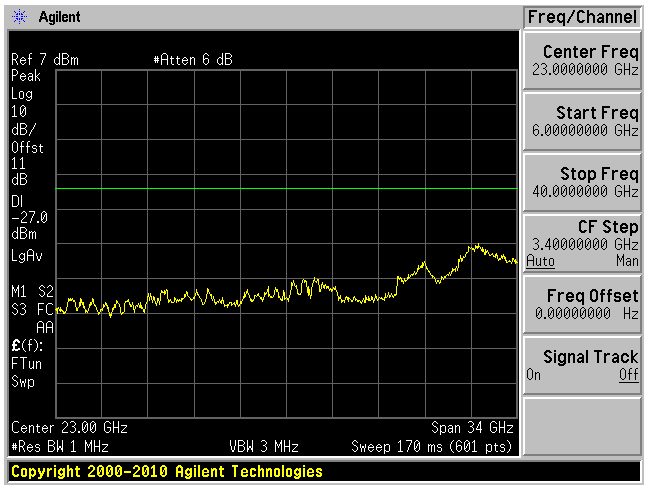
Middle Channel 5785 MHz (6-40GHz)



High Channel 5850 MHz (30MHz-6GHz)

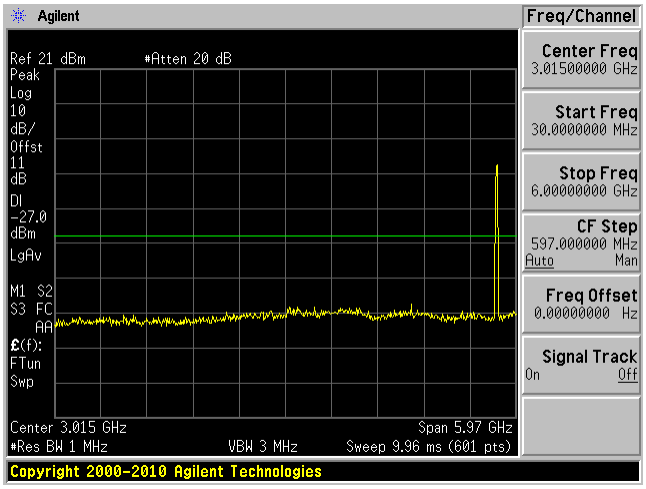


High Channel 5850 MHz (6-40GHz)

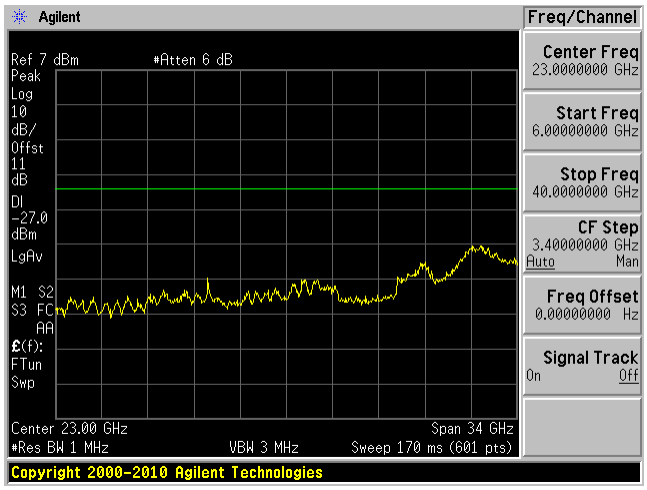


802.11ac20 mode ANT B

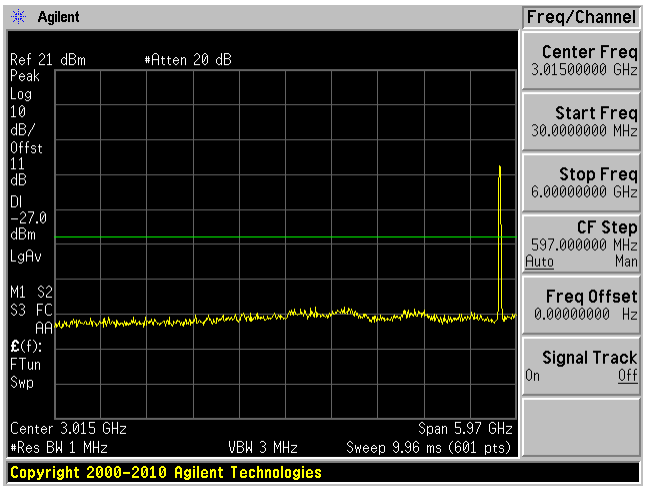
Low Channel 5745 MHz (30MHz-6GHz)



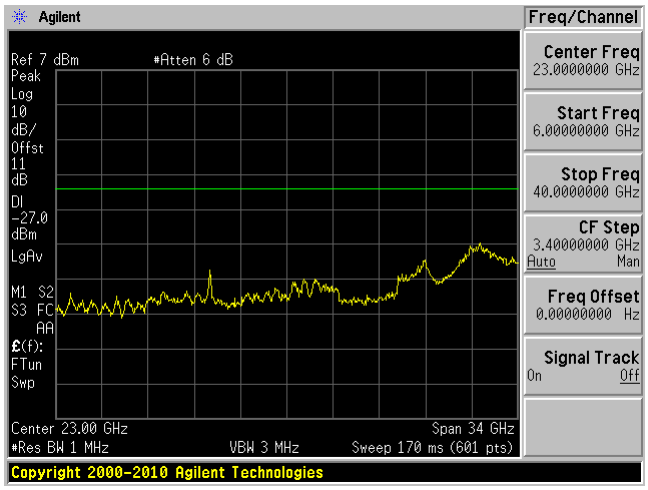
Low Channel 5745 MHz (6-40GHz)



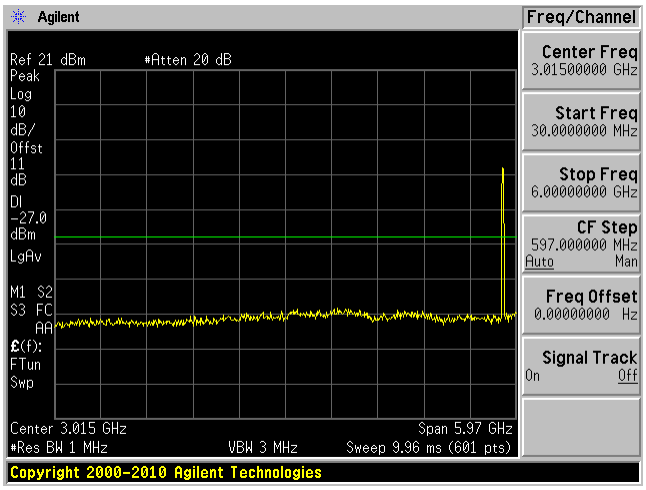
Middle Channel 5785 MHz (30MHz-6GHz)



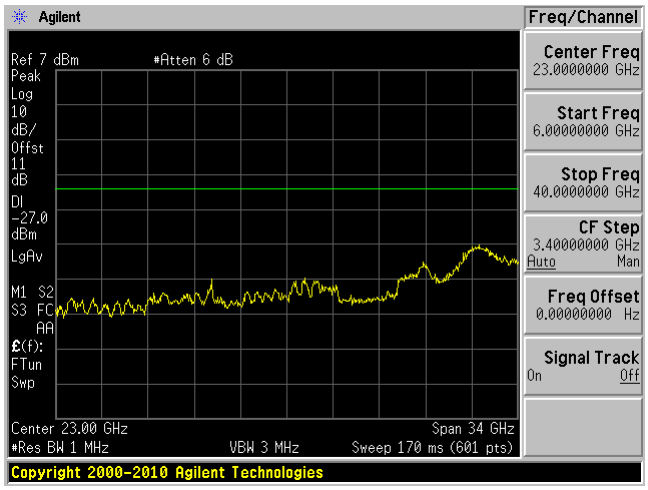
Middle Channel 5785 MHz (6-40GHz)



High Channel 5850 MHz (30MHz-6GHz)

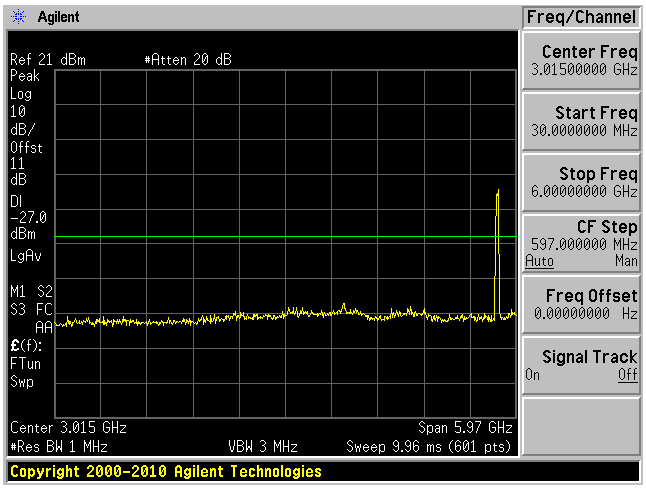


High Channel 5850 MHz (6-40GHz)

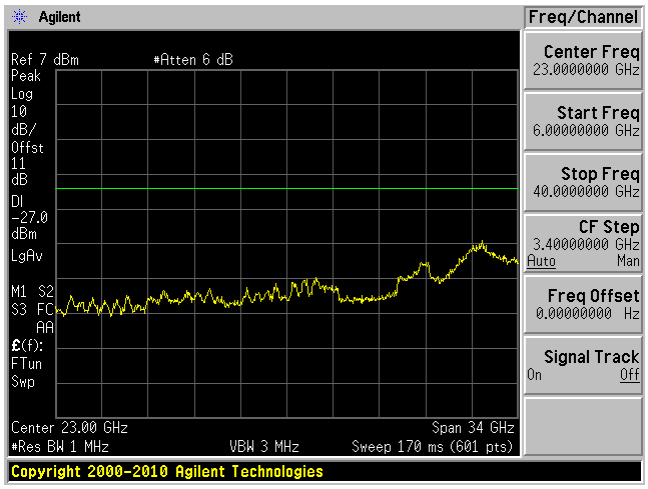


802.11ac40 mode ANT A

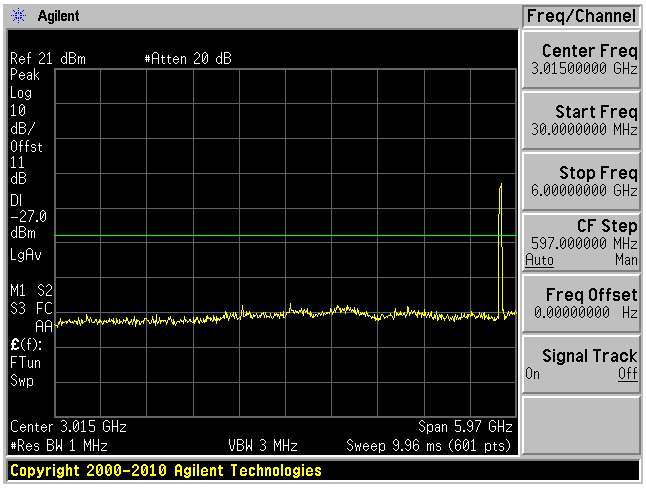
Low Channel 5755 MHz (30MHz-6GHz)



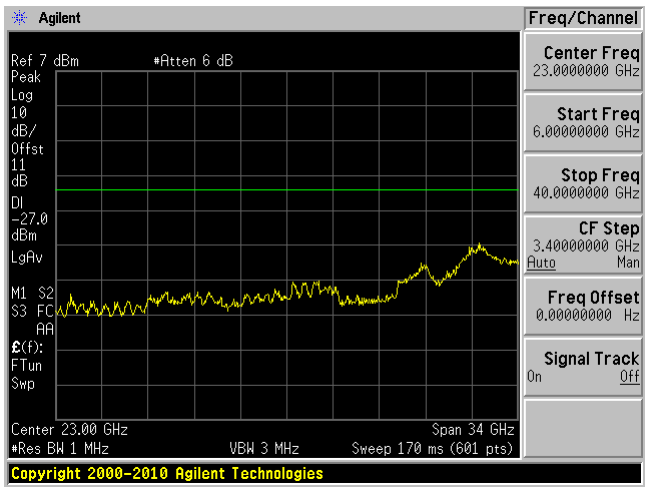
Low Channel 5755 MHz (6-40GHz)



High Channel 5795 MHz (30MHz-6GHz)

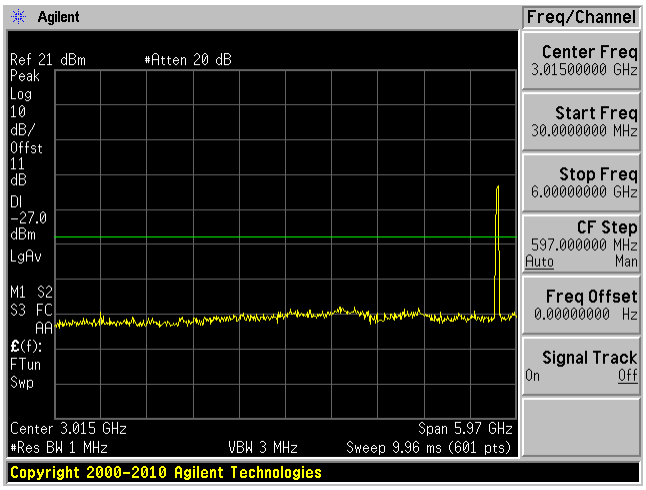


High Channel 5795 MHz (6-40GHz)

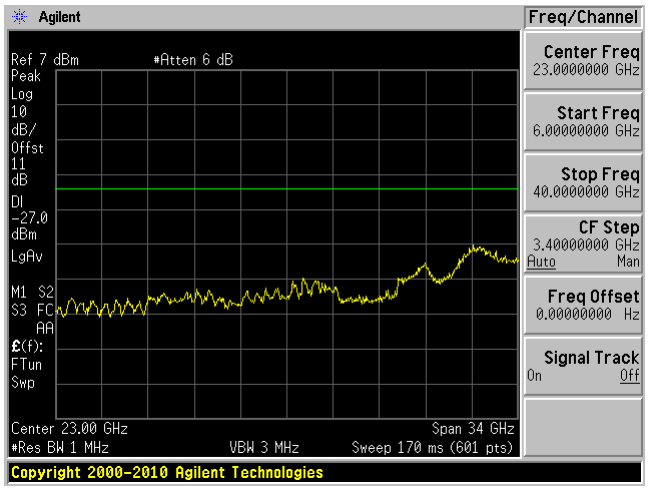


802.11ac40 mode ANT B

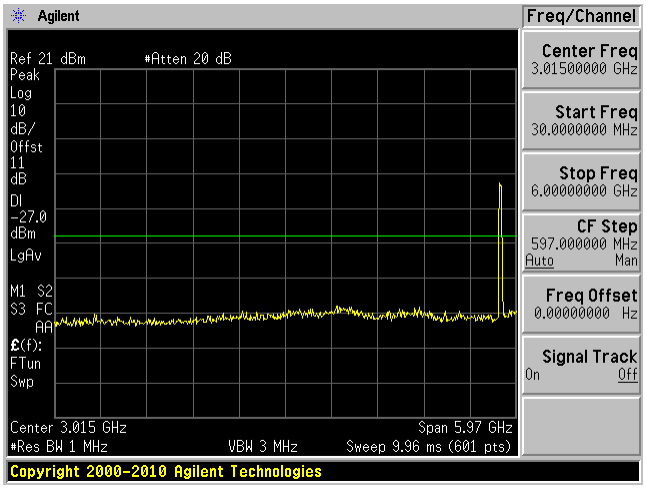
Low Channel 5755 MHz (30MHz-6GHz)



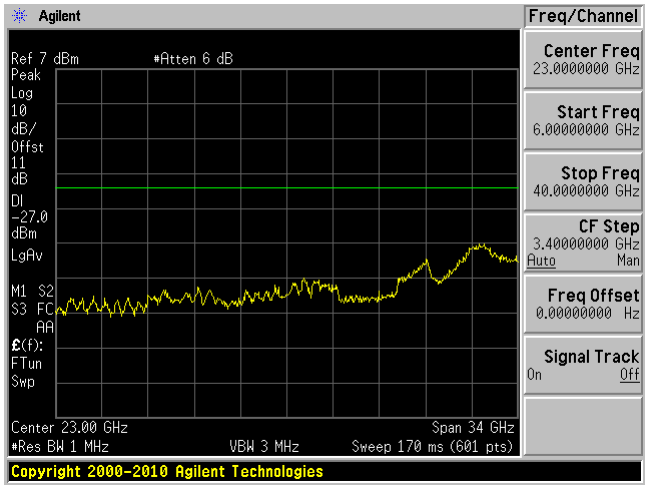
Low Channel 5755 MHz (6-40GHz)



High Channel 5795 MHz (30MHz-6GHz)

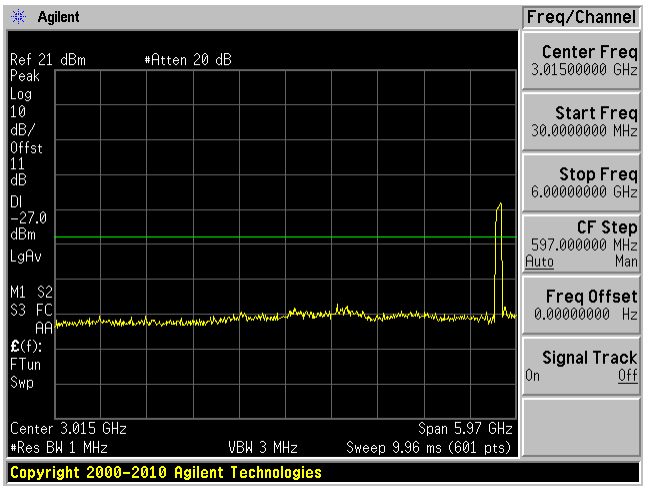


High Channel 5795 MHz (6-40GHz)

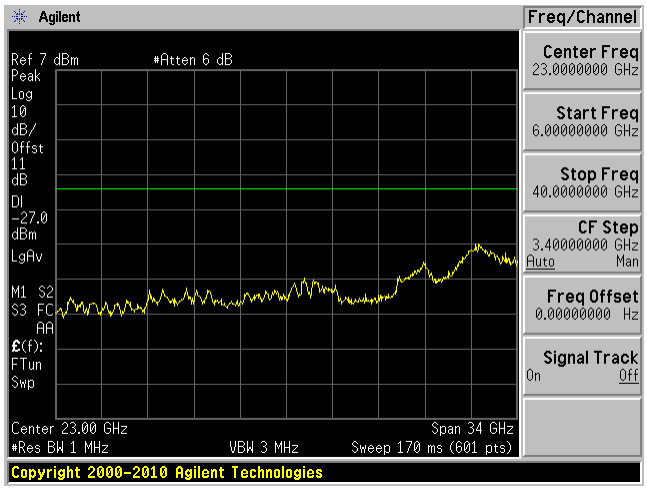


802.11ac80 mode ANT A

Middle Channel 5795 MHz (30MHz-6GHz)

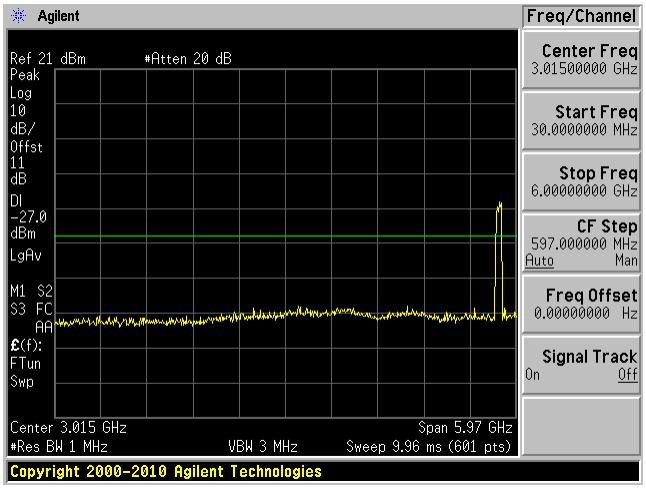


Middle Channel 5795 MHz (6-40GHz)

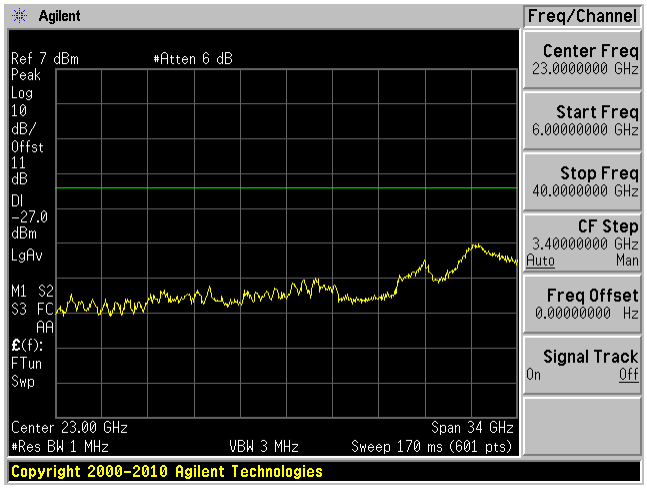


802.11ac80 mode ANT B

Middle Channel 5795 MHz (30MHz-6GHz)



Middle Channel 5795 MHz (6-40GHz)

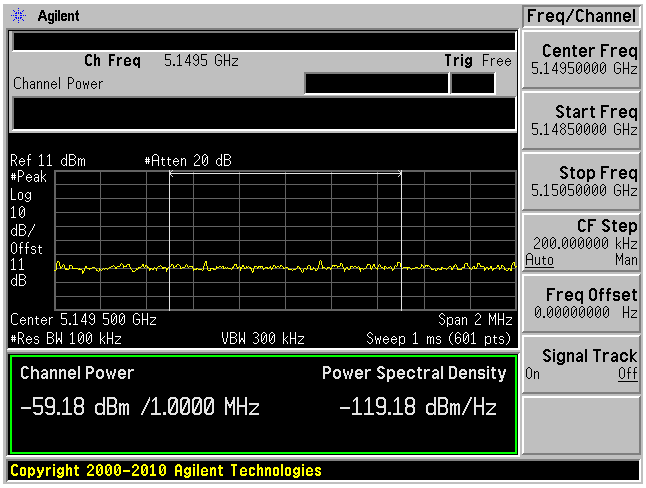


Band Edge Emissions

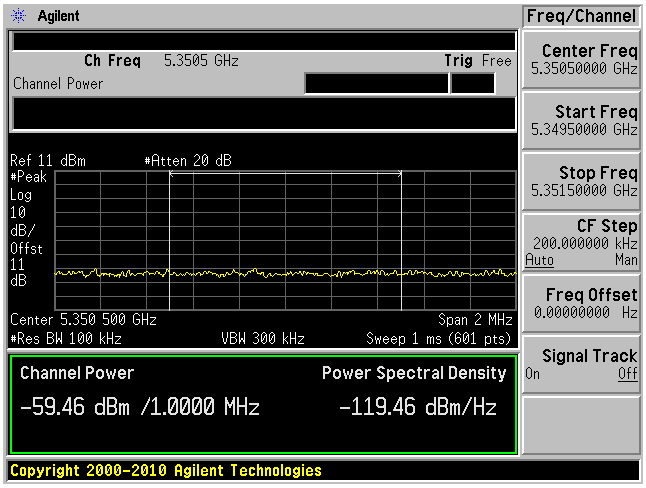
5150 - 5250 MHz

802.11a mode ANT A

Low Channel: 5180 MHz

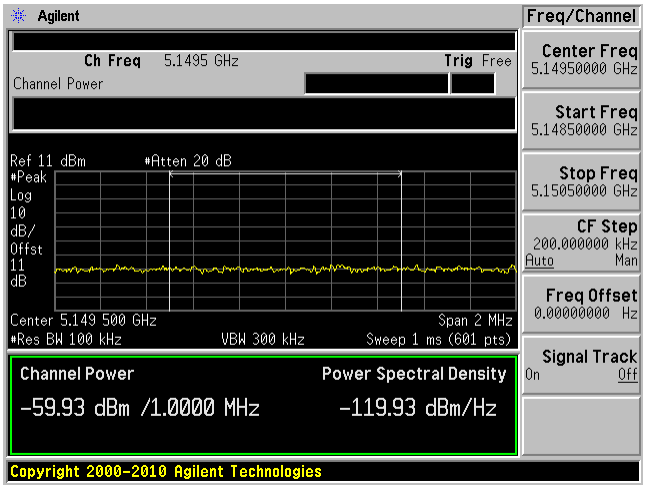


High channel: 5240 MHz

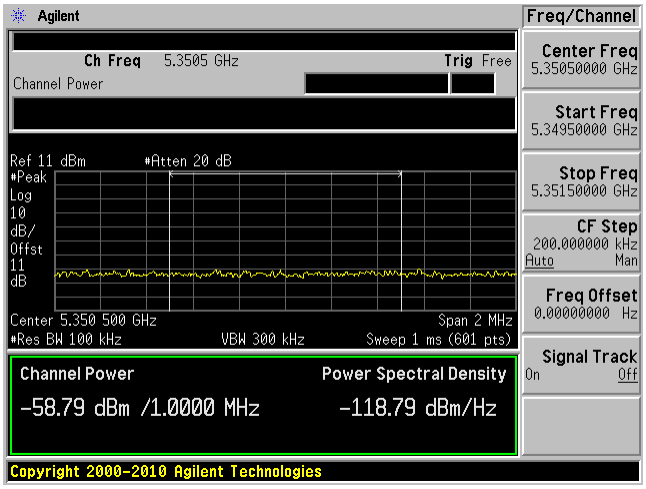


802.11a mode ANT B

Low Channel: 5180 MHz

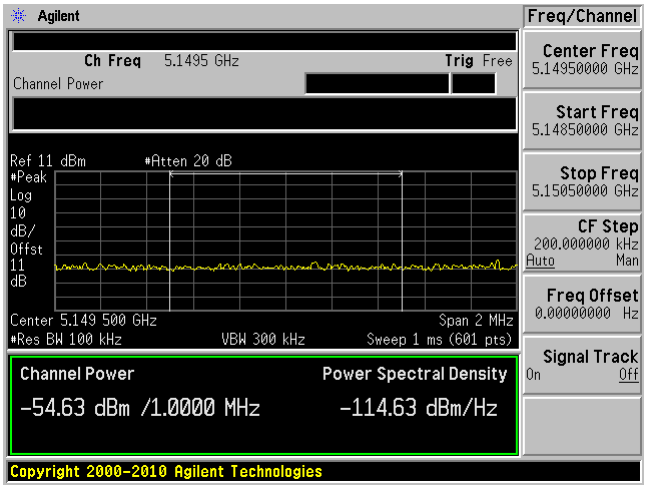


High channel: 5240 MHz

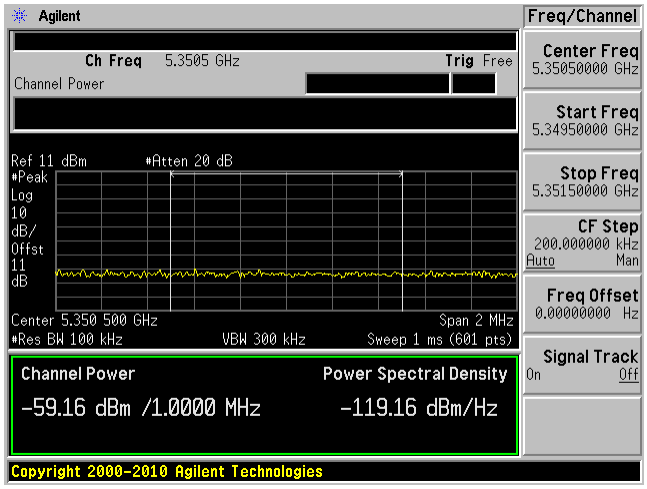


802.11n20 mode ANT A

Low Channel: 5180 MHz

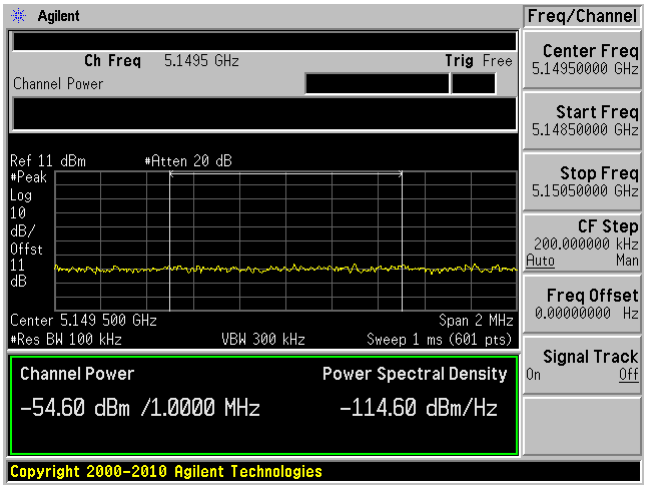


High channel: 5240 MHz

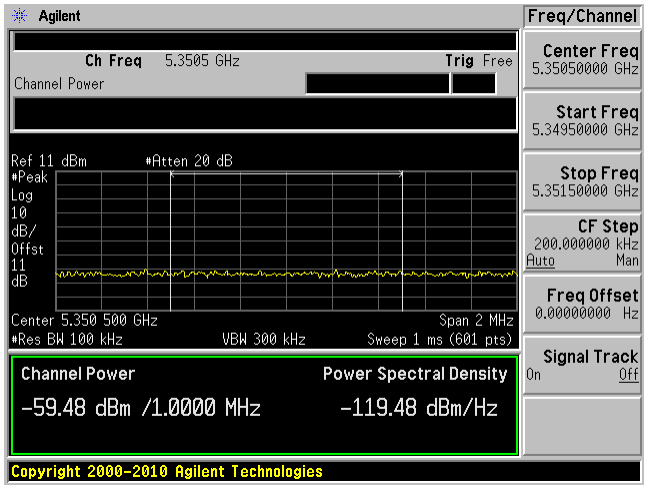


802.11n20 mode ANT B

Low Channel: 5180 MHz

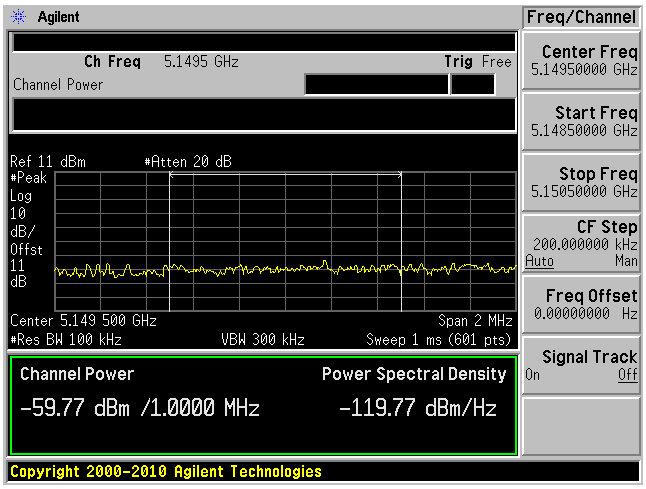


High channel: 5240 MHz

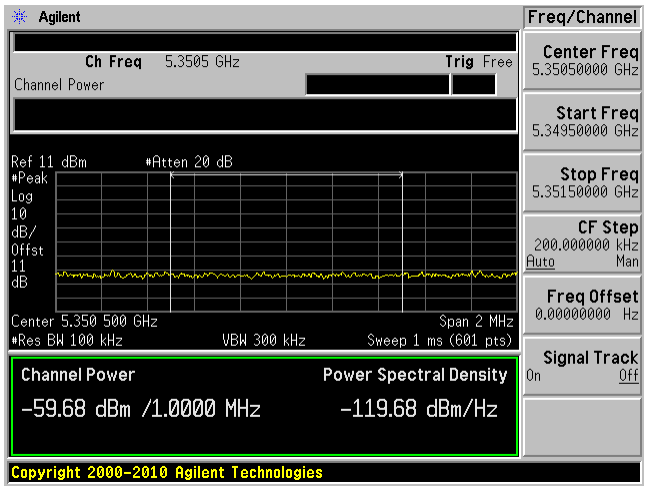


802.11n40 mode ANT A

Low Channel: 5190 MHz

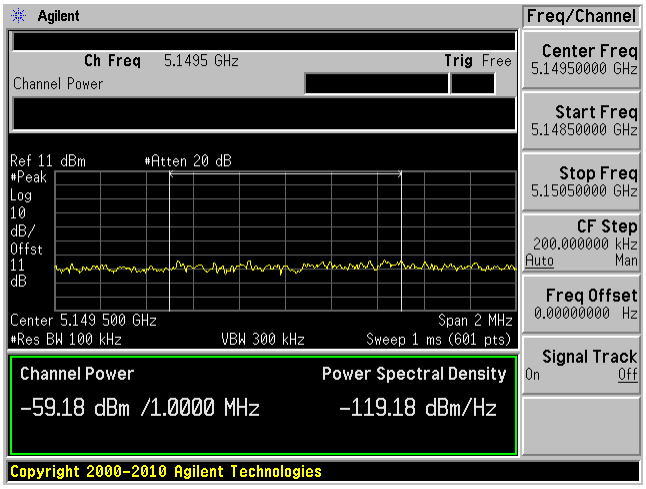


High channel: 5230 MHz

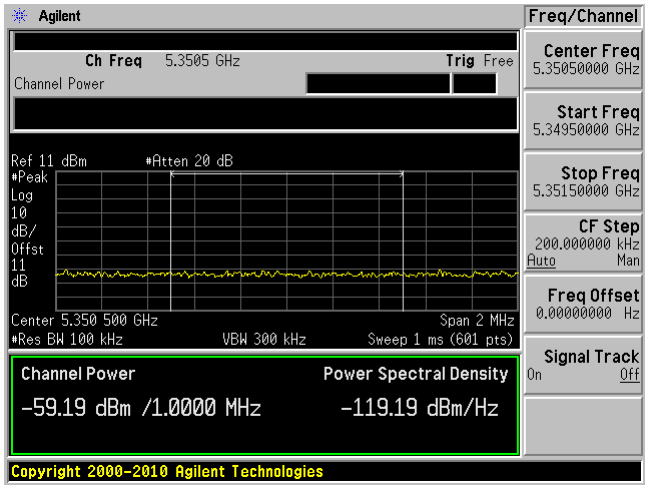


802.11n40 mode ANT B

Low Channel: 5190 MHz

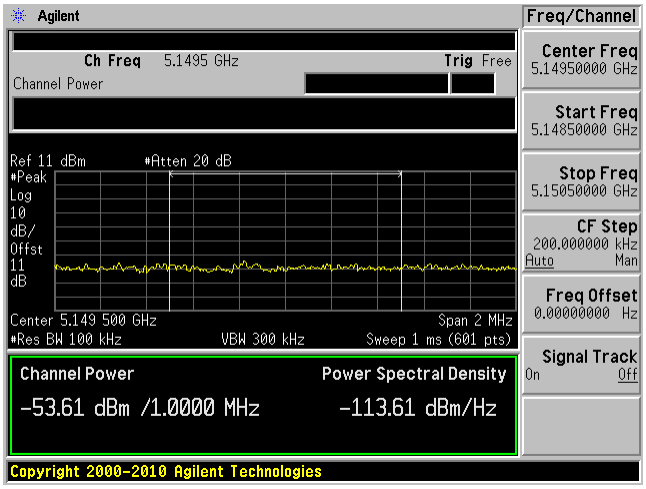


High channel: 5230 MHz

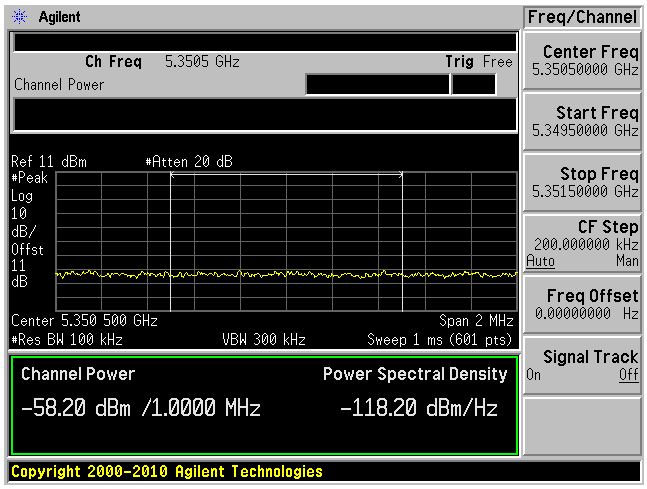


802.11ac20 mode ANT A

Low Channel: 5180 MHz

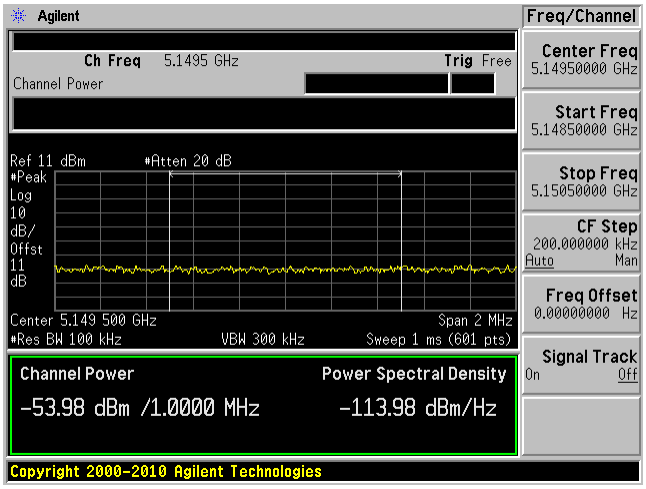


High channel: 5240 MHz

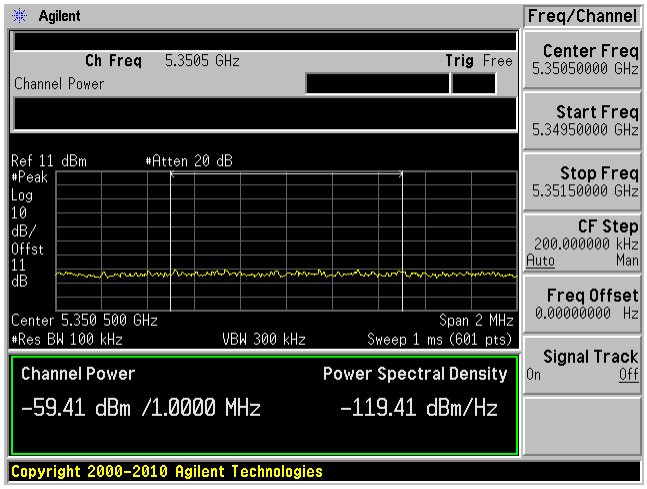


802.11ac20 mode ANT B

Low Channel: 5180 MHz

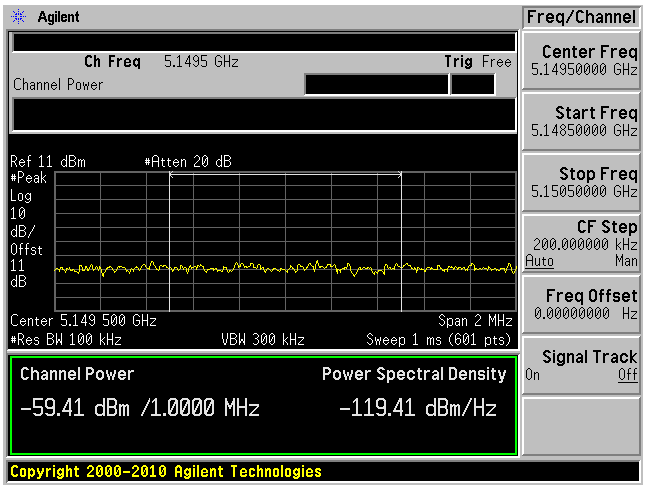


High channel: 5240 MHz

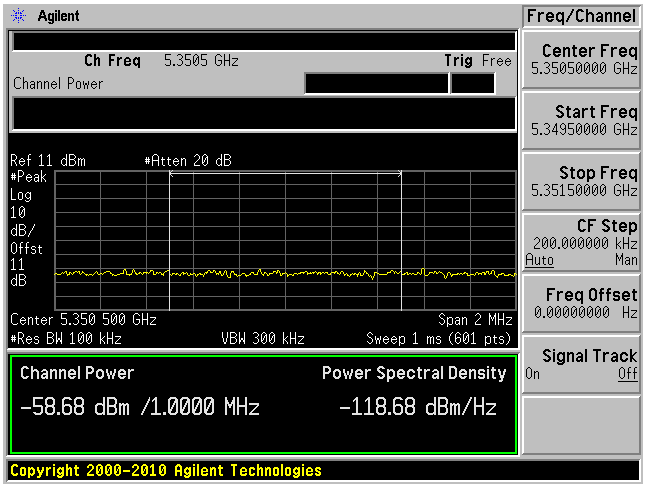


802.11ac40 mode ANT A

Low Channel: 5190 MHz

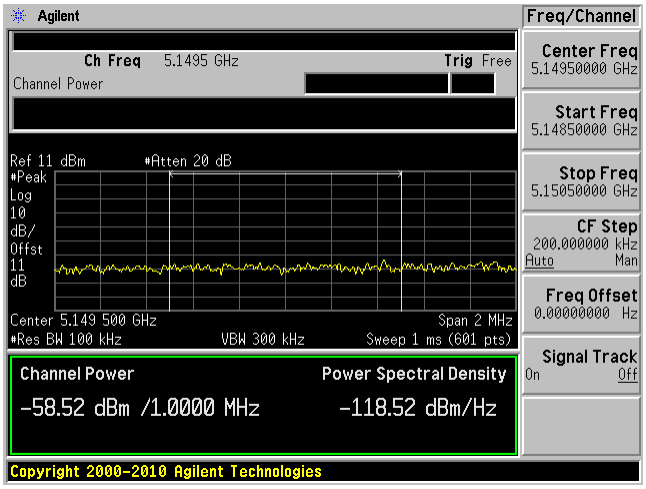


High channel: 5230 MHz

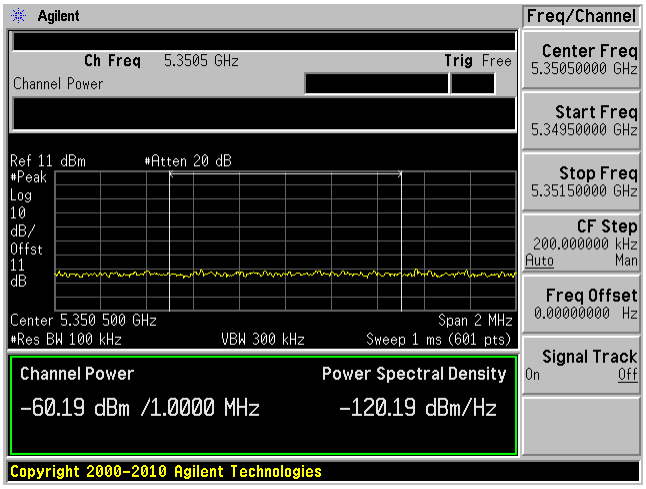


802.11ac40 mode ANT B

Low Channel: 5190 MHz

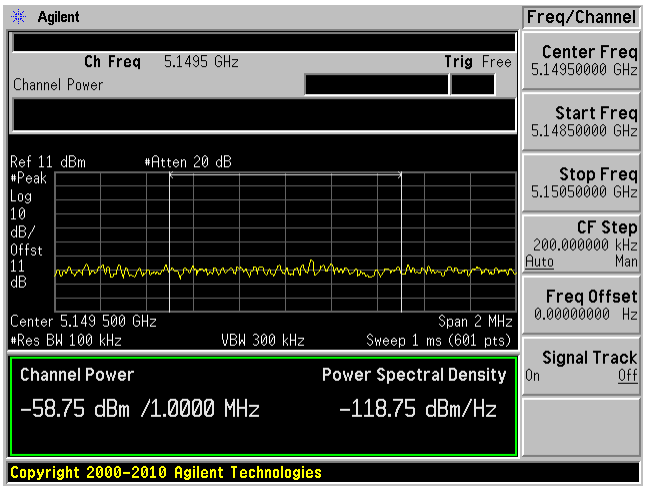


High channel: 5230 MHz

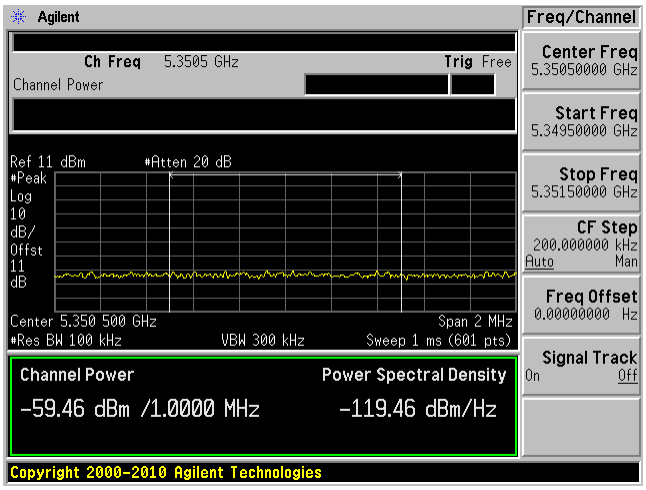


802.11ac80 mode ANT A

Middle Channel: 5210 MHz

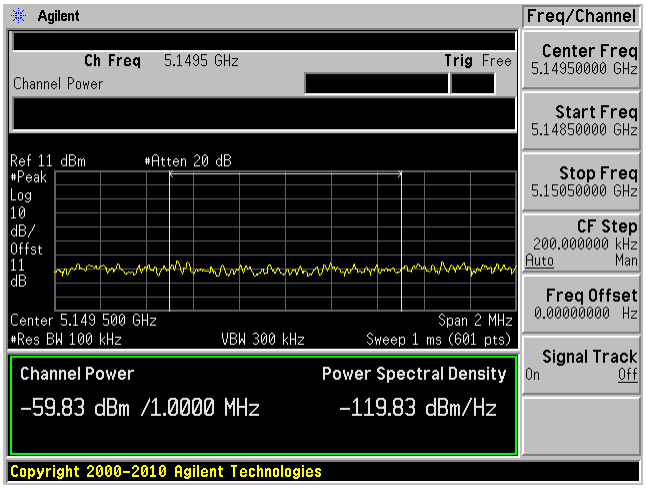


Middle Channel: 5210 MHz

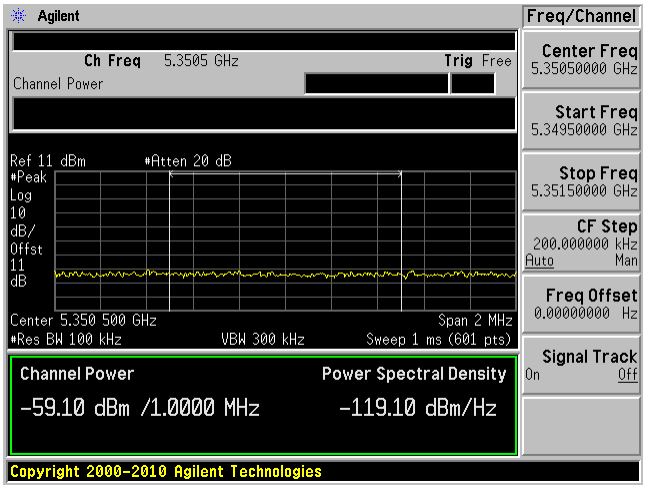


802.11ac80 mode ANT B

Middle Channel: 5210 MHz



Middle Channel: 5210 MHz



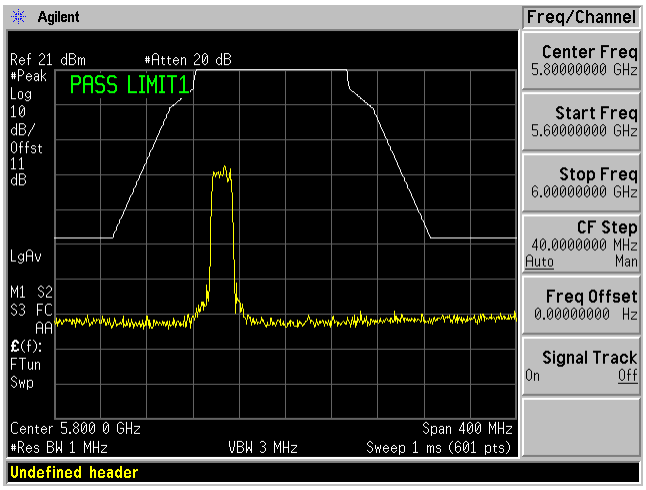
Note: 5150-5250 MHz band is FCC use only

Emission Mask

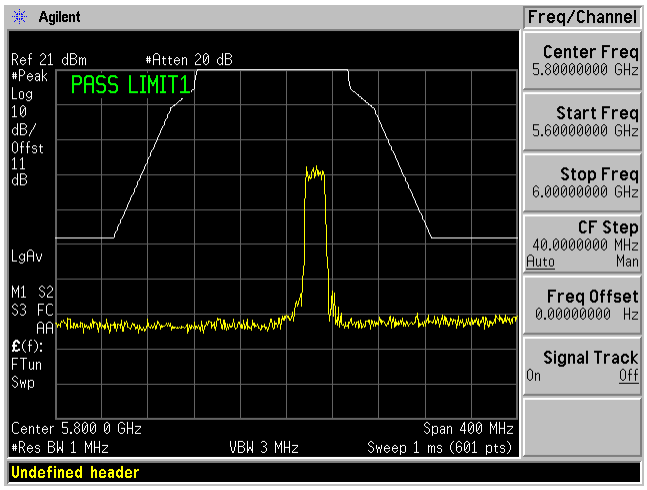
5725 - 5850 MHz

802.11a mode ANT A

Low Channel: 5745 MHz

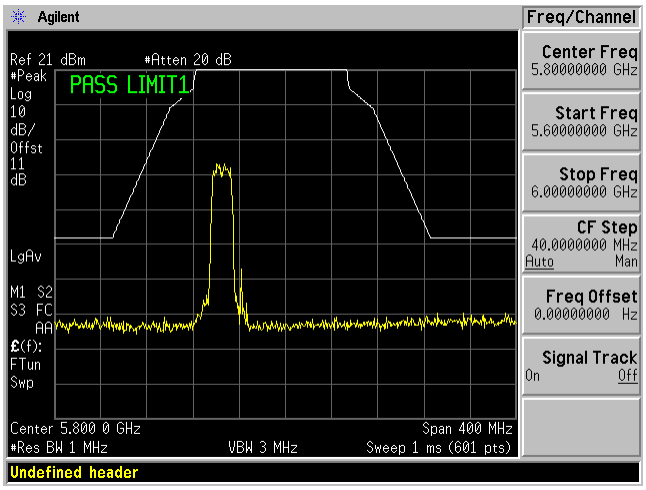


High Channel: 5825 MHz

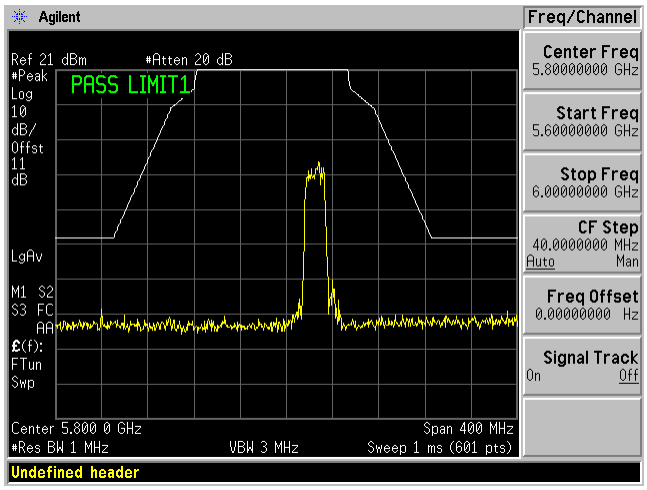


802.11a mode ANT B

Low Channel: 5745 MHz

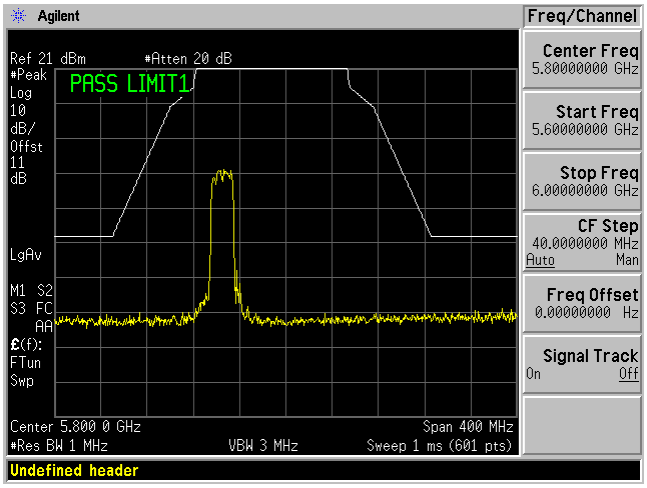


High channel: 5825 MHz

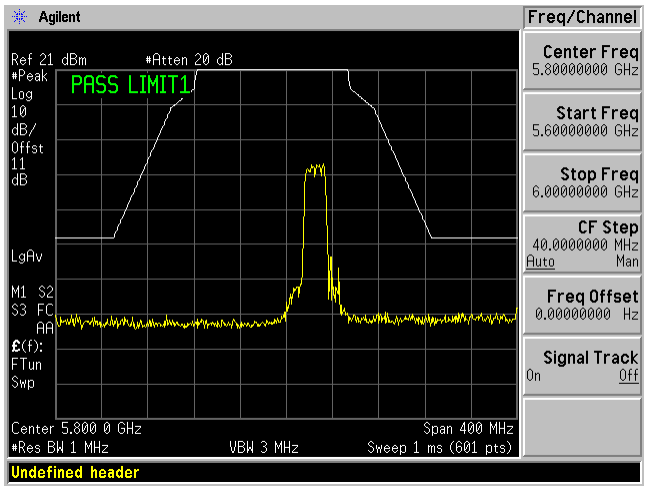


802.11n20 mode ANT A

Low Channel: 5745 MHz

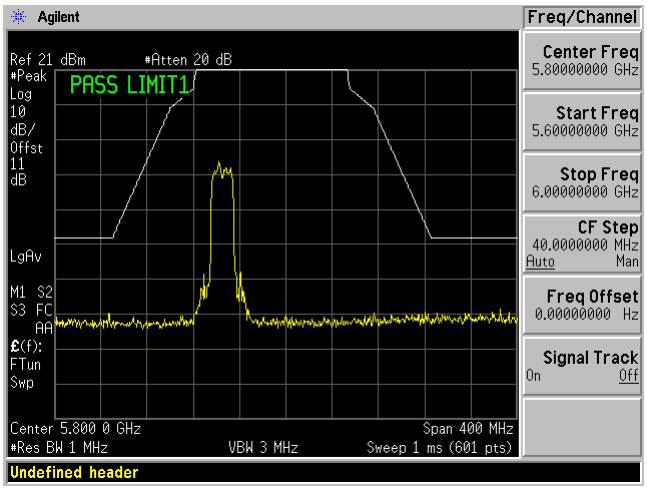


High Channel: 5825 MHz

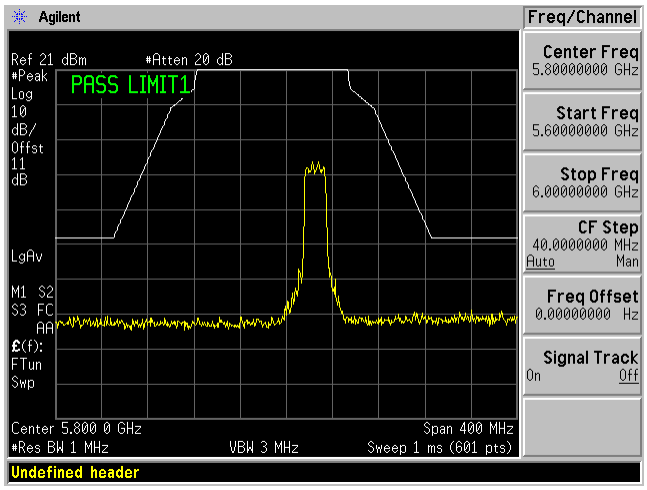


802.11n20 mode ANT B

Low Channel: 5745 MHz

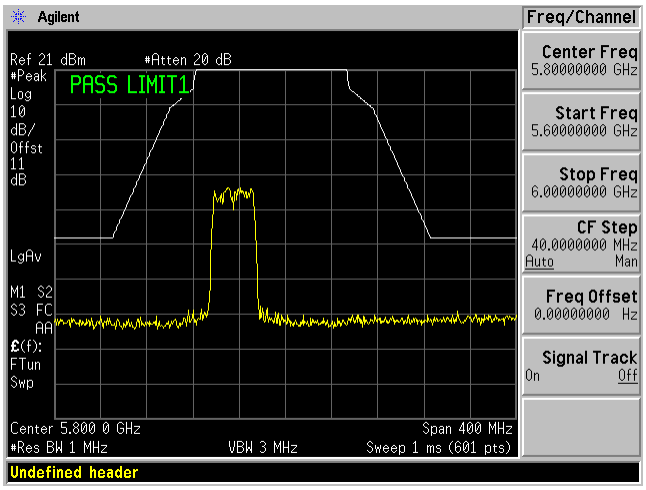


High channel: 5825 MHz

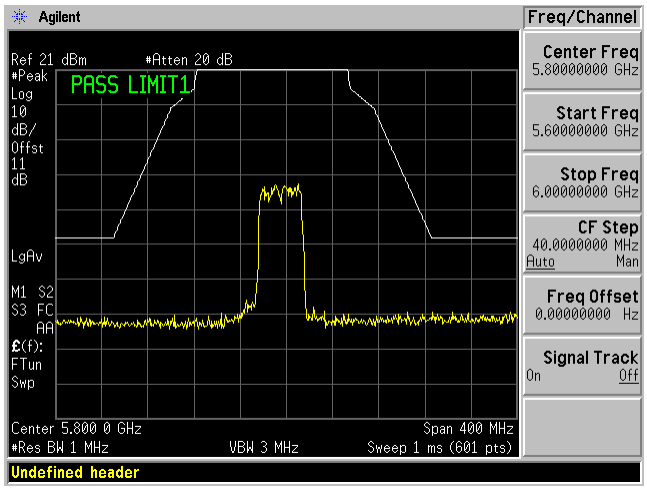


802.11n40 mode ANT A

Low Channel: 5755 MHz

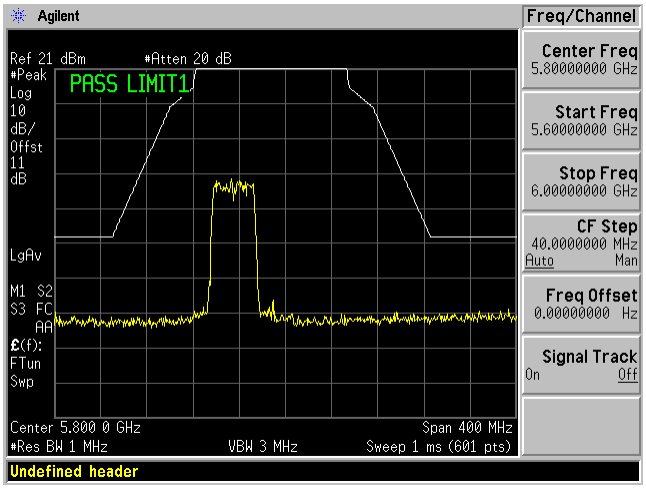


High Channel: 5795 MHz

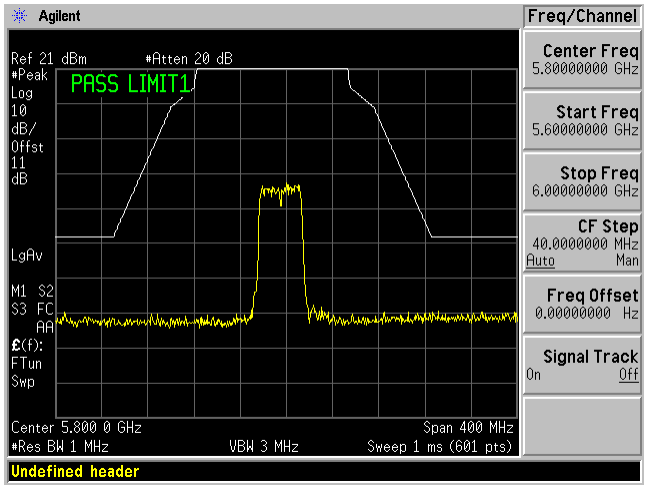


802.11n40 mode ANT B

Low Channel: 5755 MHz

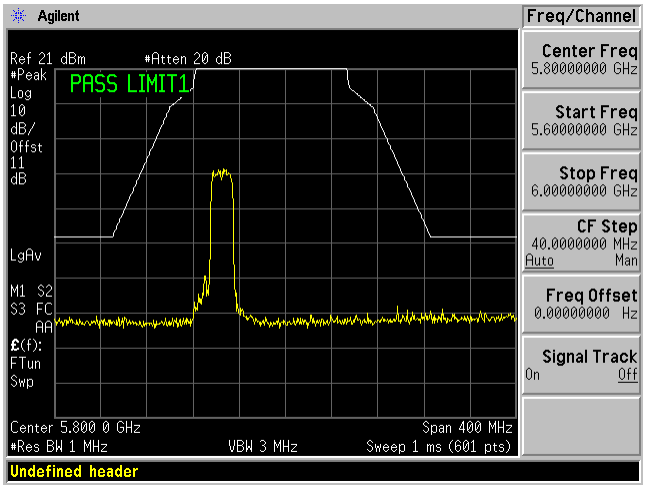


High Channel: 5795 MHz

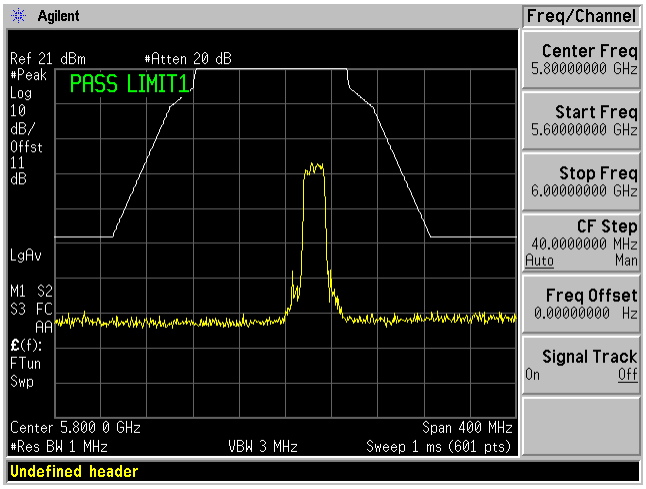


802.11ac20 mode ANT A

Low Channel: 5745 MHz

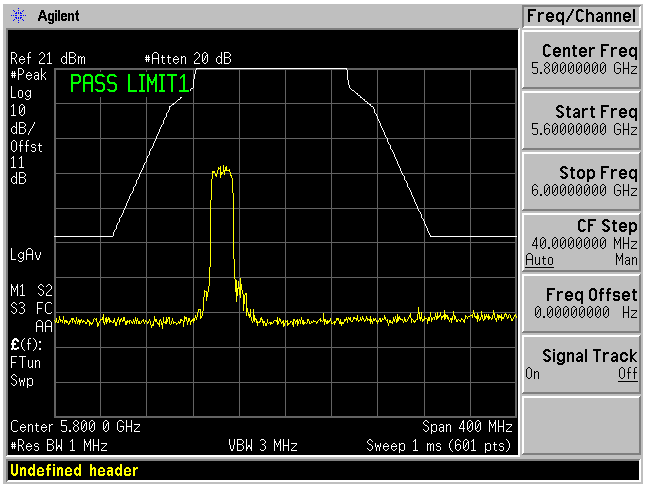


High Channel: 5825 MHz

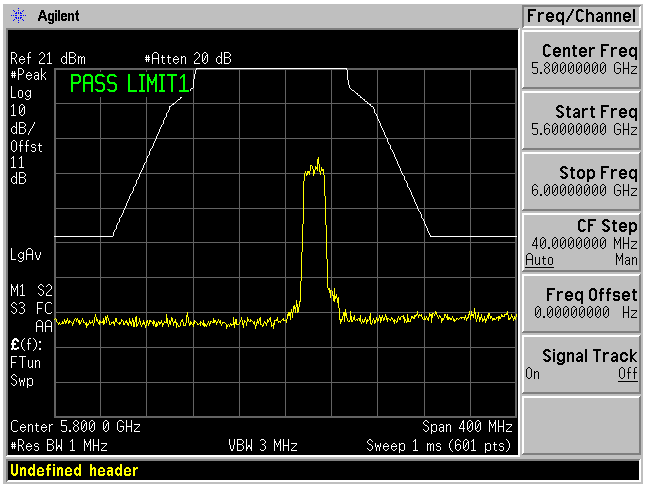


802.11ac20 mode ANT B

Low Channel: 5745 MHz

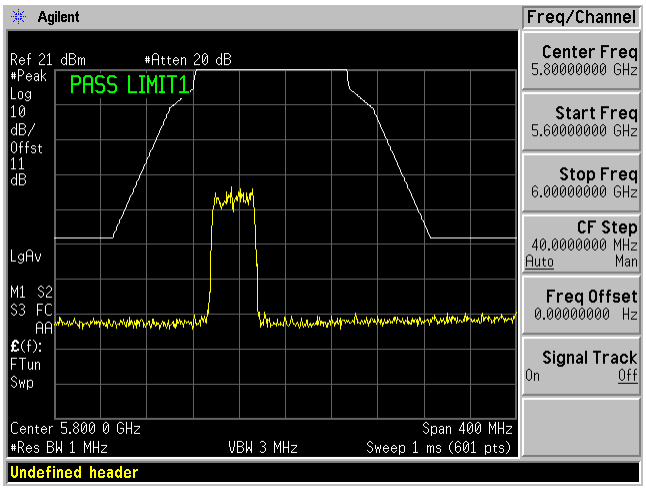


High channel: 5825 MHz

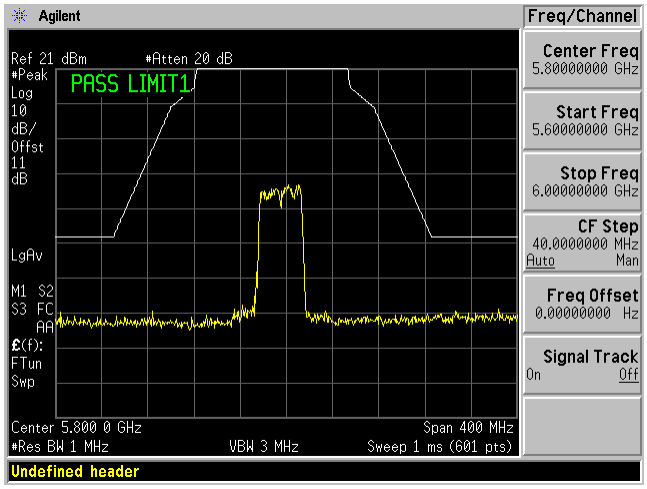


802.11ac40 mode ANT A

Low Channel: 5755 MHz

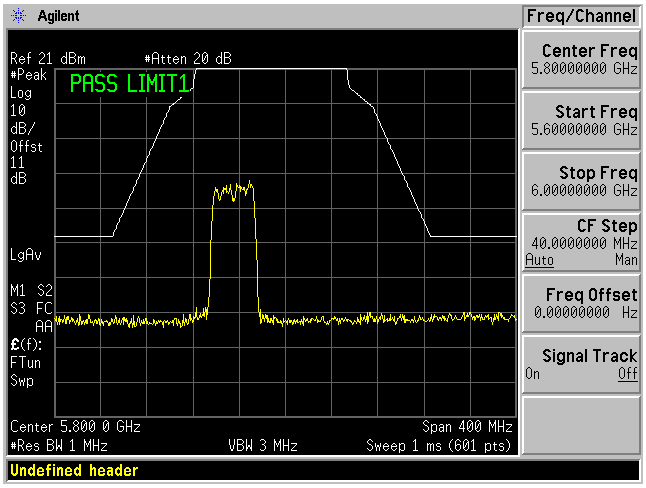


High Channel: 5795 MHz

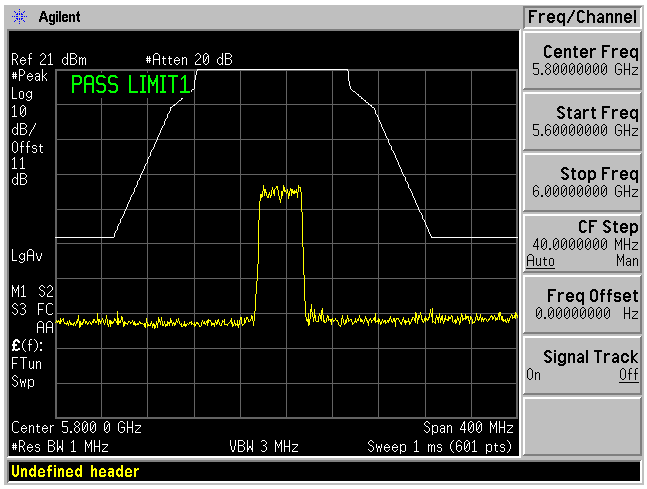


802.11ac40 mode ANT B

Low Channel: 5755 MHz

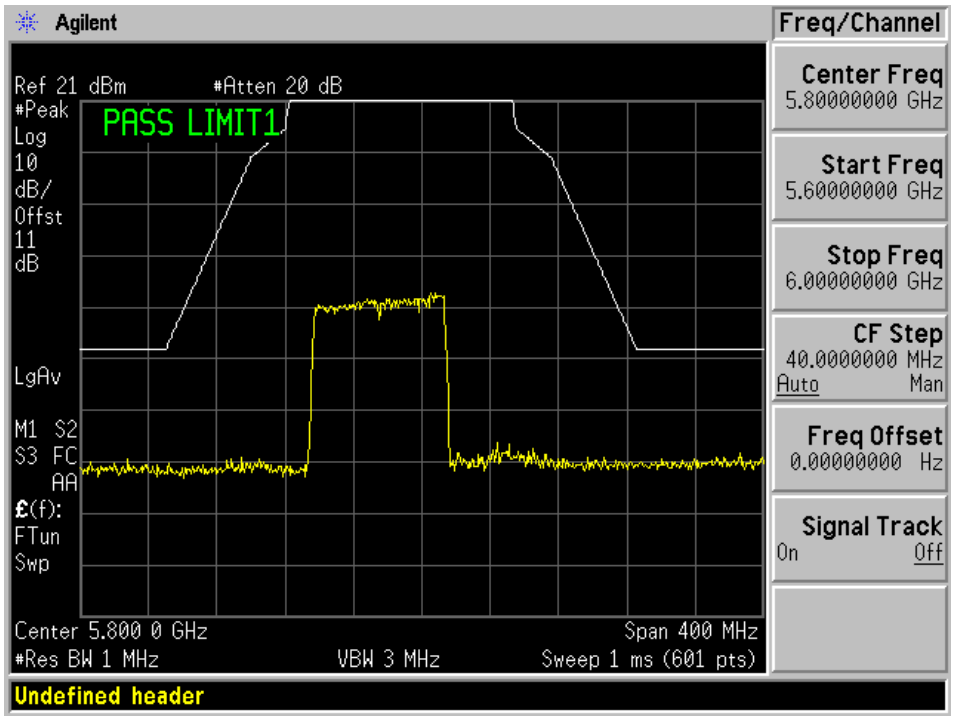


High Channel: 5795 MHz



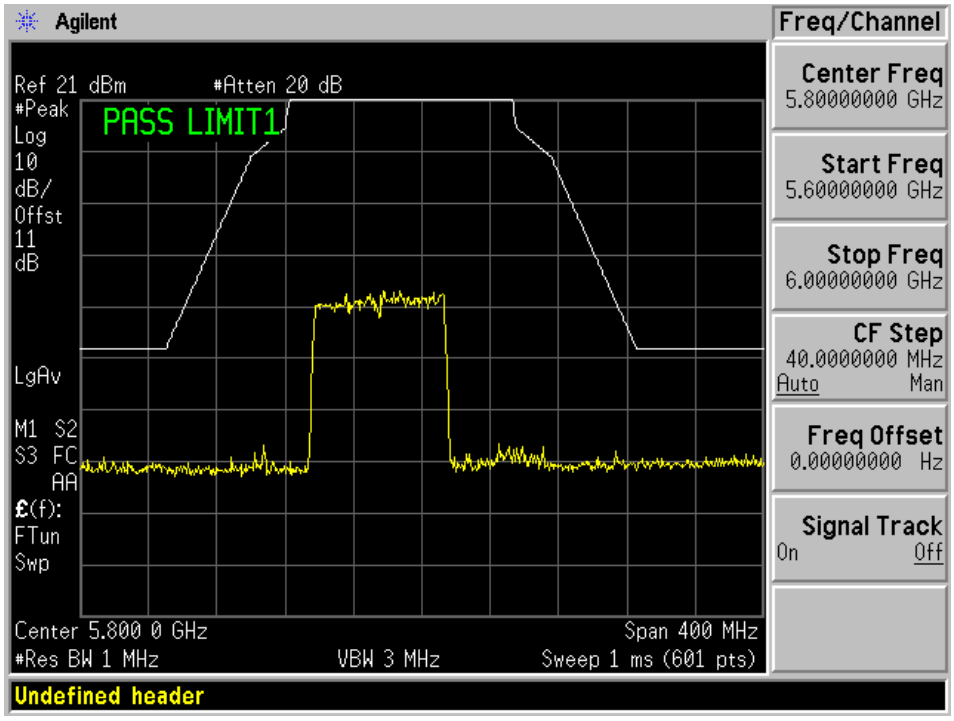
802.11ac80 mode ANT A

Middle Channel: 5775 MHz



802.11ac80 mode ANT B

Middle Channel: 5775 MHz



12 Exhibit A - FCC & ISED Equipment Labeling Requirements

12.1 FCC ID Label Requirements

As per FCC §2.925,

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

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

Example: FCC ID: XXX123

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

As per FCC §15.19,

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

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

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

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

12.2 IC Label Requirements

As per IC RSP-100 Section 3.1, the certification number shall appear as follows:

IC: XXXXXX-YYYYYYYY

Where:

- The letters "IC:" indicate that this is an Innovation, Science and Economic Development Canada's certification number, but they are not part of the certification number. XXXXXXYYYYYYYYYY is the ISED certification number.
- XXXXXX is the CN assigned by Innovation, Science and Economic Development Canada. Newly assigned CNs will be made up of five numeric characters (e.g. "20001") whereas existing CNs may consist of up to five numeric characters followed by an alphabetic character (e.g. "21A" or "15589J").
- YYYYYYYYYYY is the Unique Product Number (UPN) assigned by the applicant, made up of a maximum of 11 alphanumeric characters.

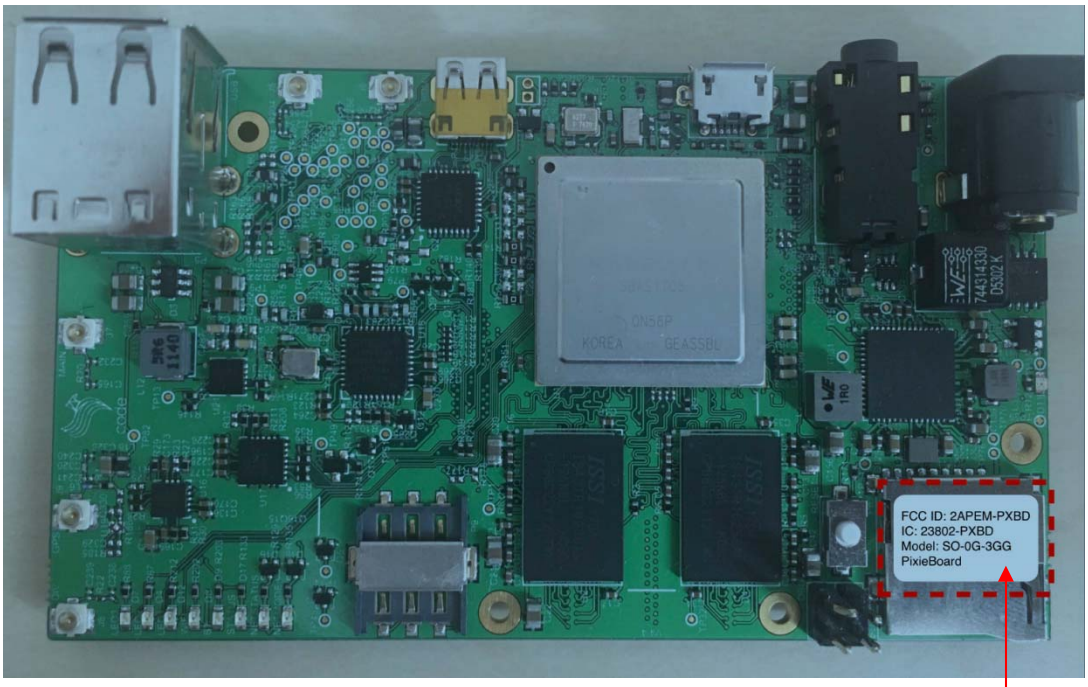
- The CN and UPN are limited to capital alphabetic characters (A-Z) and numerals (0-9) only. The use of punctuation marks or other symbols, including “wildcard” characters, is not permitted.
- The HVIN may contain punctuation marks or symbols but they shall not represent any indeterminate (“wildcard”) characters.

As per RSS-Gen §2.1 Equipment Labeling:

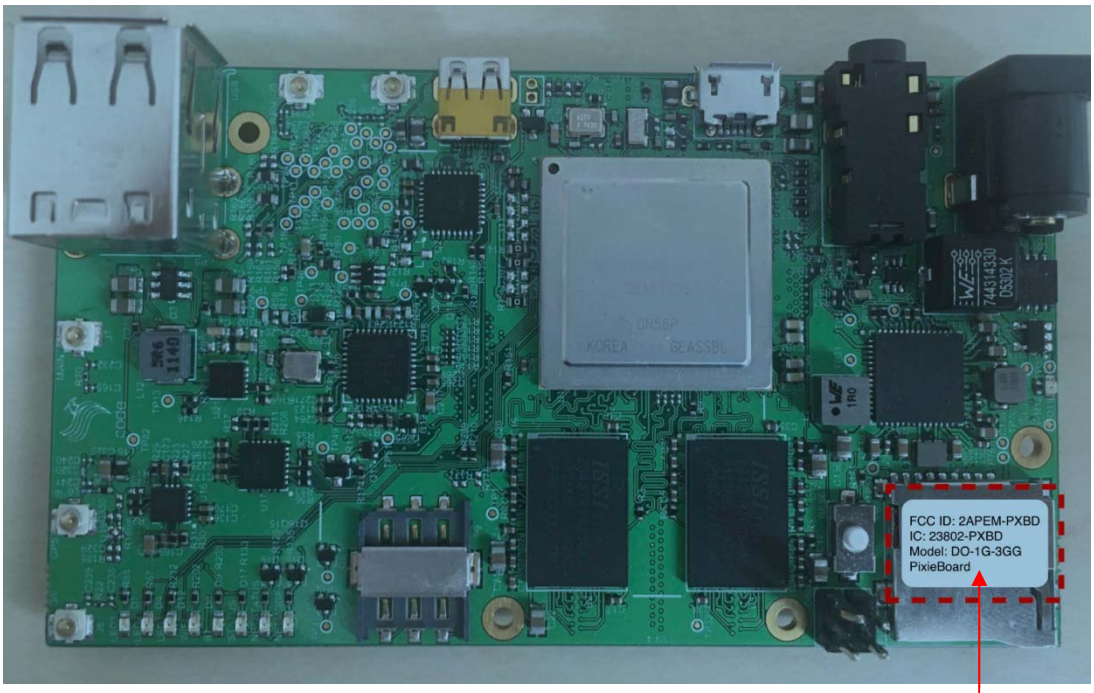
The application for equipment certification shall be submitted in accordance with Industry Canada’s Radio Standards Procedure RSP-100, Radio Equipment Certification Procedure which sets out the requirements for certification and labelling of radio apparatus. RSP-100 shall be used in conjunction with RSS-Gen and other Radio Standards Specifications (RSSs) specifically applicable to the type of radio apparatus for which certification is sought.

12.3 Recommended Label Contents and Location

SO-0G-3GG

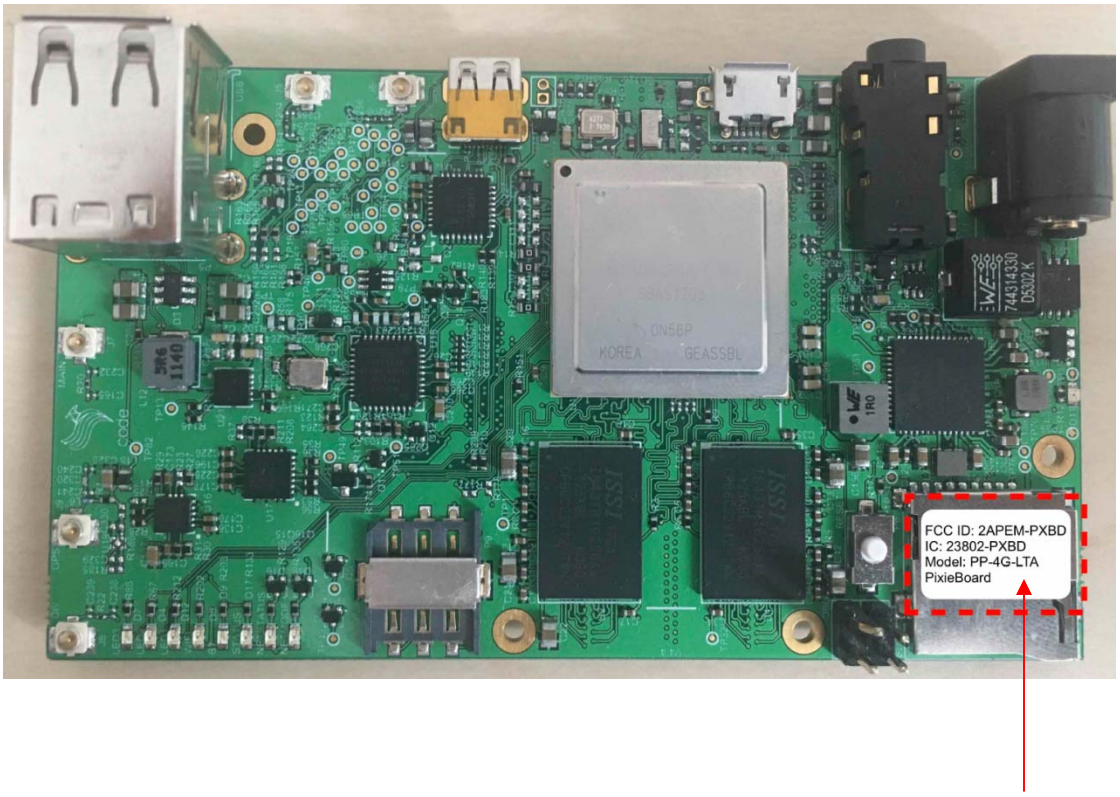


DO-1G-3GG



PO-2G-LTA

PP-4G-LTA



13 Annex A (Informative) – Declaration of Similarity Letter

CODE & MODULES

DECLARATION OF SIMILARITY

May 10, 2018

To:

FEDERAL COMMUNICATIONS COMMISSIONS

Authorization and Evaluation Division

7435 Oakland Mills Road

Columbia, MD 21046

Dear Sir or Madam:

We *Code & Modules* hereby declare that product: *PixieBoard,* model(s): *SO-0G-3GG and PO-2G-LTA* is/are electrically identical with the same electromagnetic emissions and electromagnetic compatibility characteristics as model: *PP-4G-LTA and DO-1G-3GG* tested by BACL, the results of which are featured in BACL project: R1803143.

A description of the differences between the tested model and those that are declared similar are as follows:

SO-0G-3GG: i.MX6 Solo processor, 516 MB of RAM and 3G module
DO-1G-3GG: i.MX6 Dual lite processor, 1 GB of RAM and 3G module
PO-2G-LTA: i.MX6 Quad processor, 2 GB of RAM and 4G/3G module
PP-4G-LTA: i.MX6 QuadPlus processor, 4 GB of RAM and 4G/3G module

Please contact me should there be need for any additional clarification or information.

Best Regards,

Roberto Himmelbauer, Director of Consulting Solutions

4701 Patrick Henry Drive, Bldg 22, Suite 107 Santa Clara, CA 95054

QA-FR-227-A 11/05/2013

CODE & MODULES

DECLARATION OF SIMILARITY

May 10, 2018

To:
Innovation, Science and Economic Development Canada
Certification and Engineering Bureau
P.O. Box 11490, Station 'H'
3701 Carling Ave., Building 94
Ottawa, Ontario K2H 8S2

Dear Sir or Madam:

We *Code & Modules* hereby declare that product: *PixieBoard,* model(s): *SO-0G-3GG and PO-2G-LTA* is/are electrically identical with the same electromagnetic emissions and electromagnetic compatibility characteristics as model: *PP-4G-LTA and DO-1G-3GG* tested by BACL, the results of which are featured in BACL project: *R1803143.*

A description of the differences between the tested model and those that are declared similar are as follows:

SO-0G-3GG: i.MX6 Solo processor, 516 MB of RAM and 3G module
DO-1G-3GG: i.MX6 Dual lite processor, 1 GB of RAM and 3G module
PO-2G-LTA: i.MX6 Quad processor, 2 GB of RAM and 4G/3G module
PP-4G-LTA: i.MX6 QuadPlus processor, 4 GB of RAM and 4G/3G module

Please contact me should there be need for any additional clarification or information.

Best Regards,

Roberto Himmelbauer, Director of Consulting Solutions
4701 Patrick Henry Drive, Bldg 22, Suite 107 Santa Clara, CA 95054

QA-FR-227-A 11/05/2013

14 Appendix

Please see attachments:

Annex B – EUT Test Setup Photographs
Annex C – EUT Photographs

15 Annex D (Informative) - A2LA Electrical Testing Certificate

ilac-MRA A2LA

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.

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