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

TEST REPORT

For

Ruckus Wireless, Inc.

350 West Java Dr.
Sunnyvale, CA 94089, USA

FCC ID: S9GH550
IC: 5912A-H550

Report Type:	**Product Description:**
Original Report	Access Point

Prepared By:	Zhao Zhao Test Engineer	
Report Number:	R2007201-02	
Report Date:	2021-02-09	
Reviewed By:	Simon Ma RF Supervisor	

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

ACCREDITED
CERTIFICATE #3297.02

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R2007201-02	Original Report	2021-02-09

1 General Description

1.1 Product Description for Equipment under Test (EUT)

This test report was prepared on behalf of *Ruckus Wireless, Inc.,* and their product model: *H550, FCC ID: S9GH550*, IC: 5192A-H550, or the "EUT" as referred to in this report. The EUT is an Access Point with 2.4GHz/5GHz Wifi, BLE and ZigBee capabilities.

1.2 Objective

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

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

1.3 Related Submittal(s)/Grant(s)

Equipment Class: DTS, FCC ID: S9GH550, IC: 5912A-H550

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 3297.02)*****,** 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 3297.03)*** 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 3297.01)*** to certify Products to USA's Environmental Protection Agency (EPA) ENERGY STAR Product Specifications for:

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

2 Commercial Food Service Equipment
- for Commercial Dishwashers (ver. 2.0)

- for Commercial Ice Machines (ver. 2.0)
- for Commercial Ovens (ver. 2.1)
- for Commercial Refrigerators and Freezers

3 Lighting Products

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

4 Heating, Ventilation, and AC Products

- for Residential Ceiling Fans (ver. 3.0)
- for Residential Ventilating Fans (ver. 3.2)

5 Other

- For Water Coolers (ver. 3.0)

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

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

2 EUT Test Configuration

2.1 Justification

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

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

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

2.2 EUT Exercise Software

The test software used was QSPR (Qualcomm Sequence Profiling Resource). The software is compliant with the standard requirements being tested against.

Please refer to the following power setting table.

Modulation	Frequency (MHz)	Power Setting (J12 & J15)
802.11a	5180	18.5
	5200	18.5
	5240	18.5
	5260	18.5
	5280	18.5
	5320	18.5
	5500	18.5
	5580	18.5
	5700	18.5
	5720	18.5
	5745	18.5
	5785	18.5
	5825	18.5

Modulation	Frequency (MHz)	Power Setting (J12 & J15)
802.11n/ac20	5180	18.5
	5200	18.5
	5240	18.5
	5260	18.5
	5280	18.5
	5320	18.5
	5500	18.5
	5580	18.5
	5700	18.5
	5720	18.5
	5745	18.5
	5785	18.5
	5825	18.5
802.11ax20	5180	18.5
	5200	18.5
	5240	18.5
	5260	18.5
	5280	18.5
	5320	18.5
	5500	18.5
	5580	18.5
	5700	18.5
	5720	18.5
	5745	18.5
	5785	18.5
	5825	18.5
802.11n/ac40	5190	19
	5230	19
	5270	19
	5310	19
	5510	19
	5550	19
	5670	19
	5710	19
	5755	19
	5795	19

Modulation	Frequency (MHz)	Power Setting (J12 & J15)
802.11ax40	5190	19
	5230	19
	5270	19
	5310	19
	5510	19
	5550	19
	5670	19
	5710	19
	5755	19
	5795	19
802.11ac80	5210	18
	5290	18
	5530	18
	5610	20
	5690	20
	5775	18
802.11ax80	5210	18
	5290	18
	5530	18
	5610	20
	5690	20
	5775	18

*Data rates tested:
802.11a mode: 6Mbps
802.11ac20 VHT20: MCS0
802.11ax20 HE20: MCS0
802.11ac40 VHT40: MCS0
802.11ax40 HE40: MCS0
802.11ac80 VHT80: MCS0
802.11ax80 HE80: MCS0

2.3 Duty Cycle Correction Factor

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

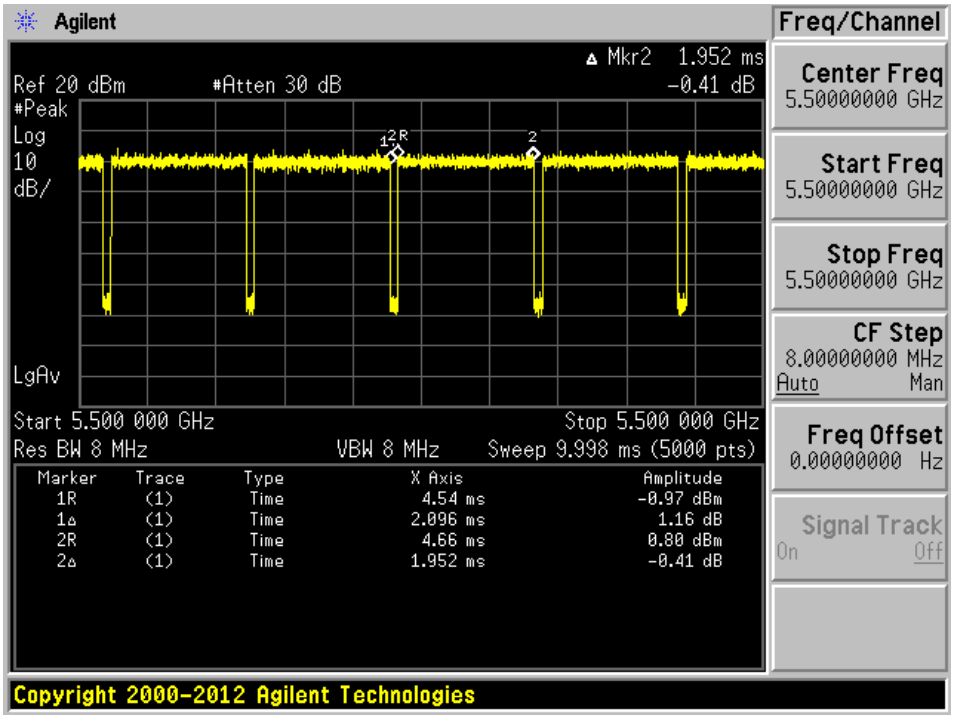
All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximum-power transmission duration, T, are required for each tested mode of operation.

Radio Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11a	1.952	2.096	93%	0.31
802.11n/ac20	5.364	5.669	95%	0.24
802.11 ax20	5.441	5.677	96%	0.18
802.11n/ac40	5.386	5.634	96%	0.20
802.11 ax40	5.447	5.867	93%	0.32
802.11n/ac80	10.772	12.41	87%	0.61
802.11 ax80	5.406	5.71	95%	0.24

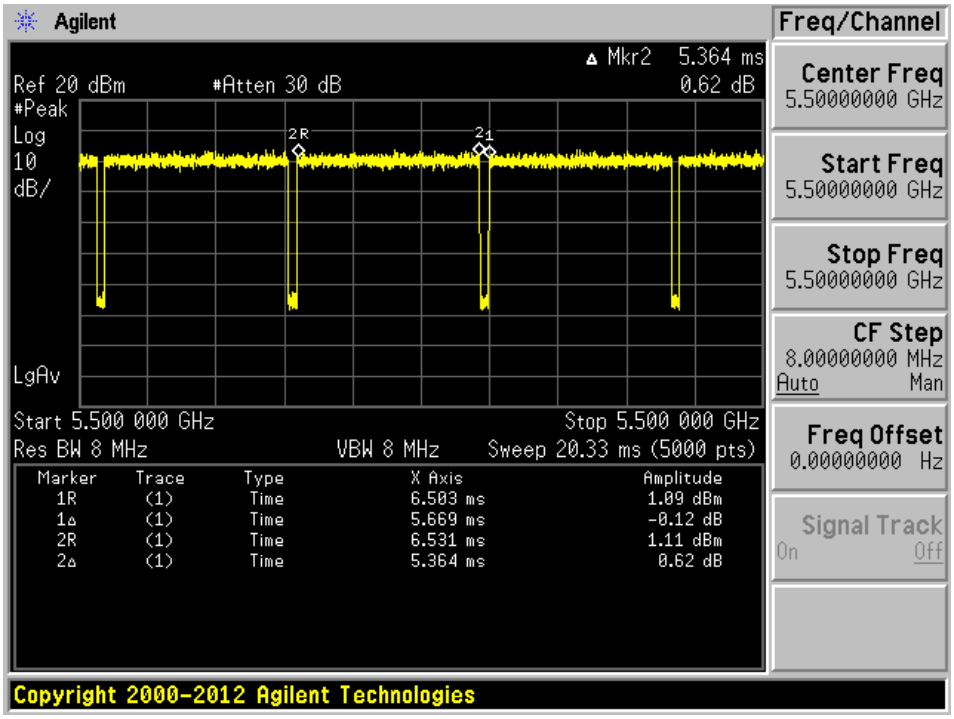
Note: Duty Cycle Correction Factor = 10*log(1/duty cycle)

Please refer to the following plots.

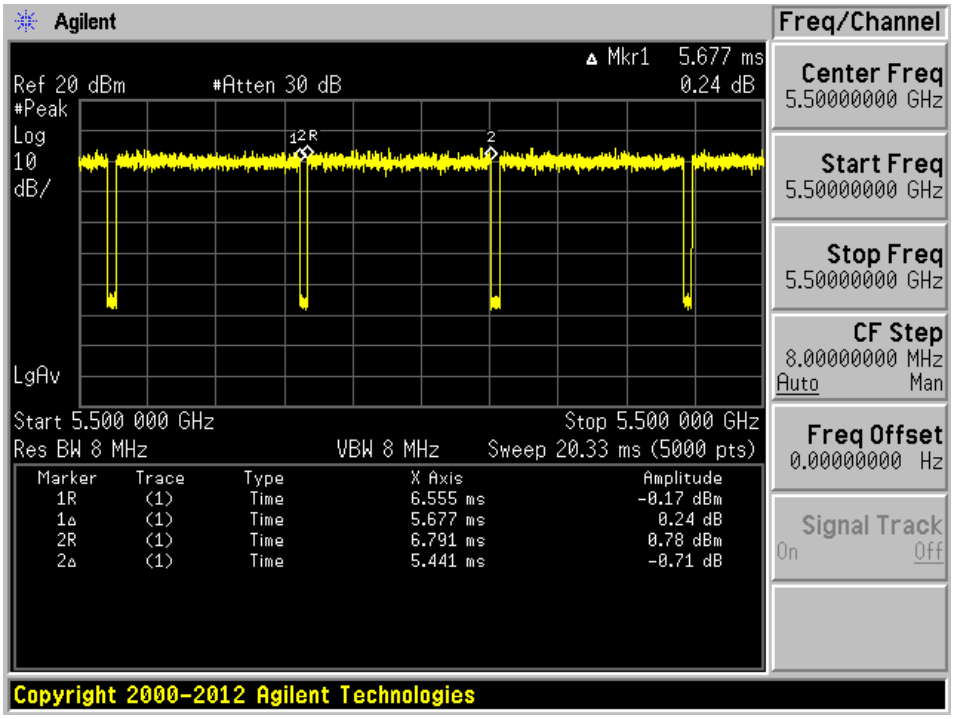
802.11a mode



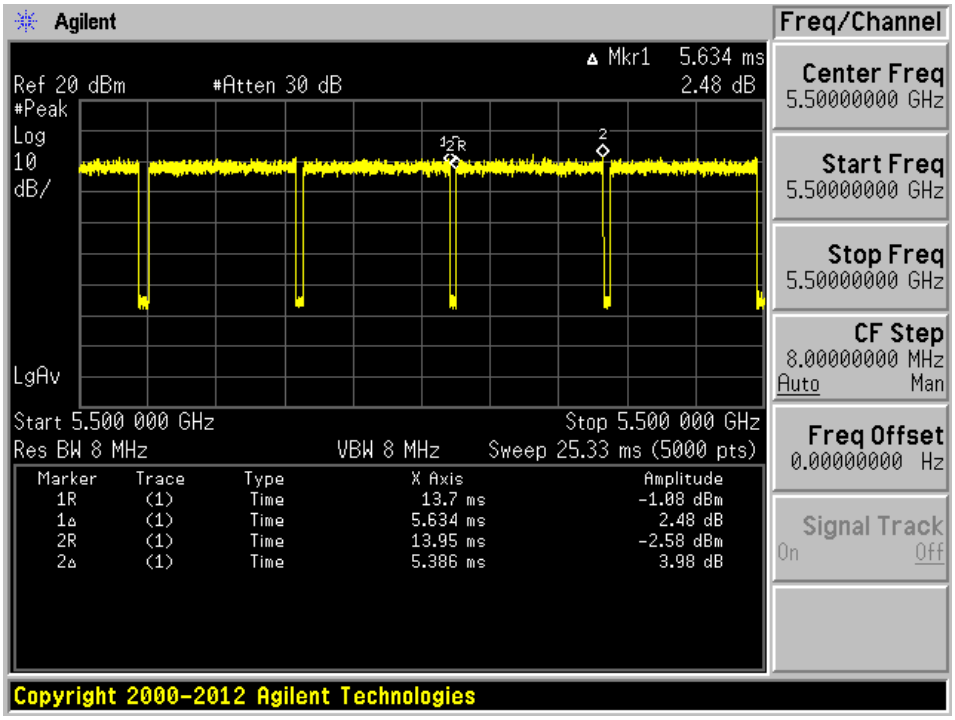
802.11ac20 mode



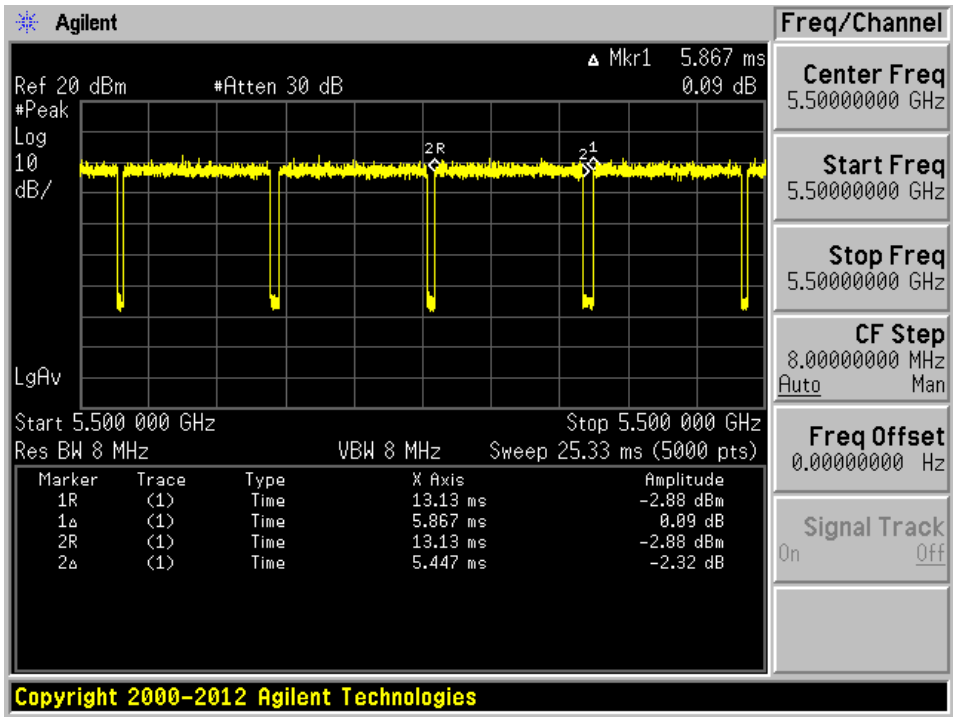
802.11ax20 mode



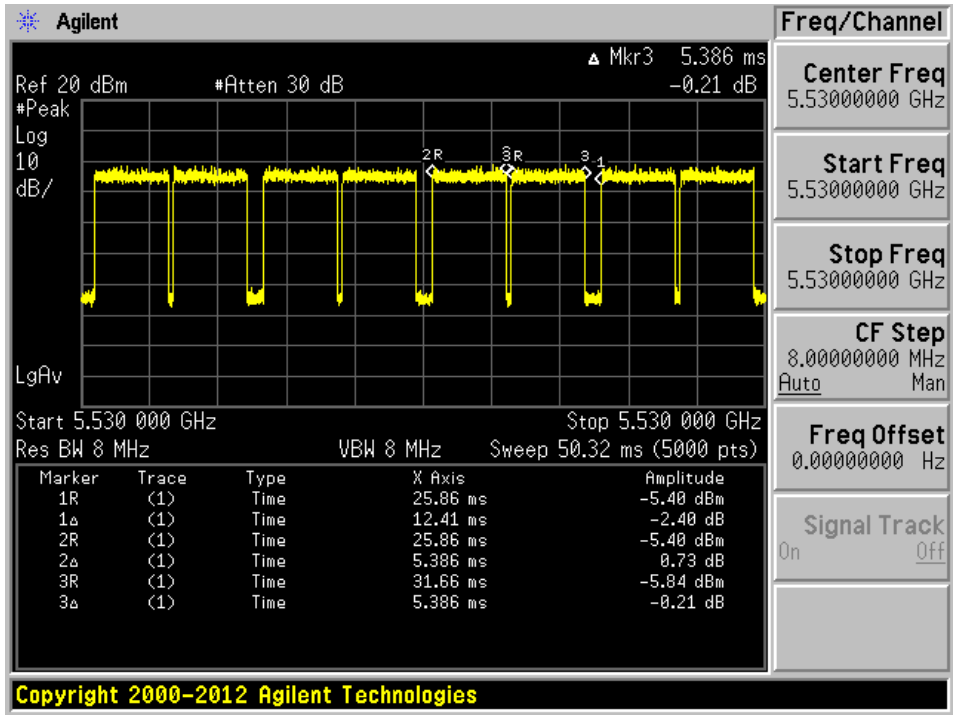
802.11ac40 mode



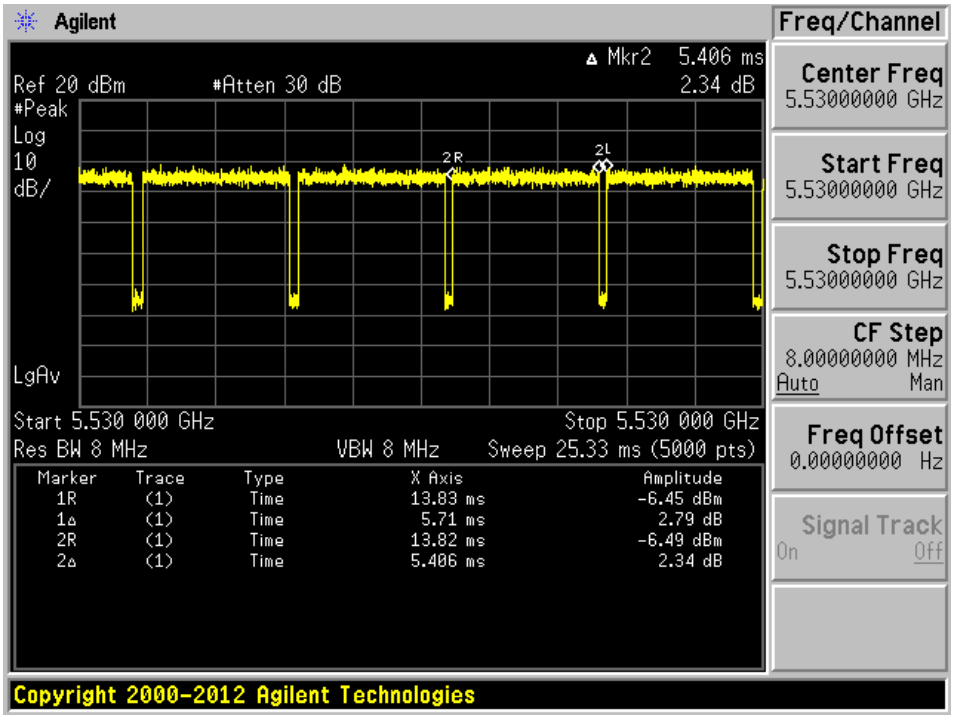
802.11ax40 mode



802.11ac80



802.11ax80


Agilent
Freq/Channel
Mkr2 5.406 ms
Ref 20 dBm
#Atten 30 dB
2.34 dB
#Peak
Log
10
dB/
2R
2L
LgAv
Center Freq
5.53000000 GHz
Start Freq
5.53000000 GHz
Stop Freq
5.53000000 GHz
CF Step
8.00000000 MHz
Auto
Man
Start 5.530 000 GHz
Stop 5.530 000 GHz
Res BW 8 MHz
VBW 8 MHz
Sweep 25.33 ms (5000 pts)
Freq Offset
0.00000000 Hz
Signal Track
On
Off
Marker Trace Type X Axis Amplitude
1R (1) Time 13.83 ms -6.45 dBm
1Δ (1) Time 5.71 ms 2.79 dB
2R (1) Time 13.82 ms -6.49 dBm
2Δ (1) Time 5.406 ms 2.34 dB
Copyright 2000-2012 Agilent Technologies

2.4 Equipment Modifications

N/A

2.5 Local Support Equipment

Manufacturer	Description	Model
Dell	Laptop	Latitude E6410

2.6 Support Equipment

Manufacturer	Description	Model
Ruckus Wireless, Inc.	PoE Injector	740-64214-001

2.7 Interface Ports and Cabling

Cable Description	Length (m)	To	From
Ethernet Cable	2M	EUT	PoE Injector
Ethernet Cable	2M	Laptop	EUT

3 Summary of Test Results

FCC and ISEDC 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
FCC §15.407(h) ISEDC RSS-247 §6.3	Dynamic Frequency Selection	Compliant[1]

Note[1]: Please refer to Test Report R2007201-DFS for test results.

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

4.1 Applicable Standards

According to FCC §15.247(i) 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.

According to KDB 447 498 Section (7.2), "simultaneous transmission of MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on calculated or measured field strengths or power density, is ≤ 1.0. The MPE ratio of each antenna is determined at the minimum *test separation distance* required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency.

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

Where: 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.

4.2 MPE Prediction

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

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

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

Note: According to MIMOFCC KDB 662911 D02 MIMO with Cross Polarized Antenna v01, Where an FCC rule specifies limits in radiated terms such as EIRP or ERP, the limits apply to the maximum emission that would be observed by a linearly polarized measurement antenna. Therefore, the highest output power from single antenna power was selected to calculate in this section.

4.3 MPE Results

Radio Standalone RF Exposure Configuration

2.4 GHz Wi-Fi: 802.11n40, Mid Channel 2437 MHz

Maximum output power at antenna input terminal (dBm):	21.18
Maximum output power at antenna input terminal (mW):	131.22
Prediction distance (cm):	20
Prediction frequency (MHz):	2437
Maximum Antenna Gain, typical (dBi):	0
Maximum Antenna Gain (numeric):	1
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.026
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

5 GHz Wi-Fi: 802.11ac80, Mid Channel 5610 MHz

Maximum output power at antenna input terminal (dBm):	20.90
Maximum output power at antenna input terminal (mW):	123.03
Prediction distance (cm):	20
Prediction frequency (MHz):	5610
Maximum Antenna Gain, typical (dBi):	1
Maximum Antenna Gain (numeric):	1.26
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.031
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

BLE: High Channel 2480 MHz

Maximum output power at antenna input terminal (dBm):	18.626
Maximum output power at antenna input terminal (mW):	72.88
Prediction distance (cm):	20
Prediction frequency (MHz):	2480
Maximum Antenna Gain, typical (dBi):	0
Maximum Antenna Gain (numeric):	1
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0145
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

ZigBee: Low Channel 2405 MHz

Maximum output power at antenna input terminal (dBm):	19.24
Maximum output power at antenna input terminal (mW):	83.95
Prediction distance (cm):	20
Prediction frequency (MHz):	2405
Maximum Antenna Gain, typical (dBi):	0
Maximum Antenna Gain (numeric):	1
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0167
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 at 20 cm distance.

Radio Co-location RF Exposure Configuration

Radio	Standalone MPE (mW/cm^2)	Standalone MPE Limit (mW/cm^2)	Ratio (%)	Total Ratio for Radio Co-location Configuration (%)	Radio Co-location Limit (%)
2.4 GHz Wi-Fi	0.026	1	2.6	8.82	100
5 GHz Wi-Fi	0.031	1	3.1		
BLE	0.0145	1	1.45		
ZigBee	0.0167	1	1.67		

4.4 RF exposure evaluation exemption for IC

2.4 GHz Wi-Fi: 802.11n40, Mid Channel 2437 MHz

Maximum EIRP power = 21.18 dBm + 0 dBi = 21.18 dBm, which is less than $1.31\times10^{-2}f^{0.6834}$ = 2.70 W = 34.31 dBm

5 GHz Wi-Fi: 802.11ac80, Mid Channel 5610 MHz

Maximum EIRP power = 20.90dBm + 1 dBi = 21.90 dBm, which is less than $1.31\times10^{-2}f^{0.6834}$ = 4.88 W = 36.88 dBm

BLE: High Channel 2480 MHz

Maximum EIRP power = 18.626 dBm + 0 dBi = 18.626 dBm, which is less than $1.31\times10^{-2}f^{0.6834}$ = 2.74 W = 34.4 dBm

Zigbee: Low Channel 2405 MHz

Maximum EIRP power = 19.24 dBm + 0 dBi = 19.24 dBm, which is less than $1.31\times10^{-2}f^{0.6834}$ = 2.68 W = 34.3 dBm

Therefore, the RF exposure Evaluation is not required.

5 FCC §15.203 & 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 §15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to ISEDC RSS-Gen §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

Antenna usage	Frequency Range (MHz)	Maximum Antenna Gain (dBi)	Antenna Type
Bluetooth	2400-2483.5	0	Trace Antenna
2.4GHz Wi-Fi	2400-2483.5	0	Trace Antenna
5GHz Wi-Fi	5150-5850	1	Trace Antenna

Note: The antenna gain was provided by the manufacturer.

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

6.1 Applicable Standards

As per FCC §15.207 and ISEDC RSS GEN §8.8

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

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

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

6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.10-2013 measurement procedure. The specification used was FCC §15.207 limits and and ISEDC RSS GEN §8.8.

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

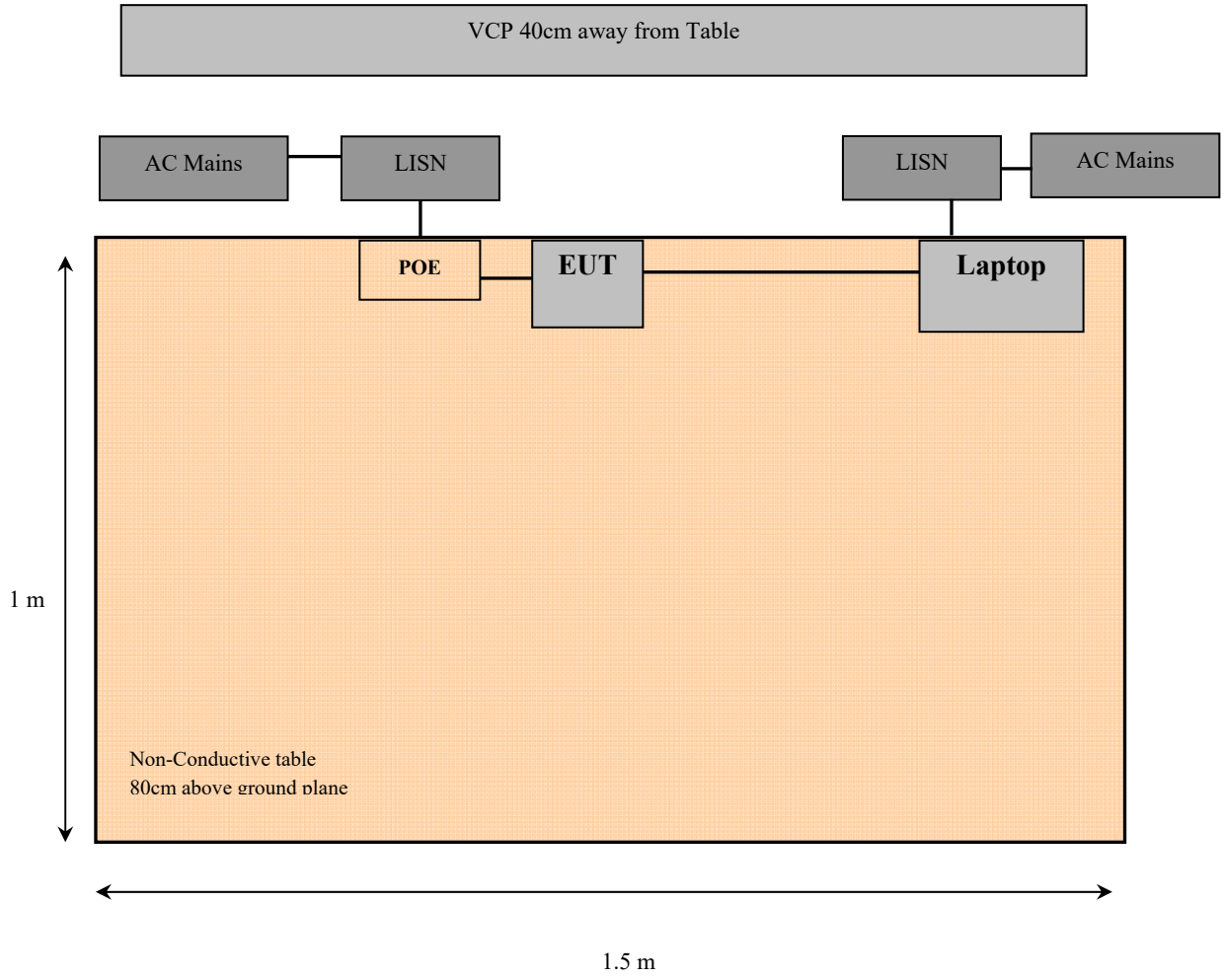
6.3 Test Procedure

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

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

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

6.4 Test Setup Block Diagram



6.5 Corrected Amplitude and Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Correction Factor (CF) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + CF

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Correction Factor (13.7 dB)

The Correction Factor is calculated by adding Cable loss (CL), LISN calibration factor, and attenuation of the impulse limiter and the high pass filter. The basic equation is as follows:

CF= CL + LISN calibration factor + Attenuation

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Cable Loss (3.5 dB) + LISN calibration factor (0.2 dB) + Attenuator (10 dB)

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

Margin = Corrected Amplitude - Limit

6.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950.03	100338	2020-03-17	1 year
Rohde and Schwarz	Impulse Limiter	ESH3-Z2	101964	2020-07-01	1 year
Solar Electronics Company	High Pass Filter	Type 7930-100	7930150204	2020-02-27	1 year
Suirong	30 ft conductive emission cable	LMR 400	-	N/R	N/A
FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160130	2020-10-13	1 year
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

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 the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

6.7 Test Environmental Conditions

Temperature:	20º C
Relative Humidity:	55 %
ATM Pressure:	102.1 kPa

The testing was performed by Zhao Zhao on 2021-01-15 in the Ground Plane test site.

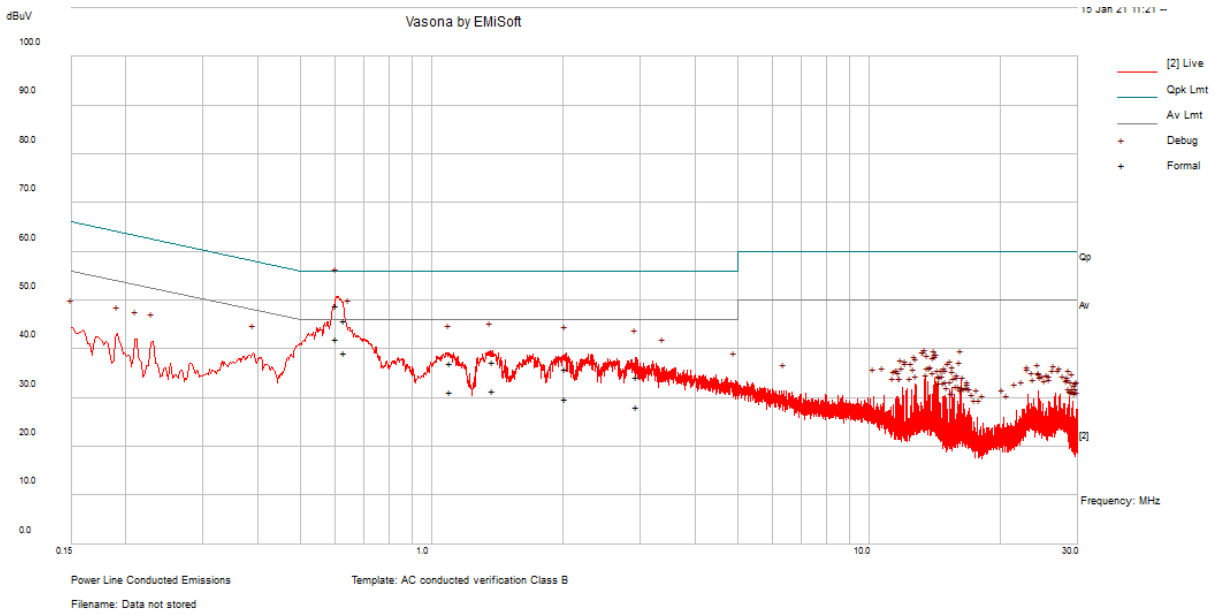
6.8 Summary of Test Results

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

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Live/Neutral)**	**Range (MHz)**
-2.58	0.610931	Neutral	0.15-30

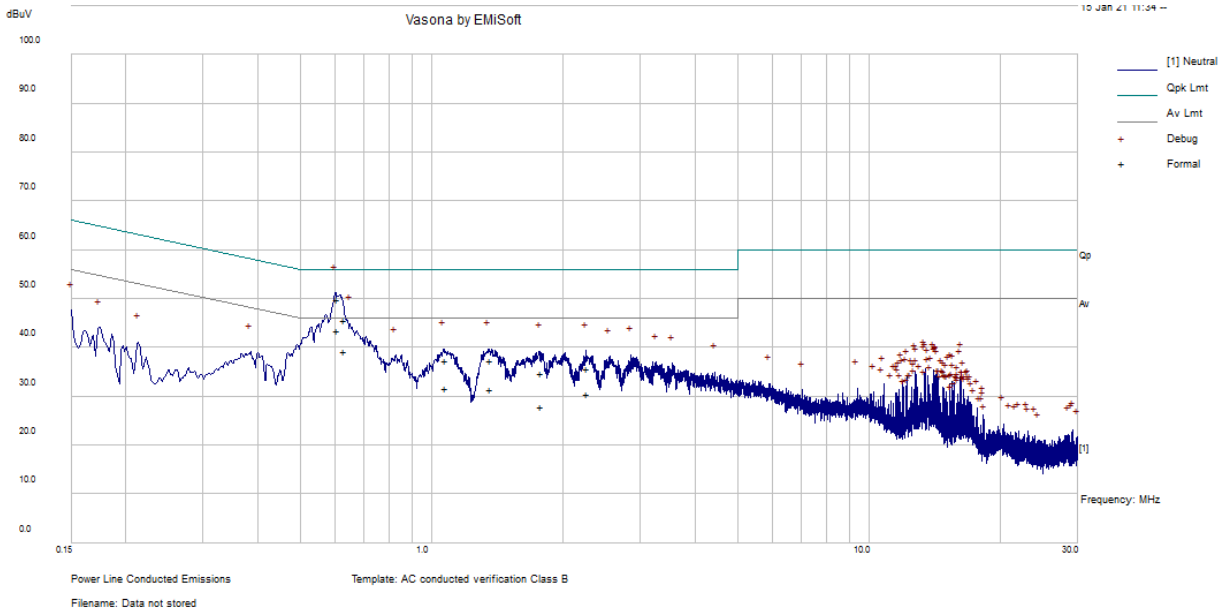
6.9 Conducted Emissions Test Plots and Data

120 V, 60 Hz – Line



Frequency (MHz)	Ai. Reading (dBuV)	Correction Factor (dB)	Corrected Amplitude (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.607468	38.94	10.09	49.02	56	-6.98	QP
0.630089	35.77	10.08	45.85	56	-10.15	QP
1.378355	27.48	9.86	37.33	56	-18.67	QP
1.106087	27.24	9.94	37.18	56	-18.82	QP
2.027839	26.22	9.8	36.02	56	-19.98	QP
2.948662	24.59	9.72	34.31	56	-21.69	QP
0.607468	32.09	10.09	42.18	46	-3.82	Ave
0.630089	29.19	10.08	39.27	46	-6.73	Ave
1.378355	21.64	9.86	31.5	46	-14.5	Ave
1.106087	21.22	9.94	31.16	46	-14.84	Ave
2.027839	19.88	9.8	29.68	46	-16.32	Ave
2.948662	18.39	9.72	28.1	46	-17.9	Ave

120 V, 60 Hz – Neutral



Frequency (MHz)	Ai. Reading (dBuV)	Correction Factor (dB)	Corrected Amplitude (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.610931	39.81	10.09	49.9	56	-6.1	QP
0.631954	35.63	10.08	45.7	56	-10.3	QP
1.367276	27.52	9.86	37.38	56	-18.62	QP
1.076767	27.34	9.95	37.29	56	-18.71	QP
2.266213	26	9.76	35.76	56	-20.24	QP
1.777816	24.83	9.81	34.65	56	-21.35	QP
0.610931	33.34	10.09	43.42	46	-2.58	Ave
0.631954	29.17	10.08	39.25	46	-6.75	Ave
1.367276	21.56	9.86	31.42	46	-14.58	Ave
1.076767	21.82	9.95	31.77	46	-14.23	Ave
2.266213	20.64	9.76	30.4	46	-15.6	Ave
1.777816	18.07	9.81	27.88	46	-18.12	Ave

7 FCC §15.209, §15.407(b) & ISEDC RSS-247 §6.2 - Spurious Radiated Emissions

7.1 Applicable Standard

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	960 – 1240	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5. 35 – 5. 46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 –167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3 3458 – 3 358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

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

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

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

As per FCC Part 15.407 (b)

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

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

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

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

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

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

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

As per ISEDC RSS-247 §6.2

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

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

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

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

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

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

7.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.10-2013. The specification used was the FCC 15.407 and ISEDC RSS-247 limits.

The spacing between the peripherals was 10 centimeters.

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

7.3 Test Procedure

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

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

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

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

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

Above 1000 MHz:

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

7.4 Corrected Amplitude and Margin Calculation

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

CA = Ai + AF + CL + Atten – Ga

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

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

Margin = Corrected Amplitude – Limit

7.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100044	2020-10-26	2 years
Rohde & Schwarz	Signal Analyzer	FSV40	1321.3008K39-101203-UW	2019-08-06	1.5 years
Agilent	Spectrum Analyzer	E4446A	US44300386	2019-08-24	1.5 years
Sunol Science Corp	System Controller	SC110V	122303-1	N/R	N/A
HP	Pre-Amplifier	8447D	2944A07030	2020-08-17	1 year
HP	Pre-Amplifier	8449B	3147A00400	2020-02-27	1 year
Wisewave	Horn Antenna	ARH-4223-02	10555-02	2020-02-05	2 years
Wisewave	Antenna, Horn	ARH-2823-02	10555-01	2020-02-05	2 years
AH Systems	Preamplifier	PAM 1840 VH	170	2020-11-09	1 year
ETS Lindgren	Horn Antenna	3117	00218973	2019-02-13	2 years
Sunol Sciences	Biconilog Antenna	JB3	A020106-2	2019-11-20	2 years
-	RF cable	-	-	Each time[1]	N/A
-	Notch Filter	-	-	Each time[1]	N/A
Insulted Wire Corp.	157 Series 2.92 SM (x2) Armored 33 ft. Cable	KPS-1571AN-3960-KPS	DC 1917	2020-02-28	1 year
MDP Digital	Times Microwave LMR 400 UltraFex Coaxial Cable 35\'	LMR400UF	BACL1904161	2020-05-20	1 year
IW Microwave	157 Series Cable Armored with 2.92mm Male Plugs	KPS-1571AN-2400	DC 1922	2020-06-06	1 year
BACL	5m3 Sensitivity Box	1	2	2020-10-27	1 year

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

7.6 Test Environmental Conditions

Temperature:	20-22 ºC
Relative Humidity:	42-50 %
ATM Pressure:	102.7 kPa

The testing was performed by Zhao Zhao and Allen Huang from 2021-01-08 to 2021-01-14 in 5m chamber 3.

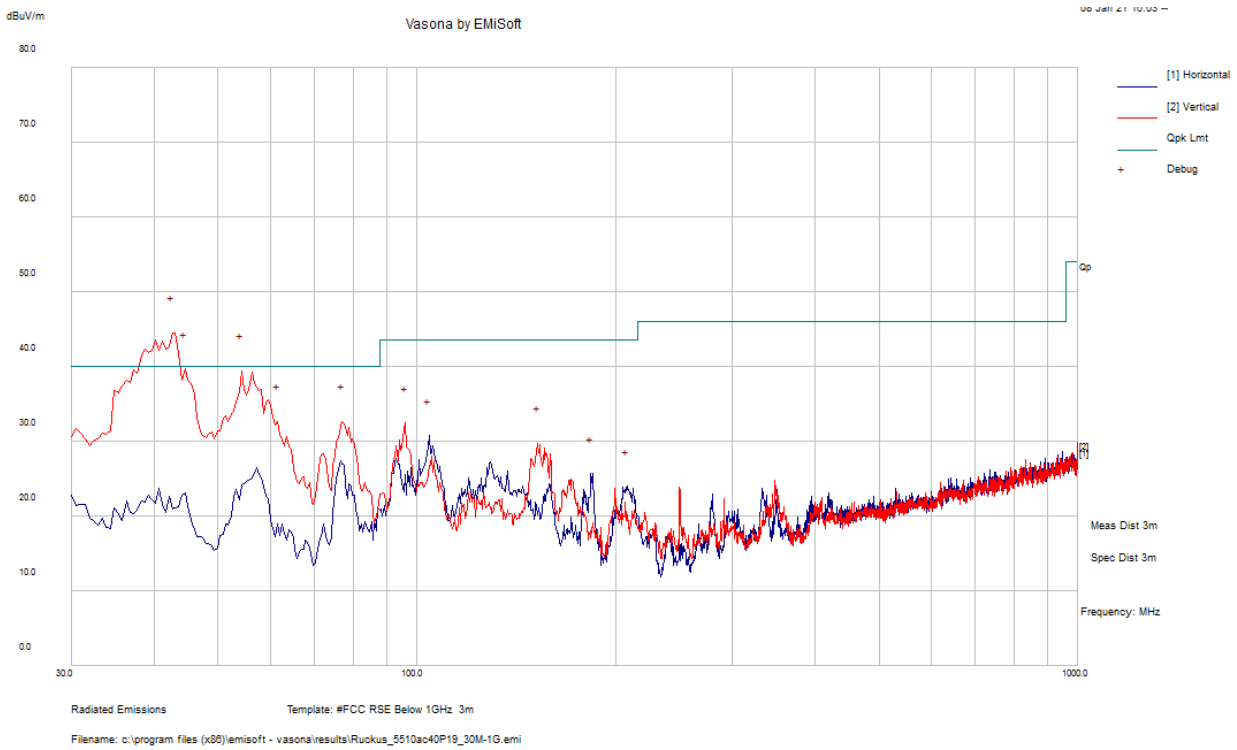
7.7 Summary of Test Results

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

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-0.06	17235	Horizontal	802.11ac20 mode, 5745 MHz

7.8 Radiated Emissions Test Result Data

1) 30 MHz – 1 GHz at 3 meters



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
42.89025	34.74	-11.93	22.81	113	V	101	40	-17.19	Pass
44.8345	38.39	-13.21	25.19	109	V	38	40	-14.81	Pass
54.17375	39.94	-16.21	23.73	140	V	88	40	-16.27	Pass
61.6575	29.32	-15.87	13.44	115	V	232	40	-26.56	Pass
77.05975	29.92	-15.84	14.08	265	V	165	40	-25.92	Pass
95.6665	31.03	-14.38	16.65	243	H	258	43.5	-26.85	Pass

2) 1–18 GHz measured at 3 meters

5150-5250 MHz

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
5180 MHz ax20 mode PS:18.5											
10360	44.43	320	150	H	38.1	14.553	35.74	61.343	84	-22.657	Peak
10360	41.26	0	100	V	38.1	14.553	35.74	58.173	84	-25.827	Peak
10360	34.83	320	150	H	38.1	14.553	35.74	51.743	64	-12.257	Ave
10360	31.99	0	100	V	38.1	14.553	35.74	48.903	64	-15.097	Ave
15540	50.27	298	150	H	40.7	14.781	33.87	71.881	84	-12.119	Peak
15540	49.06	25	166	V	40.7	14.781	33.87	70.671	84	-13.329	Peak
15540	38.87	298	150	H	40.7	14.781	33.87	60.481	64	-3.519	Ave
15540	34.87	25	166	V	40.7	14.781	33.87	56.481	64	-7.519	Ave
5190 MHz ax40 mode PS:19											
10380	44.07	258	150	H	38.1	14.563	35.49	61.24	84	-22.76	Peak
10380	43.29	360	154	V	38.1	14.563	35.49	60.46	84	-23.54	Peak
10380	34.02	258	150	H	38.1	14.563	35.49	51.19	64	-12.81	Ave
10380	32.68	360	154	V	38.1	14.563	35.49	49.85	64	-14.15	Ave
15570	51.07	300	147	H	40.5	15.221	33.7	73.09	84	-10.91	Peak
15570	48.75	18	170	V	40.5	15.221	33.7	70.77	84	-13.23	Peak
15570	38.84	300	147	H	40.5	15.221	33.7	60.86	64	-3.14	Ave
15570	36.50	18	170	V	40.5	15.221	33.7	58.52	64	-5.48	Ave
5210 MHz ax80 mode PS:18											
10420	44.26	255	150	H	38.1	14.563	35.49	61.43	84	-22.57	Peak
10420	44.61	360	150	V	38.1	14.563	35.49	61.78	84	-22.22	Peak
10420	33.80	255	150	H	38.1	14.563	35.49	50.97	64	-13.03	Ave
10420	32.68	360	150	V	38.1	14.563	35.49	49.85	64	-14.15	Ave
15630	48.49	295	150	H	41.8	15.391	32.84	72.84	84	-11.16	Peak
15630	43.43	20	160	V	41.8	15.391	32.84	67.78	84	-16.22	Peak
15630	35.04	295	150	H	41.8	15.391	32.84	59.39	64	-4.61	Ave
15630	33.61	20	160	V	41.8	15.391	32.84	57.96	64	-6.04	Ave

5250-5350 MHz

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
5320 MHz ax20 mode PS:18.5											
10640	42.47	305	150	H	38.2	14.691	35.23	60.13	84	-23.87	Peak
10640	41.33	10	160	V	38.2	14.691	35.23	58.99	84	-25.01	Peak
10640	31.65	300	150	H	38.2	14.691	35.23	49.31	64	-14.69	Ave
10640	30.47	0	100	V	38.2	14.691	35.23	48.13	64	-15.87	Ave
15960	56.10	297	150	H	41.2	16.043	34.01	79.33	84	-4.67	Peak
15960	51.82	25	164	V	41.2	16.043	34.01	75.05	84	-8.95	Peak
15960	39.94	297	150	H	41.2	16.043	34.01	63.17	64	-0.83	Ave
15960	36.07	25	164	V	41.2	16.043	34.01	59.30	64	-4.70	Ave
5310 MHz ax40 mode PS:19											
10620	43.45	0	100	H	38.2	14.691	35.23	61.11	84	-22.89	Peak
10620	42.48	0	100	V	38.2	14.691	35.23	60.14	84	-23.86	Peak
10620	31.28	0	100	H	38.2	14.691	35.23	48.94	64	-15.06	Ave
10620	31.03	0	100	V	38.2	14.691	35.23	48.69	64	-15.31	Ave
15930	53.12	285	160	H	41	15.793	34.01	75.90	84	-8.10	Peak
15930	49.54	14	169	V	41	15.793	34.01	72.32	84	-11.68	Peak
15930	41.01	285	150	H	41	15.793	34.01	63.79	64	-0.21	Ave
15930	37.43	14	160	V	41	15.793	34.01	60.21	64	-3.79	Ave
5290 MHz ax80 mode PS:18											
10580	44.67	300	150	H	38.2	14.691	35.23	62.33	78.2	-15.87	Peak
10580	42.41	0	100	V	38.2	14.691	35.23	60.07	78.2	-18.13	Peak
10580	33.26	300	150	H	38.2	14.691	35.23	50.92	64	-13.08	Ave
10580	31.47	0	100	V	38.2	14.691	35.23	49.13	64	-14.87	Ave
15870	47.24	298	150	H	41.8	16.955	32.84	73.16	84	-10.84	Peak
15870	45.33	10	160	V	41.8	16.955	32.84	71.25	84	-12.75	Peak
15870	36.72	298	150	H	41.8	16.955	32.84	62.64	64	-1.37	Ave
15870	33.41	10	160	V	41.8	16.955	32.84	59.33	64	-4.68	Ave

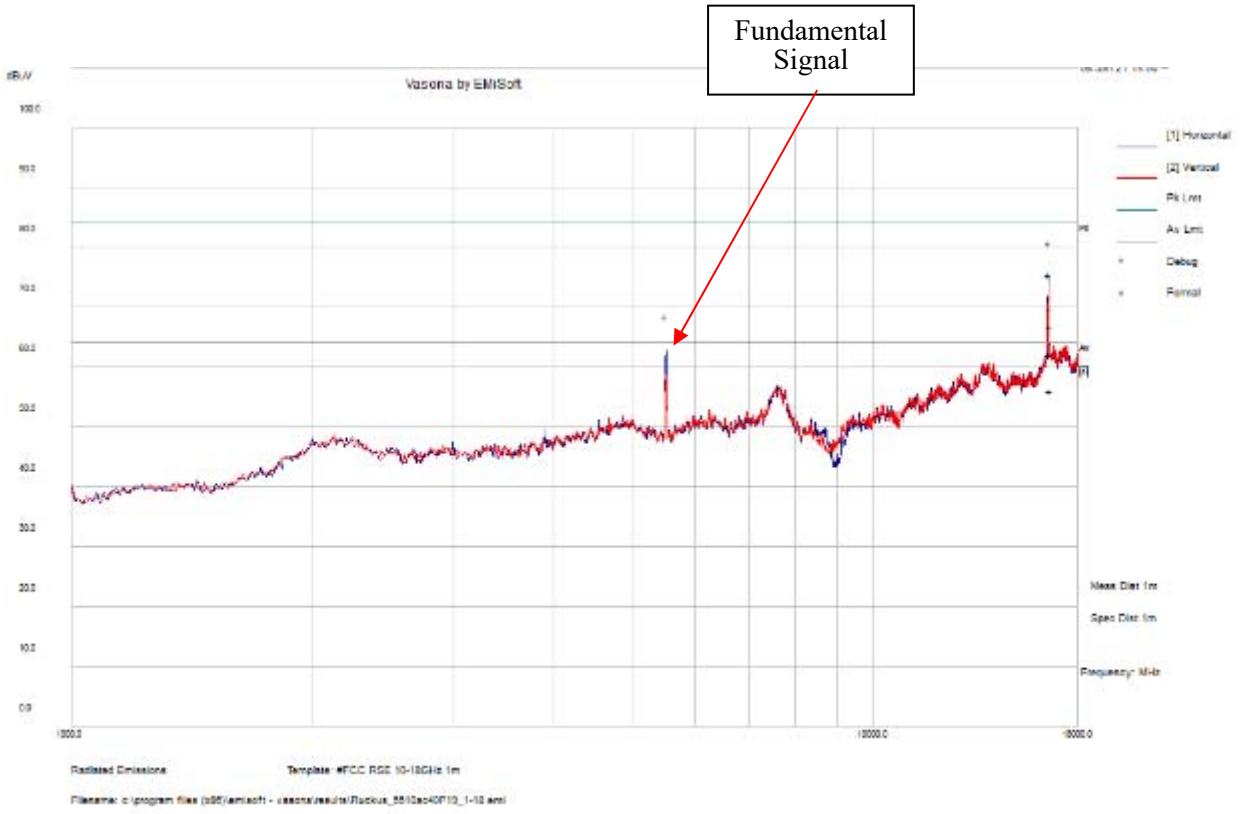
5470-5725 MHz

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
5580 MHz ax20 mode PS:18.5											
11160	42.33	301	150	H	38.5	15.311	34.73	61.41	84	-22.59	Peak
11160	41.69	0	100	V	38.5	15.311	34.73	60.77	84	-23.23	Peak
11160	32.50	301	150	H	38.5	15.311	34.73	51.58	64	-12.42	Ave
11160	30.94	0	100	V	38.5	15.311	34.73	50.02	64	-13.98	Ave
16740	52.29	302	150	H	42	16.574	33.07	77.79	78.2	-0.41	Peak
16740	49.75	35	168	V	42	16.574	33.07	75.25	78.2	-2.95	Peak
5550 MHz ax40 mode PS:19											
11100	44.02	300	150	H	38.5	15.311	34.73	63.10	84	-20.90	Peak
11100	43.43	0	100	V	38.5	15.311	34.73	62.51	84	-21.49	Peak
11100	32.19	300	150	H	38.5	15.311	34.73	51.27	64	-12.73	Ave
11100	31.68	0	100	V	38.5	15.311	34.73	50.76	64	-13.24	Ave
16650	54.21	50	150	H	41.9	15.797	33.77	78.14	78.2	-0.06	Peak
16650	49.46	19	159	V	41.9	15.797	33.77	73.39	78.2	-4.81	Peak
5610 MHz ax80 mode PS:20											
11220	43.24	287	150	H	38.5	15.311	34.73	62.32	84	-21.68	Peak
11220	42.89	0	100	V	38.5	15.311	34.73	61.97	84	-22.03	Peak
11220	31.17	287	150	H	38.5	15.311	34.73	50.25	64	-13.75	Ave
11220	30.64	0	100	V	38.5	15.311	34.73	49.72	64	-14.28	Ave
16830	50.30	51	150	H	41.8	16.955	32.84	76.22	78.2	-1.99	Peak
16830	47.24	40	160	V	41.8	16.955	32.84	73.16	78.2	-5.05	Peak

5725-5850 MHz

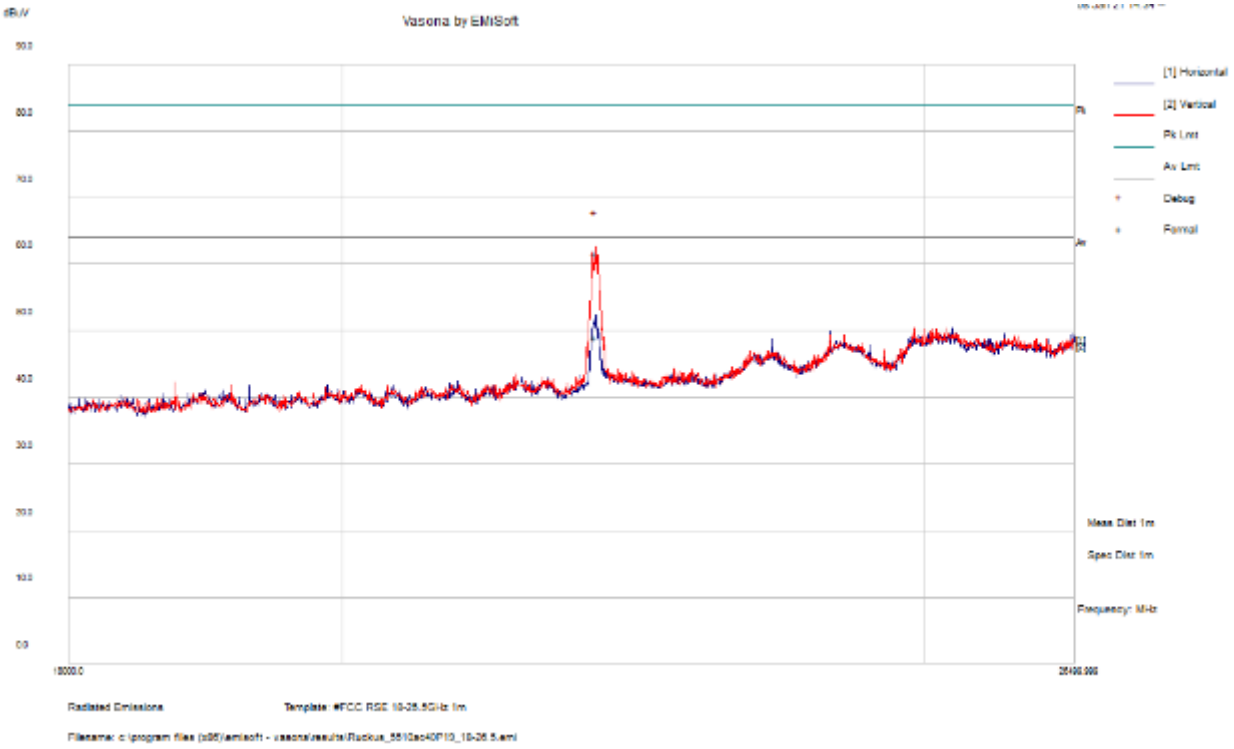
Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
5745 MHz ax20 mode PS:18.5											
11490	41.05	0	100	H	38.7	15.243	34.47	60.52	84	-23.48	Peak
11490	40.88	0	100	V	38.7	15.243	34.47	60.35	84	-23.65	Peak
11490	30.11	0	100	H	38.7	15.243	34.47	49.58	64	-14.42	Ave
11490	29.96	0	100	V	38.7	15.243	34.47	49.43	64	-14.57	Ave
17235	52.42	321	150	H	42	16.274	33.07	77.62	78.2	-0.58	Peak
17235	47.79	213	160	V	42	16.274	33.07	72.99	78.2	-5.21	Peak
5755 MHz ax40 mode PS:19											
11510	42.17	0	100	H	38.7	15.243	34.47	61.64	84	-22.36	Peak
11510	41.94	0	100	V	38.7	15.243	34.47	61.41	84	-22.59	Peak
11510	31.69	0	100	H	38.7	15.243	34.47	51.16	64	-12.84	Ave
11510	30.44	0	100	V	38.7	15.243	34.47	49.91	64	-14.09	Ave
17265	52.17	315	150	H	41.8	16.015	32.84	77.15	78.2	-1.06	Peak
17265	44.96	10	165	V	41.8	16.015	32.84	69.94	78.2	-8.27	Peak
5775 MHz ax80 mode PS:18											
11550	40.18	0	100	H	38.7	15.243	34.47	59.65	84	-24.35	Peak
11550	39.81	0	100	V	38.7	15.243	34.47	59.28	84	-24.72	Peak
11550	30.33	0	100	H	38.7	15.243	34.47	49.80	64	-14.20	Ave
11550	29.70	0	100	V	38.7	15.243	34.47	49.17	64	-14.83	Ave
17325	47.27	324	150	H	41.8	16.955	32.84	73.19	78.2	-5.02	Peak
17325	43.96	20	160	V	41.8	16.955	32.84	69.88	78.2	-8.33	Peak

1 GHz – 18 GHz Worst Case Scan at 1 Meter



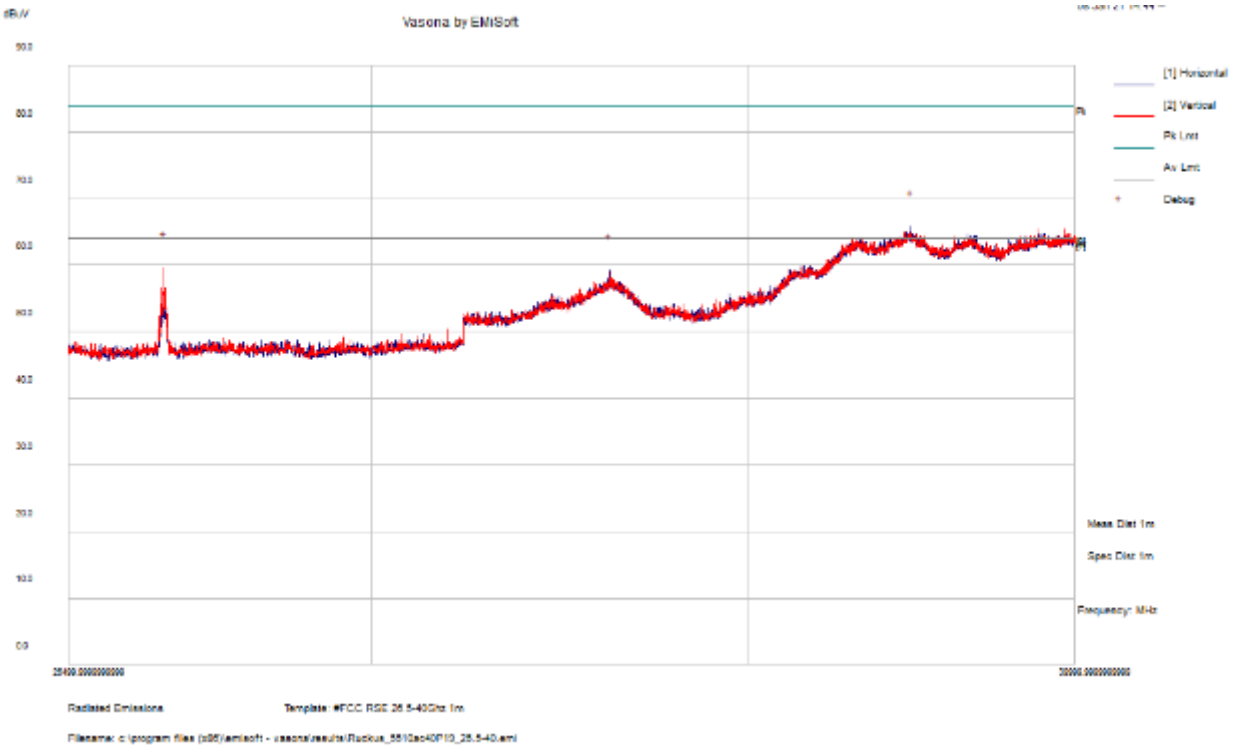
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
16554.865	50.42	25.06	75.47	213	H	340	84	-8.53	Peak
16604.785	41.54	25.09	66.63	240	H	27	84	-17.37	Peak
16554.865	36.97	25.06	62.03	213	H	340	64	-1.97	Ave
16604.785	30.96	25.09	56.05	240	H	27	64	-7.95	Ave

3) 18 GHz – 26.5 GHz Worst Case Scan at 1 Meter



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
22034.568	54.29	7.45	61.74	262	V	285	84	-22.26	Peak
22034.568	41.7	7.45	49.15	262	V	285	64	-14.85	Ave

4) 26.5 GHz – 40 GHz Worst Case Scan at 1 Meter



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
37411.001	55.58	17.26	72.84	221	V	54	84	-11.16	Peak
27558.084	41.46	14.28	55.74	106	V	274	84	-28.26	Peak
33064.965	50.31	14.84	65.14	158	H	7	84	-18.86	Peak
37411.001	44.38	17.26	61.64	151	H	69	64	-2.36	Ave
27558.084	31	14.28	45.28	106	V	274	64	-18.72	Ave
33064.965	39.76	14.84	54.6	211	V	304	64	-9.4	Ave

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

8.1 Applicable Standards

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

8.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 or 26 dB from the reference level. Record the frequency difference as the minimum emission or emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	MY48250238	2019-06-26	2 years
-	RF cable	-	-	Each time[1]	N/A
-	20 dB 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 the latest version of A2LA policy P102 "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 Zhao Zhao from 2021-01-05 and 2021-01-06 in RF site.

8.5 Test Results

Please refer to the following tables and plots.

5150 - 5250 MHz

Ant J12

Channel	Frequency (MHz)	99% OBW (MHz)	26 dB OBW (MHz)
802.11a mode			
36	5180	16.3397	20.285
44	5220	16.3760	20.802
48	5240	16.4034	20.503
802.11n/ac20 mode			
36	5180	17.5715	21.293
44	5220	17.5239	21.284
48	5240	17.5274	21.102
802.11ax20 mode			
36	5180	18.9324	22.658
44	5220	18.9030	21.929
48	5240	18.9280	21.842
802.11n/ac40 mode			
38	5190	35.9344	40.342
46	5230	36.0628	40.505
802.11ax40 mode			
38	5190	37.6804	40.854
46	5230	37.6867	40.886
802.11ac80 mode			
42	5210	75.0331	81.396
802.11ax80 mode			
42	5210	77.0983	82.479

Ant J15

Channel	Frequency (MHz)	99% OBW (MHz)	26 dB OBW (MHz)
802.11a mode			
36	5180	16.3283	20.597
44	5220	16.3265	20.406
48	5240	16.3214	20.051
802.11n/ac20 mode			
36	5180	17.5068	20.955
44	5220	17.5061	20.763
48	5240	17.5127	20.709
802.11ax20 mode			
36	5180	18.8206	21.192
44	5220	18.9208	21.675
48	5240	18.9051	21.735
802.11n/ac40 mode			
38	5190	35.9939	40.862
46	5230	36.0056	40.706
802.11ax40 mode			
38	5190	37.5999	40.972
46	5230	37.6546	41.524
802.11ac80 mode			
42	5210	75.2274	82.025
802.11ax80 mode			
42	5210	76.9597	82.270

5250 - 5350 MHz

Ant J12

Channel	Frequency (MHz)	99% OBW (MHz)	26 dB OBW (MHz)
802.11a mode			
52	5260	16.3842	20.522
60	5300	16.3759	20.530
64	5320	16.6257	22.195
802.11n/ac20 mode			
52	5260	17.5673	21.147
60	5300	17.5214	20.857
64	5320	15.5576	21.089
802.11ax20 mode			
52	5260	18.8481	21.494
60	5300	18.8374	21.430
64	5320	18.8215	21.619
802.11n/ac40 mode			
54	5270	36.0585	41.458
62	5310	35.9767	40.236
802.11ax40 mode			
54	5270	37.6599	41.463
62	5310	37.6856	41.242
802.11ac80 mode			
58	5290	75.1364	81.980
802.11ax80 mode			
58	5290	76.8728	82.248

Ant J15

Channel	Frequency (MHz)	99% OBW (MHz)	26 dB OBW (MHz)
802.11a mode			
52	5260	16.3277	20.012
60	5300	16.3297	20.235
64	5320	16.3311	20.347
802.11n/ac20 mode			
52	5260	17.5218	20.903
60	5300	17.5134	20.924
64	5320	17.5561	21.001
802.11ax20 mode			
52	5260	18.8732	21.933
60	5300	18.8768	21.691
64	5320	18.8563	21.608
802.11n/ac40 mode			
54	5270	35.9960	40.726
62	5310	35.9776	40.671
802.11ax40 mode			
54	5270	37.6447	41.136
62	5310	37.6324	40.939
802.11ac80 mode			
58	5290	75.2043	82.311
802.11ax80 mode			
58	5290	76.9803	82.376

5470MHz - 5725 MHz

Ant J12

Channel	Frequency (MHz)	99% OBW (MHz)	26 dB OBW (MHz)
802.11a mode			
100	5500	16.3470	19.694
116	5580	16.3483	19.687
140	5700	16.3630	20.681
144	5720	16.3684	20.714
802.11n/ac20 mode			
100	5500	17.5453	20.877
116	5580	17.5156	20.757
140	5700	17.5445	20.874
144	5720	17.5379	21.025
802.11ax20 mode			
100	5500	18.8567	21.610
116	5580	18.8738	21.368
140	5700	18.8688	21.689
144	5720	18.8786	21.599
802.11n/ac40 mode			
100	5500	35.9951	40.677
116	5580	35.9972	40.989
140	5700	36.0267	40.921
144	5720	36.0530	41.412
802.11ax40 mode			
102	5510	37.6252	41.426
110	5550	37.6252	41.250
134	5670	37.6494	41.276
142	5710	37.6846	41.401
802.11ac80 mode			
106	5530	75.2684	81.985
122	5610	75.3127	82.376
138	5690	75.3396	82.929
802.11ax80 mode			
106	5530	77.0154	82.546
122	5610	76.9489	82.717
138	5690	77.3989	113.799

Ant J15

Channel	Frequency (MHz)	99% OBW (MHz)	26 dB OBW (MHz)
802.11a mode			
100	5500	16.3317	20.523
116	5580	16.3299	20.374
140	5700	16.3700	20.624
144	5720	16.3837	20.495
802.11n/ac20 mode			
100	5500	17.5494	21.135
116	5580	17.5375	20.897
140	5700	17.5771	21.973
144	5720	17.5690	21.001
802.11ax20 mode			
100	5500	18.8613	21.575
116	5580	18.8907	21.848
140	5700	18.8868	21.789
144	5720	18.8932	22.007
802.11n/ac40 mode			
100	5500	35.9996	40.970
116	5580	35.9973	41.060
140	5700	36.0374	41.318
144	5720	36.1721	45.070
802.11ax40 mode			
102	5510	37.6699	41.154
110	5550	37.6622	41.192
134	5670	37.6969	41.930
142	5710	37.7766	43.545
802.11ac80 mode			
106	5530	75.1897	82.095
122	5610	75.3644	82.484
138	5690	75.5455	92.961
802.11ax80 mode			
106	5530	76.9501	82.615
122	5610	77.0924	82.836
138	5690	77.2186	83.635

5725 - 5850 MHz

Ant J12

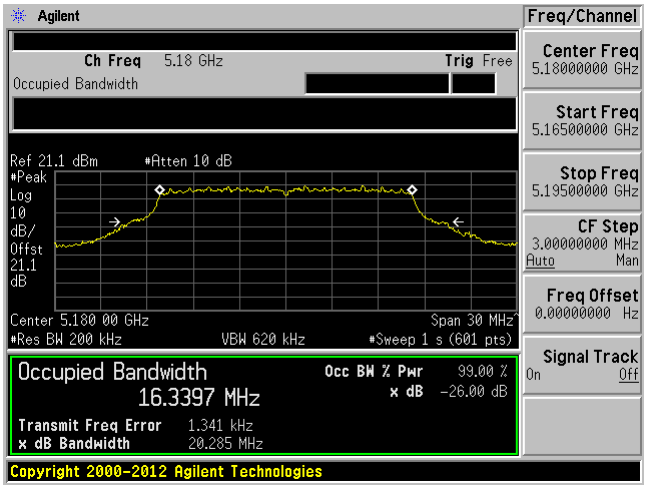
Channel	Frequency (MHz)	99% OBW (MHz)	6 dB OBW (MHz)	Limit (≥500kHz)
802.11a mode				
149	5745	16.3723	16.060	Pass
157	5785	16.3503	16.010	Pass
165	5825	16.3474	16.027	Pass
802.11n/ac20 mode				
149	5745	17.6175	16.502	Pass
157	5785	17.5300	16.474	Pass
165	5825	17.5335	16.568	Pass
802.11ax20 mode				
149	5745	18.9279	18.051	Pass
157	5785	18.8808	18.324	Pass
165	5825	18.986	17.912	Pass
802.11n/ac40 mode				
151	5755	36.0484	35.614	Pass
159	5795	35.9948	35.895	Pass
802.11ax40 mode				
151	5755	37.944	37.550	Pass
159	5795	37.6680	35.474	Pass
802.11ac80 mode				
155	5775	75.2599	75.195	Pass
802.11ax80 mode				
155	5775	76.9789	76.998	Pass

Ant J15

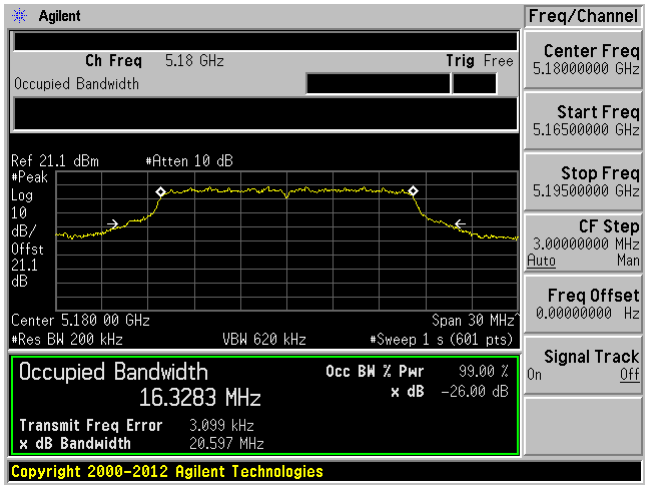
Channel	Frequency (MHz)	99% OBW (MHz)	6 dB OBW (MHz)	Limit (≥500kHz)
802.11a mode				
149	5745	16.6615	15.459	Pass
157	5785	16.4221	15.367	Pass
165	5825	16.4096	16.040	Pass
802.11n/ac20 mode				
149	5745	17.7813	16.788	Pass
157	5785	17.6403	16.497	Pass
165	5825	17.6093	16.555	Pass
802.11ax20 mode				
149	5745	19.0030	18.571	Pass
157	5785	18.9026	18.468	Pass
165	5825	18.8706	17.557	Pass
802.11n/ac40 mode				
151	5755	36.0655	36.0837	Pass
159	5795	36.1054	35.158	Pass
802.11ax40 mode				
151	5755	37.6808	37.774	Pass
159	5795	37.6895	37.846	Pass
802.11ac80 mode				
155	5775	75.3200	71.567	Pass
802.11ax80 mode				
155	5775	77.0219	75.035	Pass

5150 - 5250 MHz
802.11a Mode

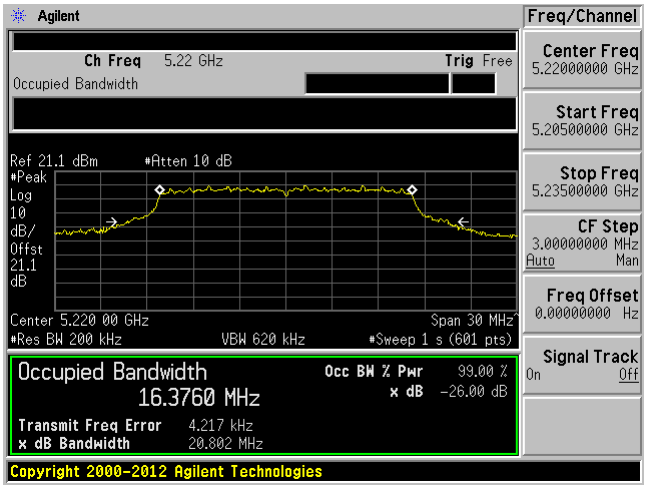
Low Channel ANT J12



Low Channel ANT J15



Mid Channel ANT J12



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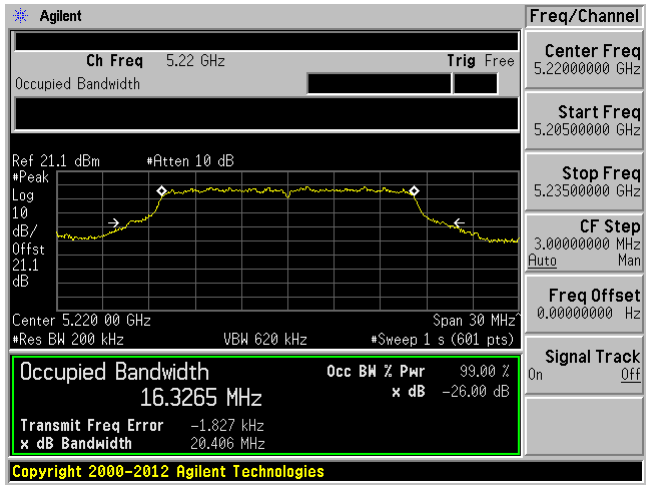
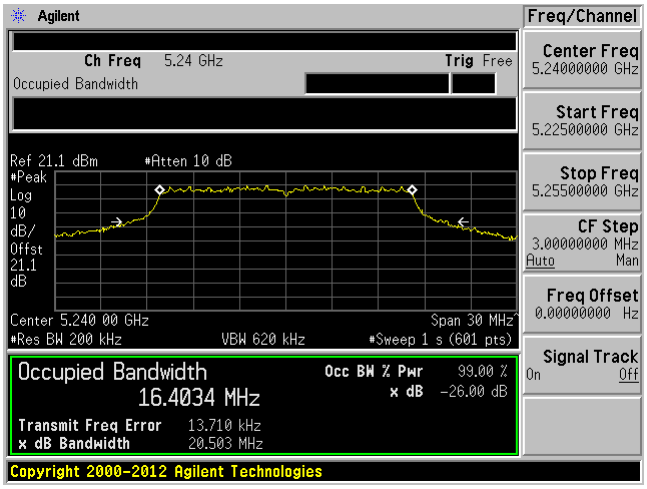


High Channel ANT J12



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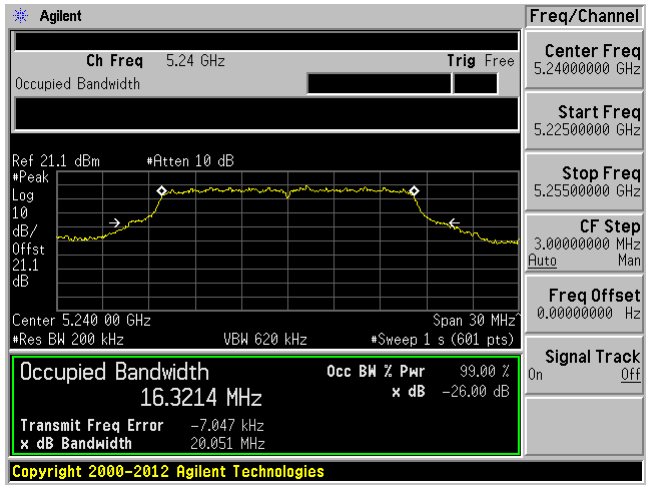
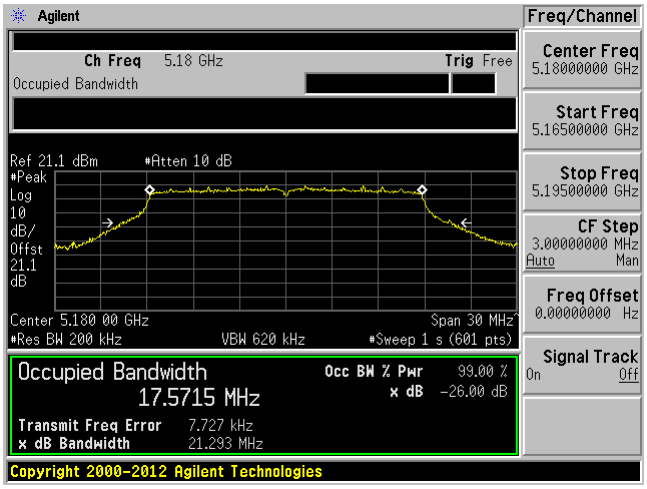
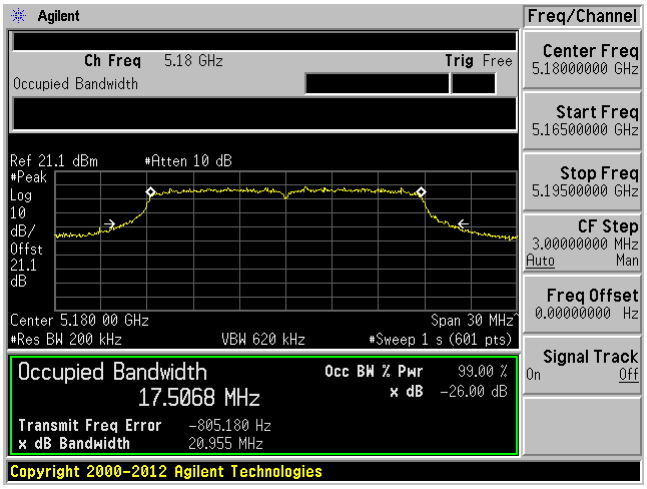


802.11ac20 Mode

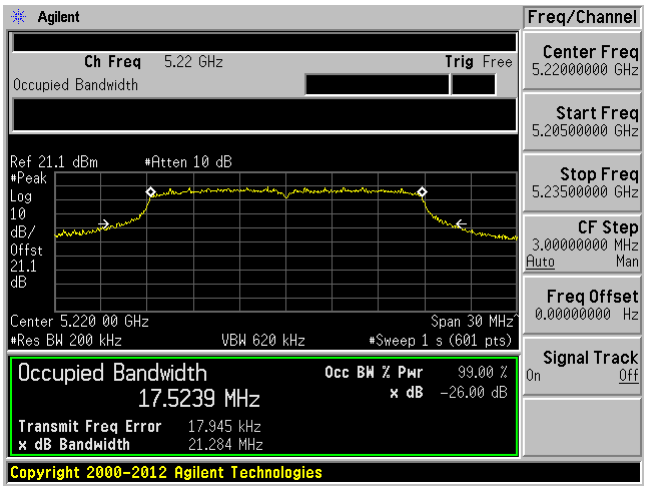
Low Channel ANT J12



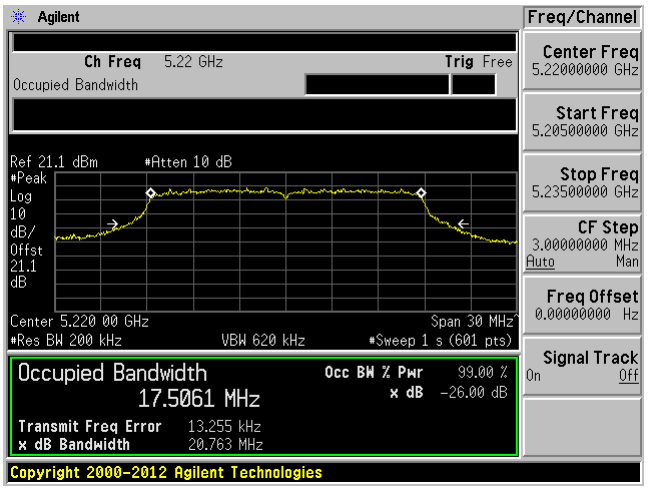
Low Channel ANT J15



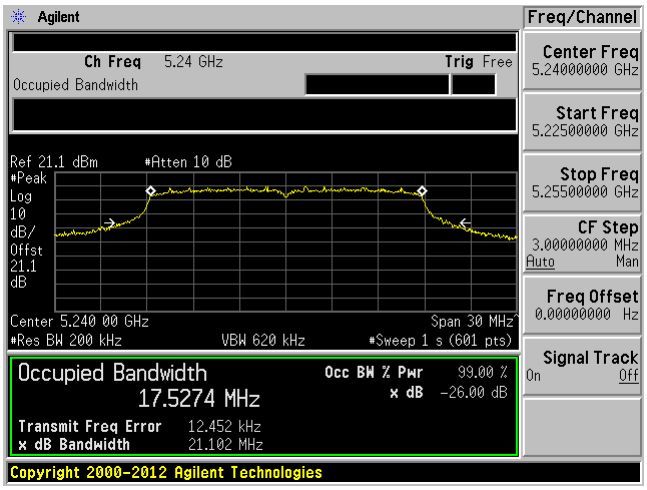
Mid Channel ANT J12



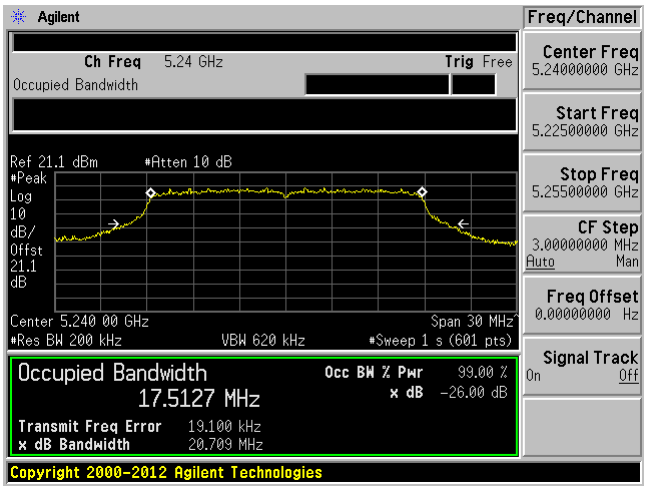
Mid Channel ANT J15



High Channel ANT J12

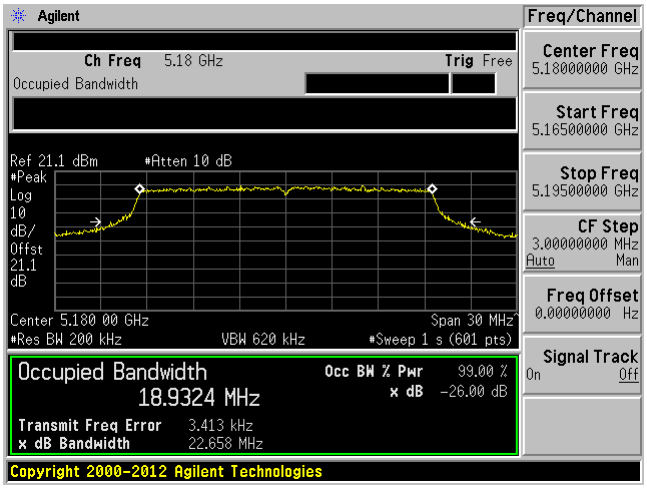


High Channel ANT J15

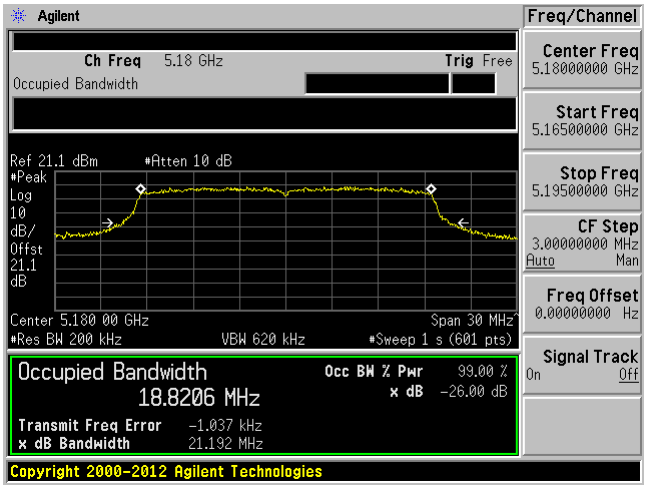


802.11ax20 Mode

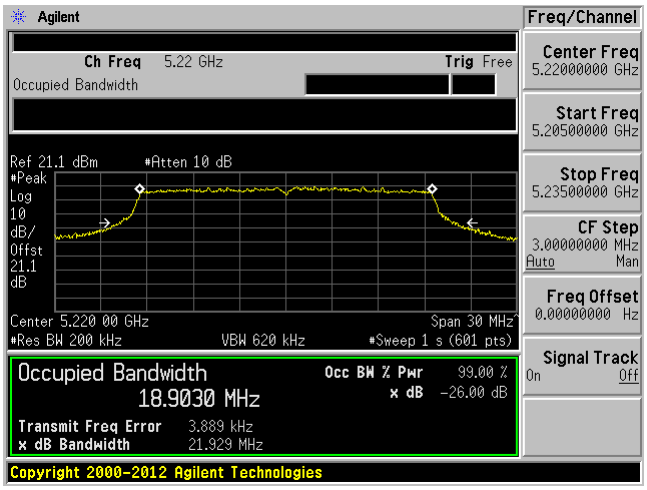
Low Channel ANT J12



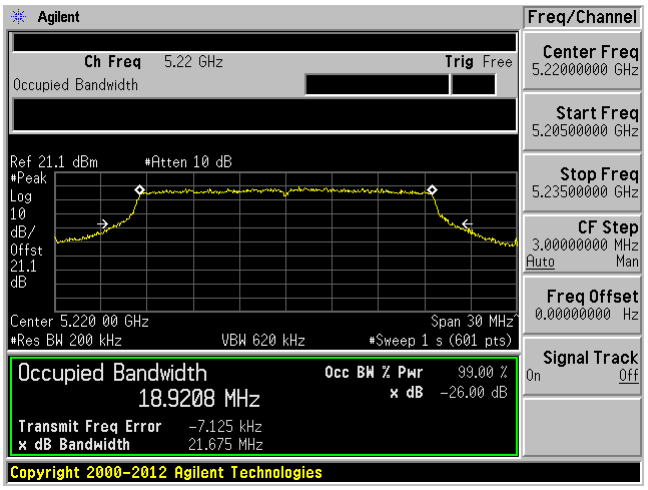
Low Channel ANT J15



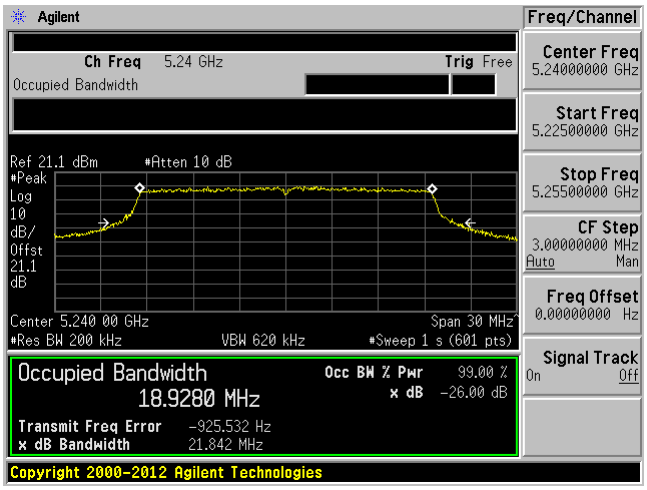
Mid Channel ANT J12



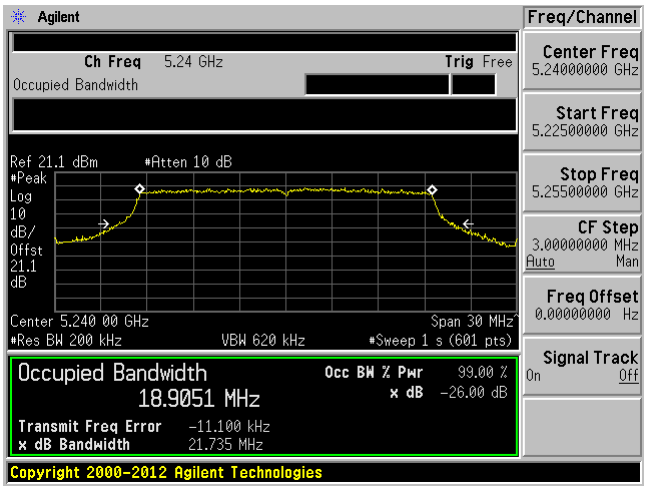
Mid Channel ANT J15



High Channel ANT J12

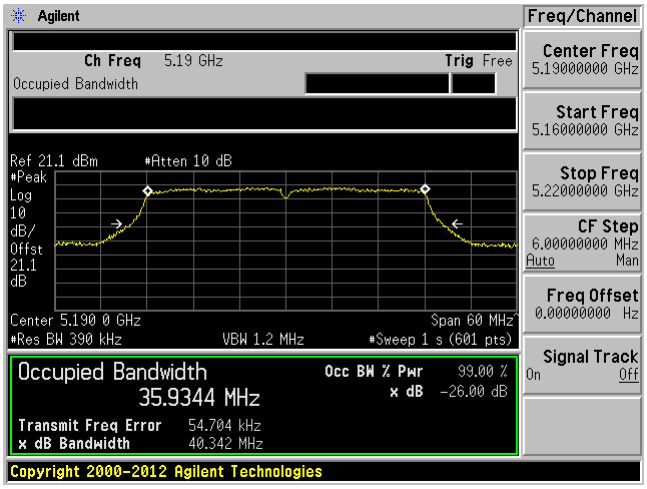


High Channel ANT J15

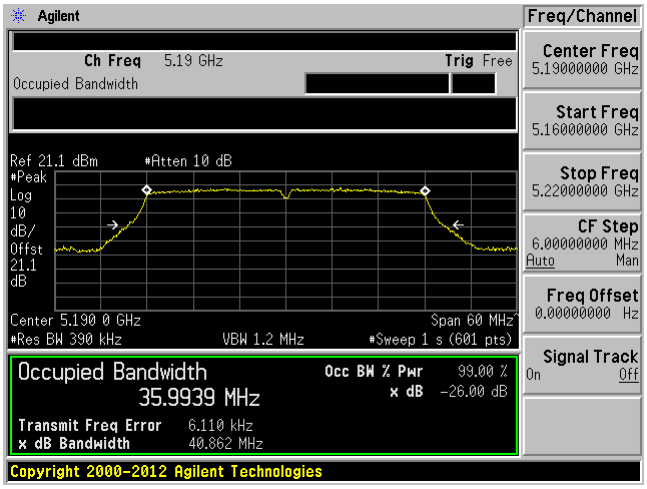


802.11ac40 Mode

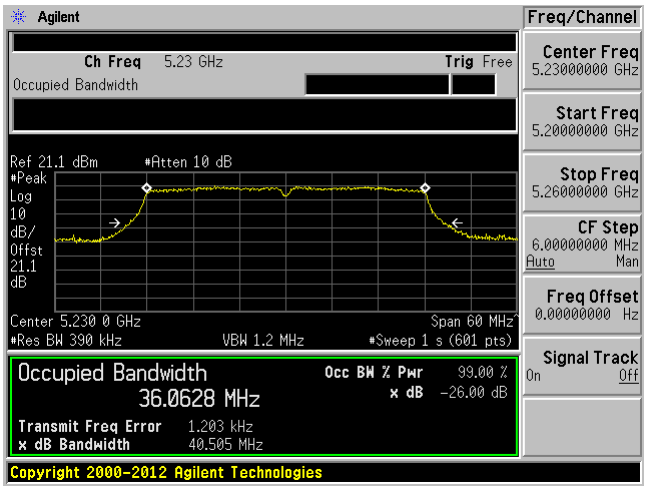
Low Channel ANT J12



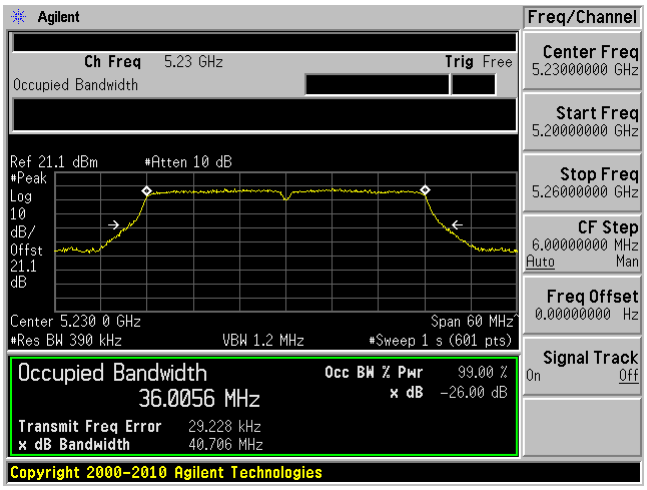
Low Channel ANT J15



High Channel ANT J12

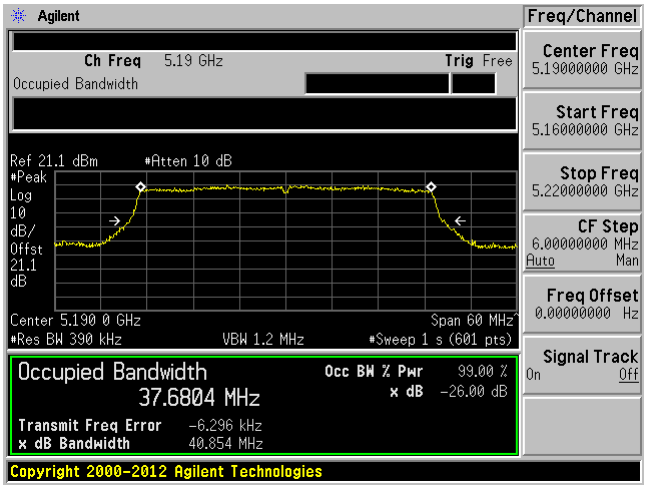


High Channel ANT J15

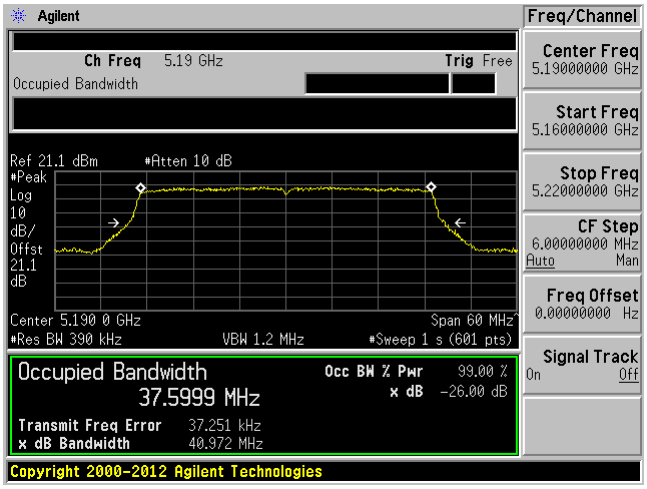


802.11ax40 Mode

Low Channel ANT J12



Low Channel ANT J15



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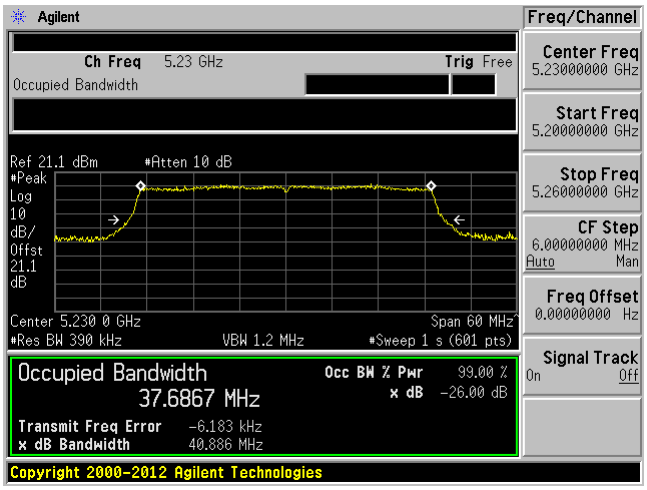
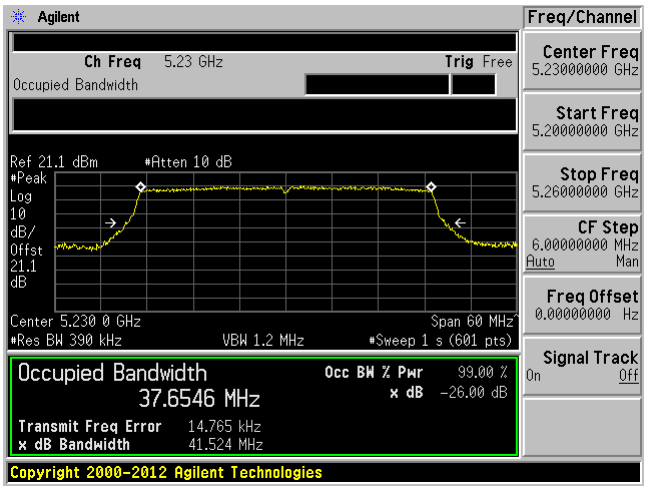
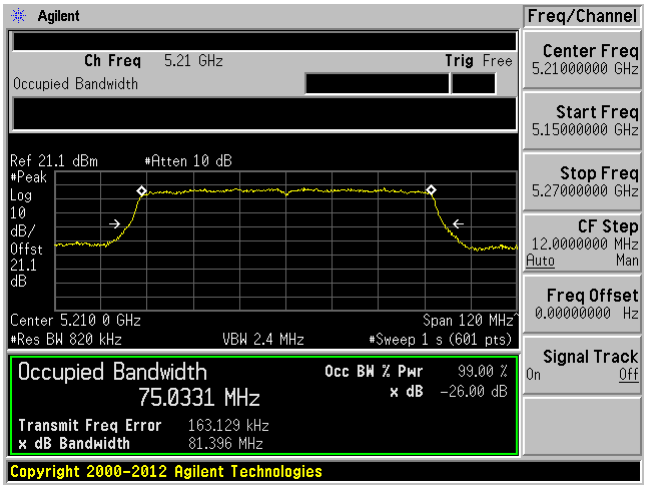


High Channel ANT J15

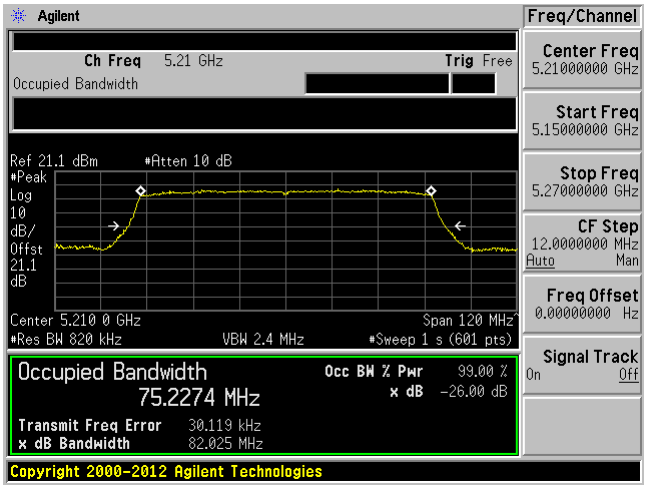


802.11ac80 Mode

ANT J12

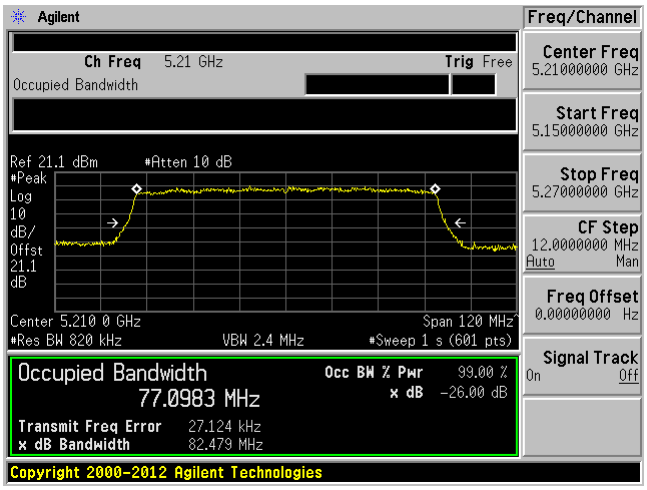


ANT J15

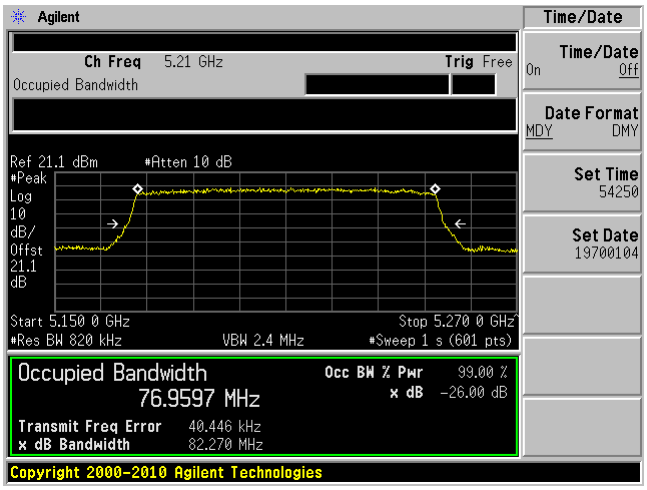


802.11ax80 Mode

ANT J12

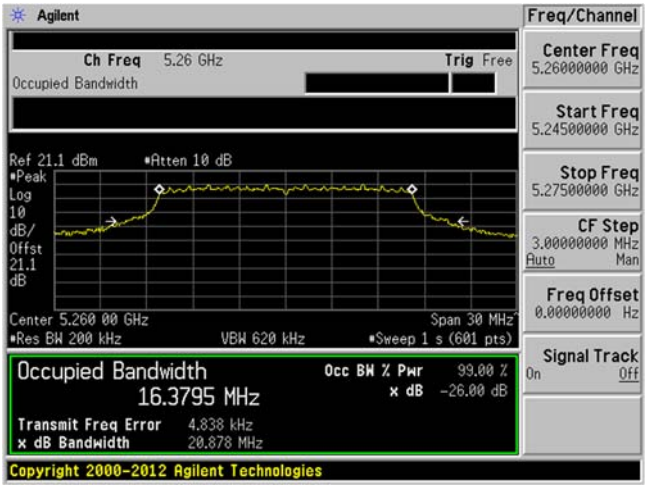


ANT J15

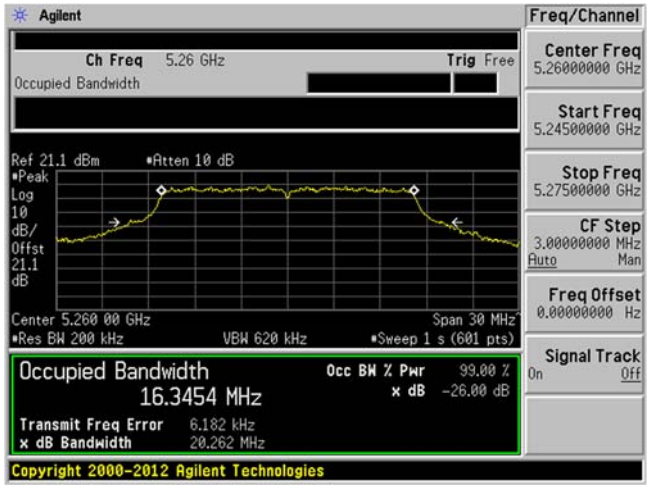


5250 - 5350 MHz
802.11a Mode

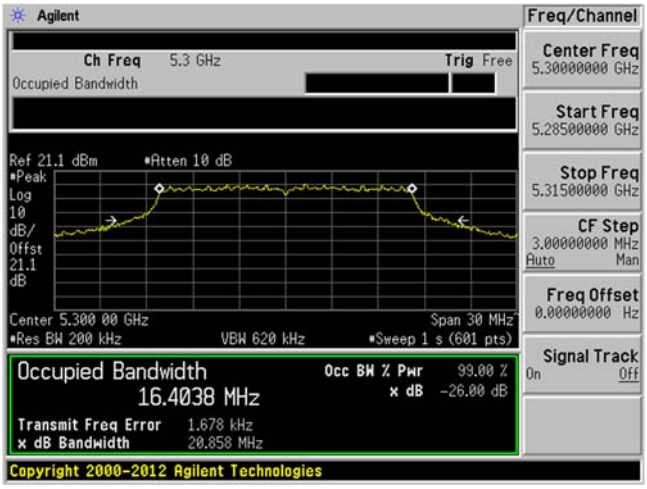
Low Channel ANT J12



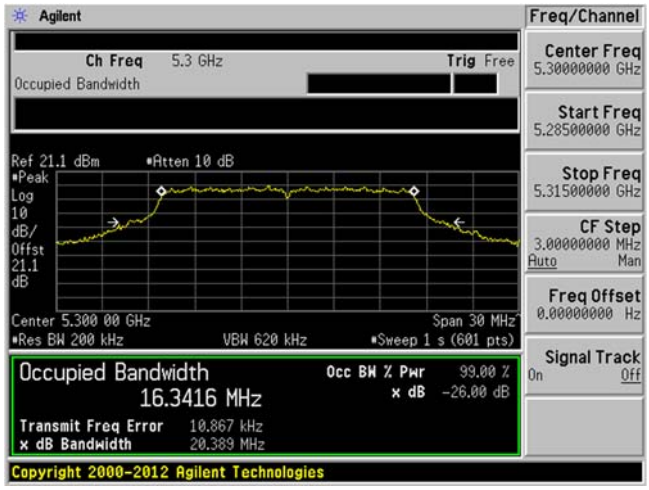
Low Channel ANT J15



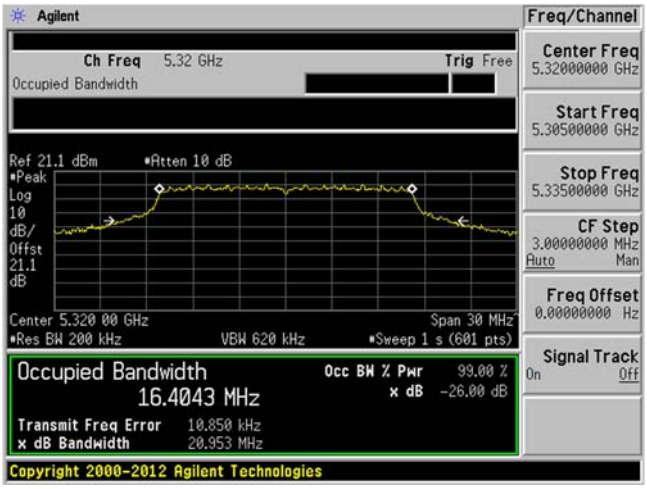
Mid Channel ANT J12



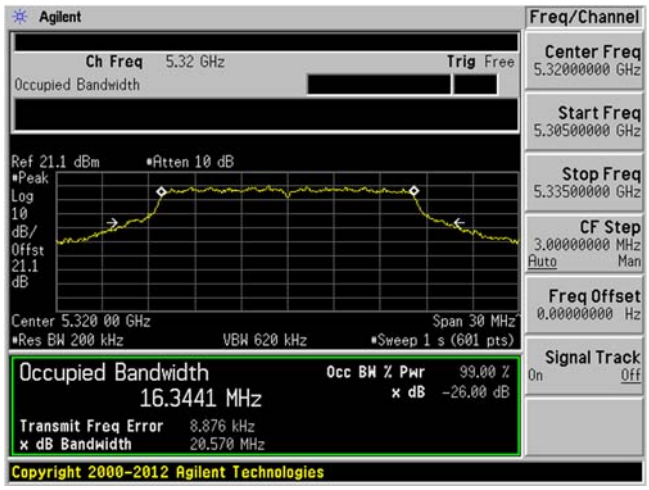
Mid Channel ANT J15



High Channel ANT J12

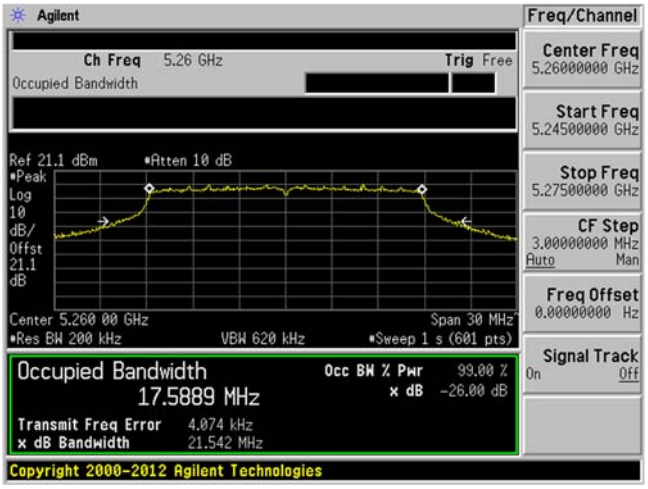


High Channel ANT J15

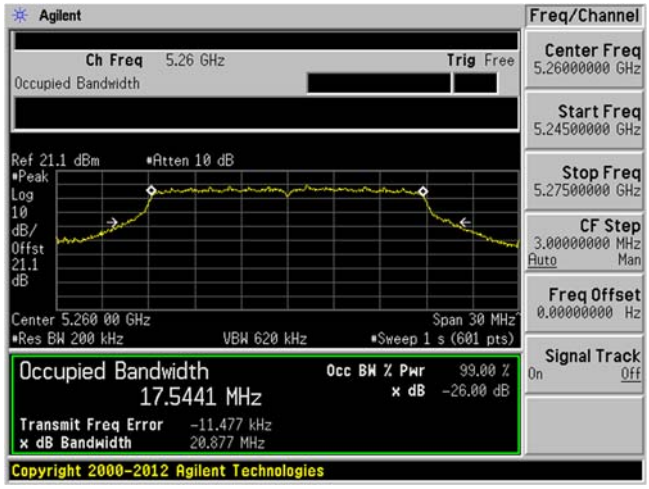


802.11ac20 Mode

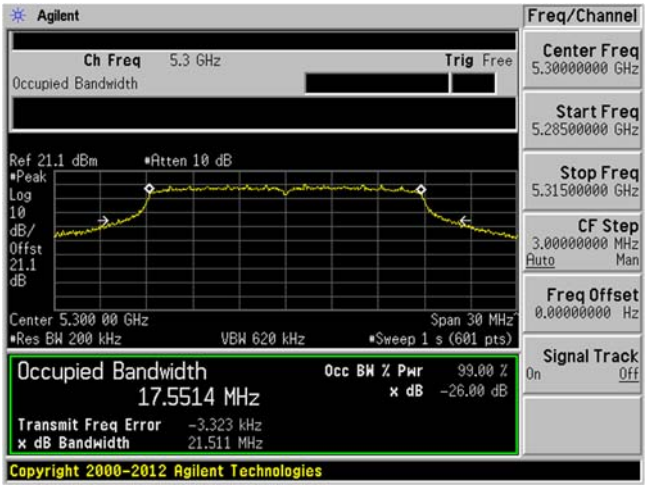
Low Channel ANT J12



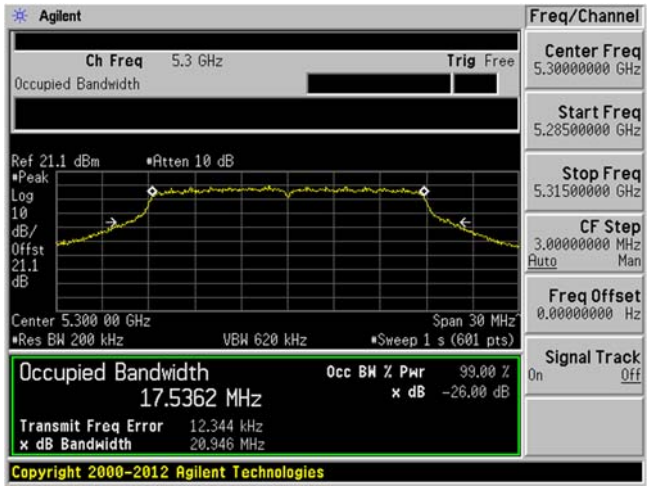
Low Channel ANT J15



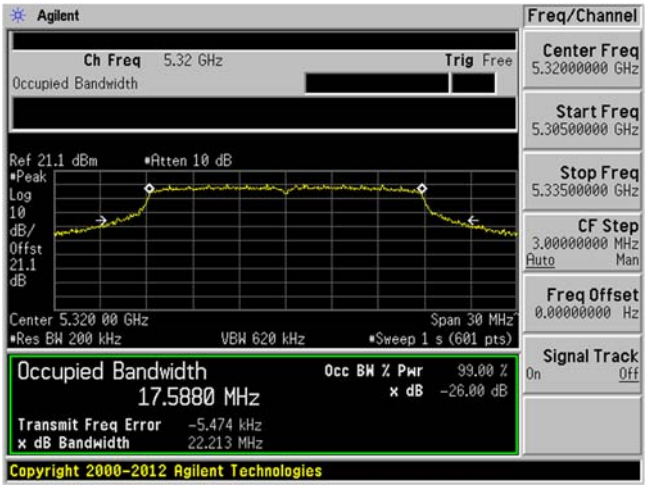
Mid Channel ANT J12



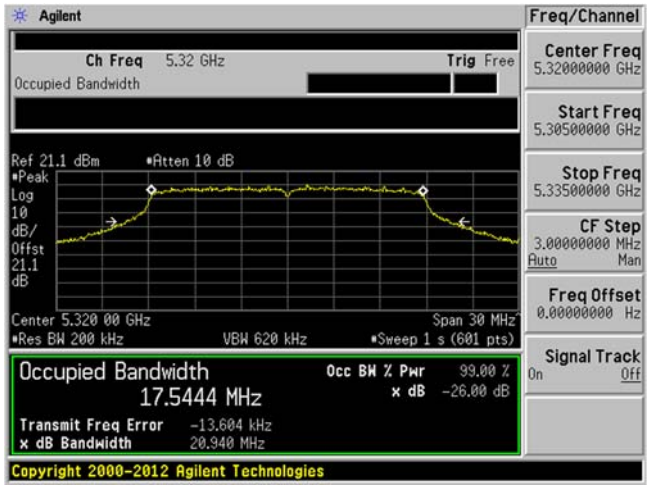
Mid Channel ANT J15



High Channel ANT J12

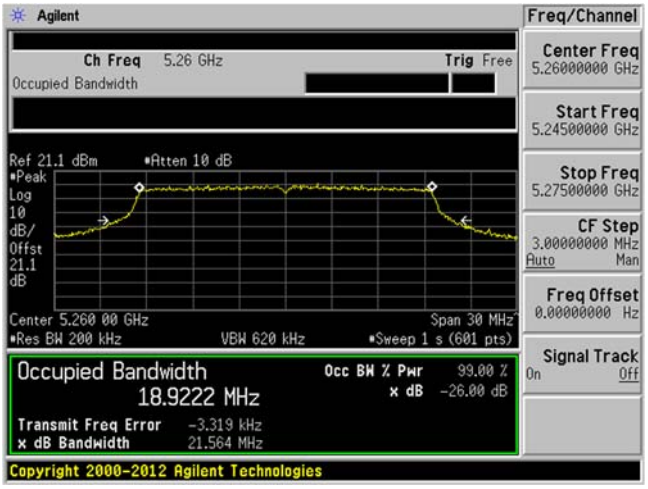


High Channel ANT J15

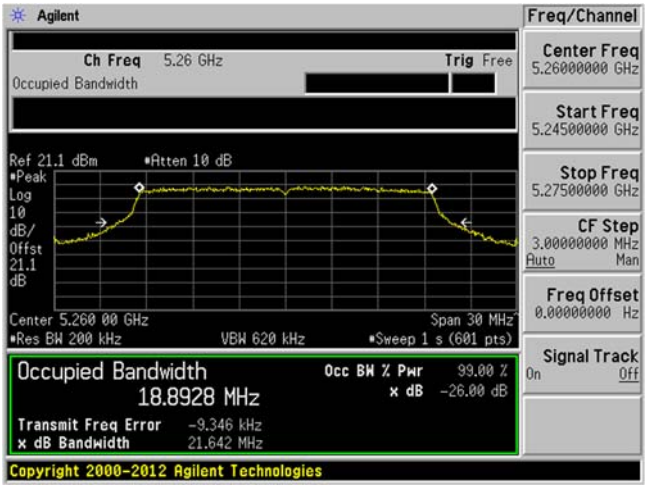


802.11ax20 Mode

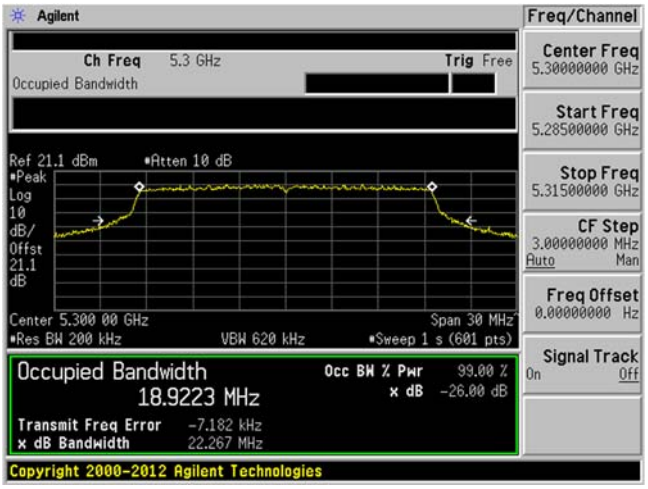
Low Channel ANT J12



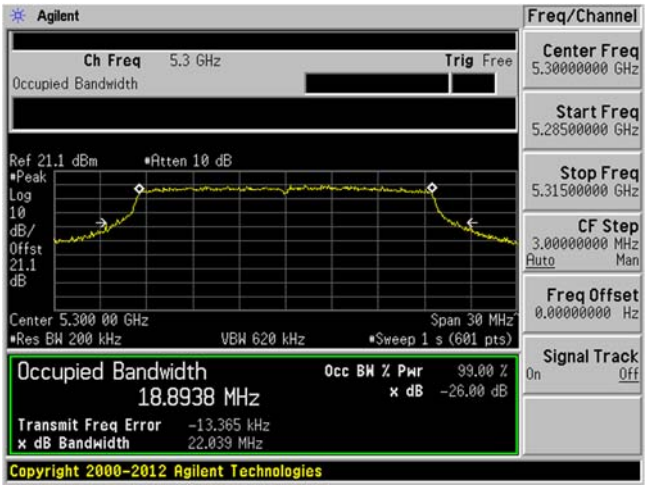
Low Channel ANT J15



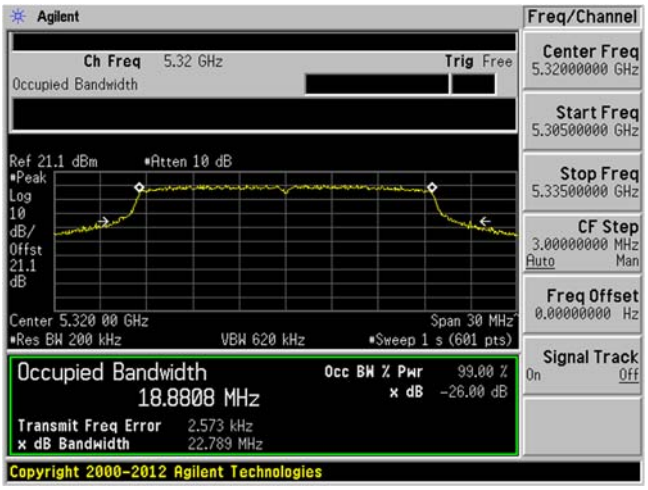
Mid Channel ANT J12



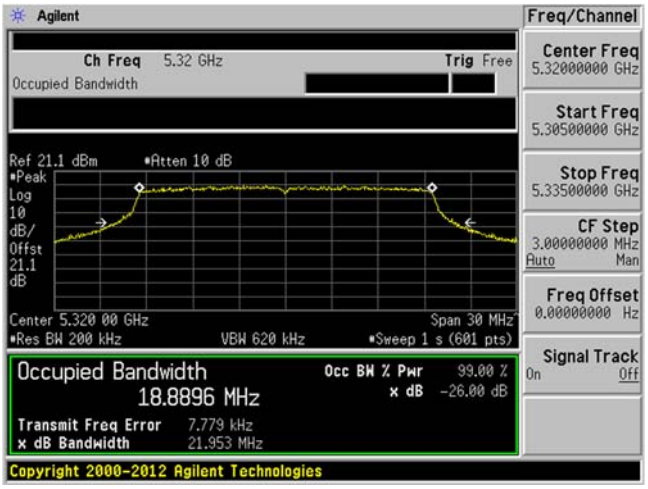
Mid Channel ANT J15



High Channel ANT J12

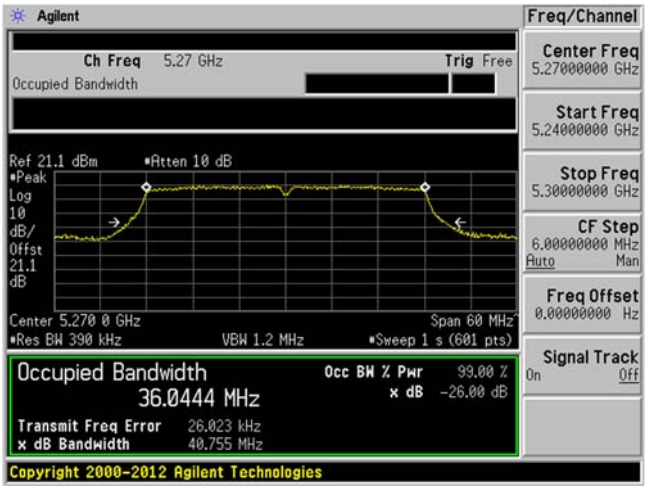


High Channel ANT J15

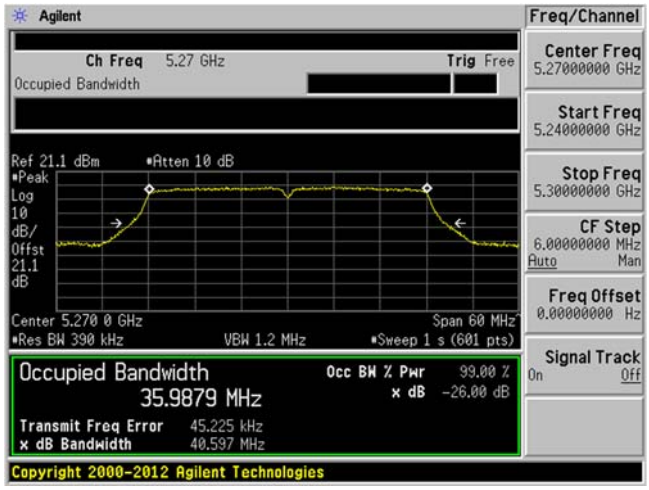


802.11ac40 Mode

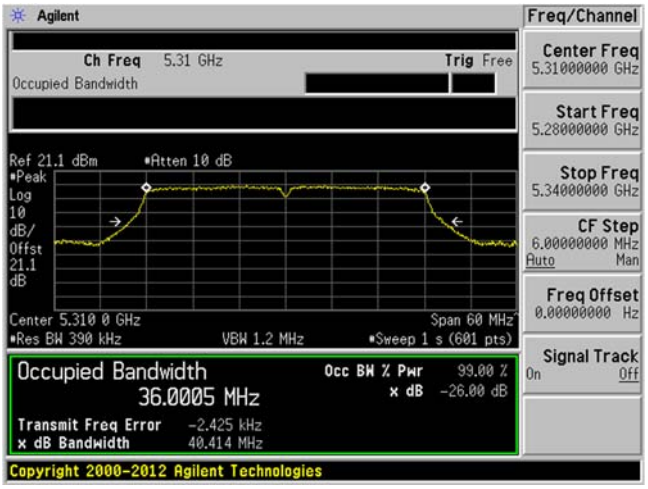
Low Channel ANT J12



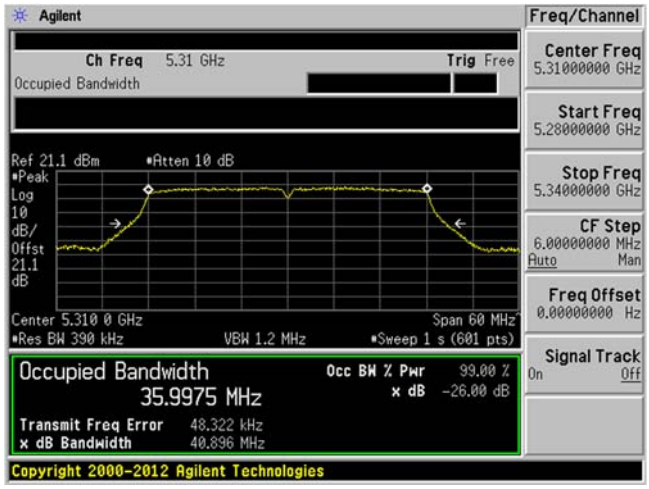
Low Channel ANT J15



High Channel ANT J12

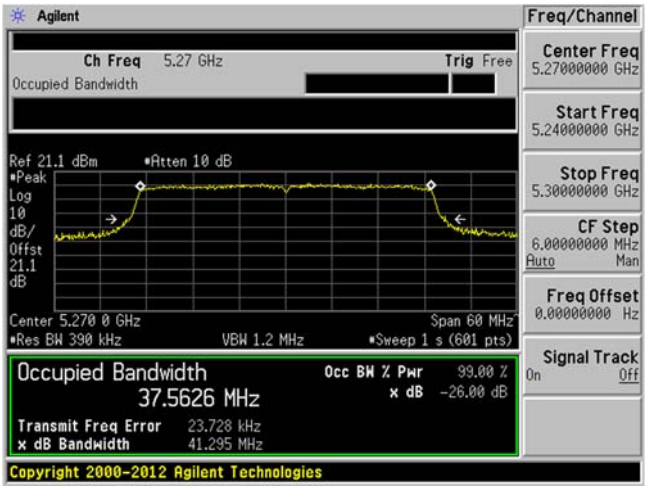


High Channel ANT J15

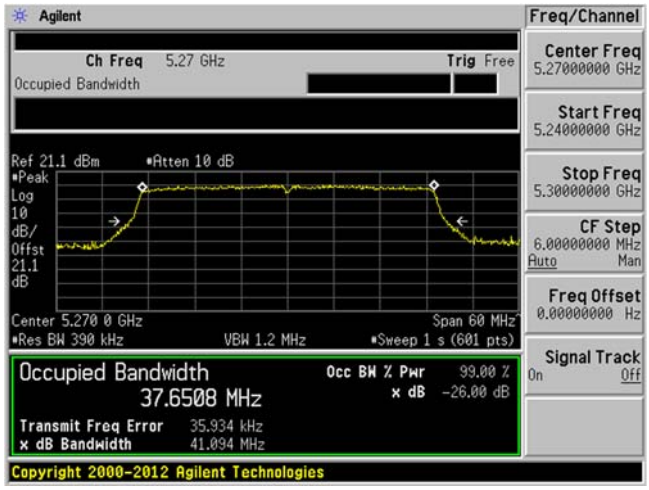


802.11ax40 Mode

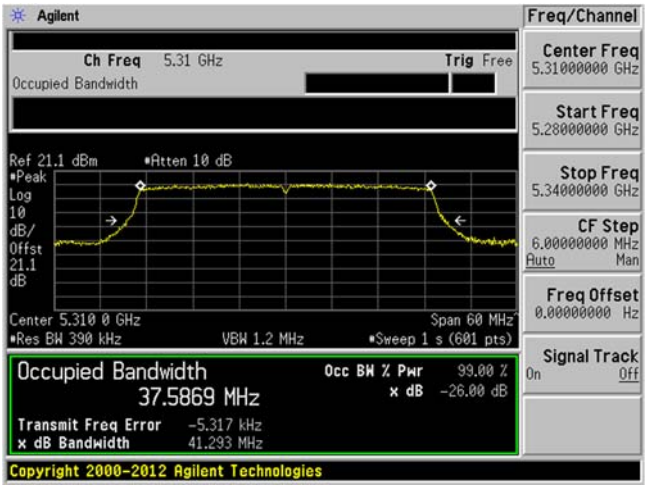
Low Channel ANT J12



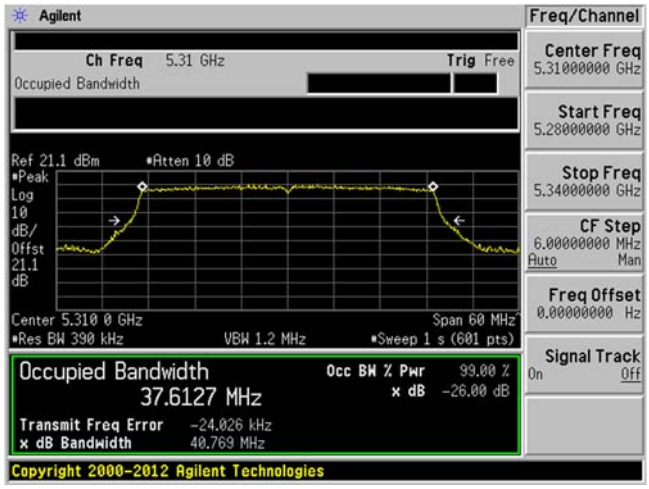
Low Channel ANT J15



High Channel ANT J12

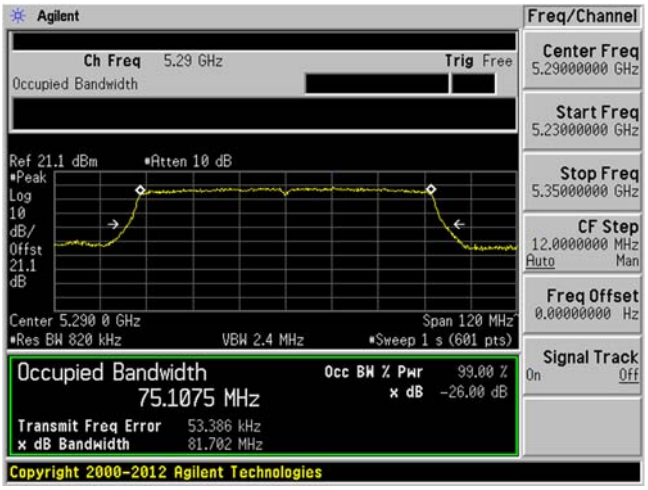


High Channel ANT J15

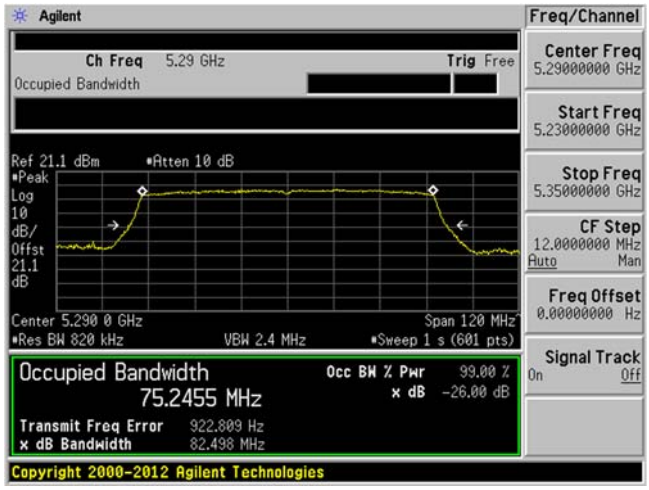


802.11ac80 Mode

ANT J12

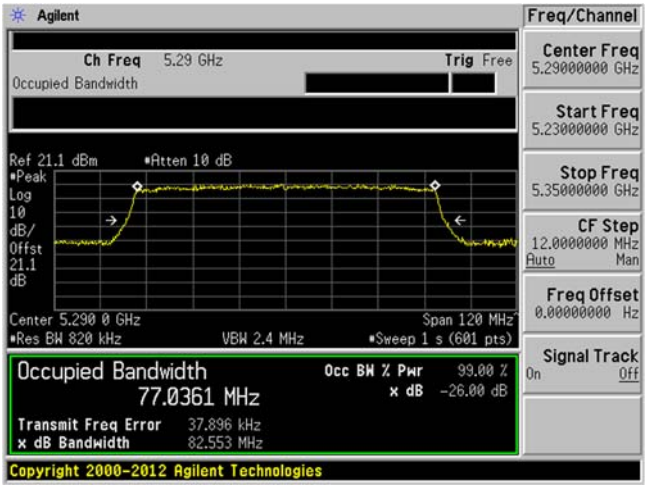


ANT J15

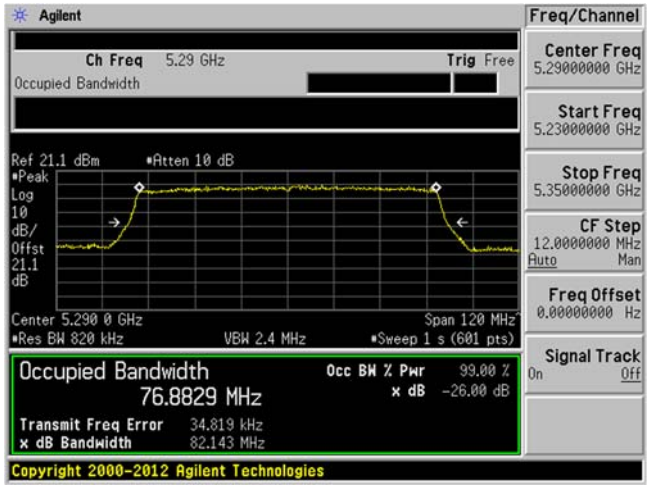


802.11ax80 Mode

ANT J12



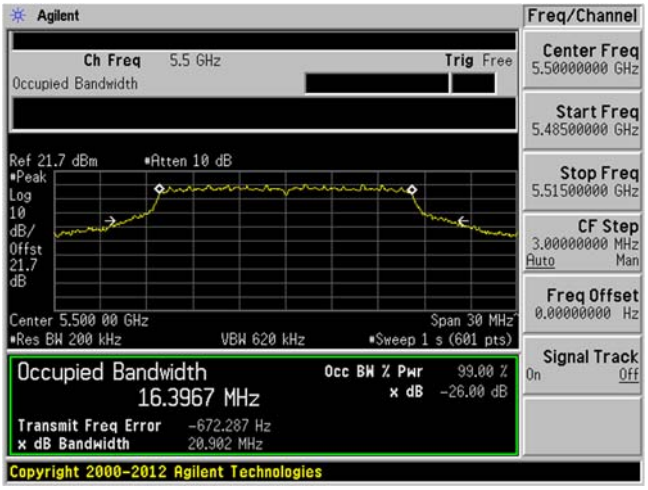
ANT J15



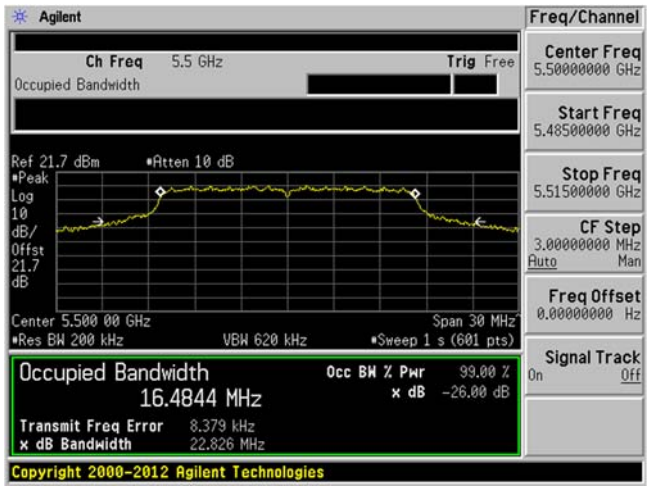
5470 - 5725 MHz

802.11a Mode

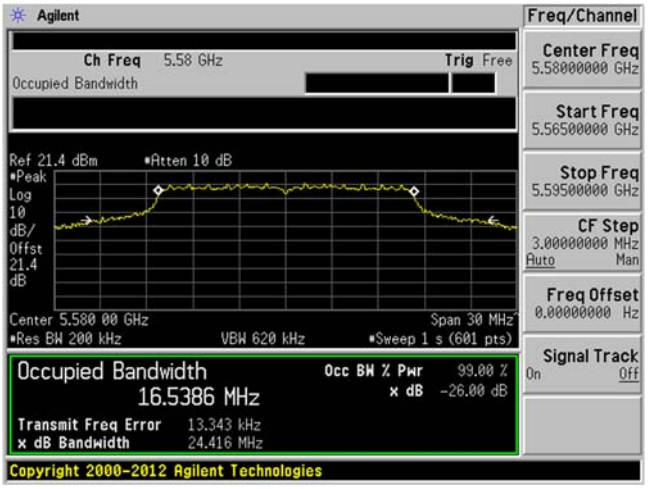
Low Channel ANT J12



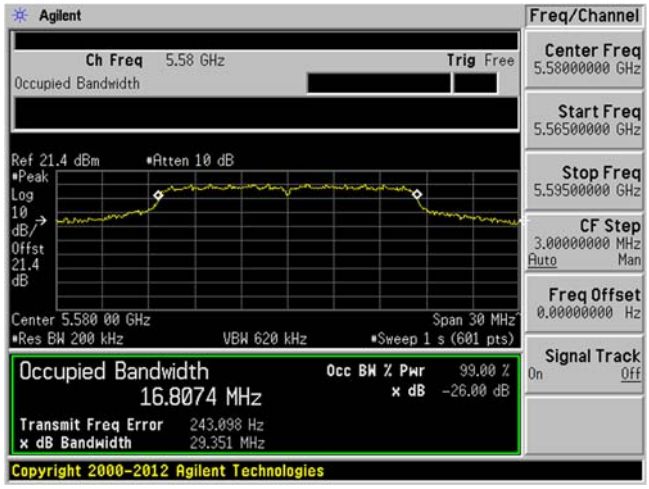
Low Channel ANT J15



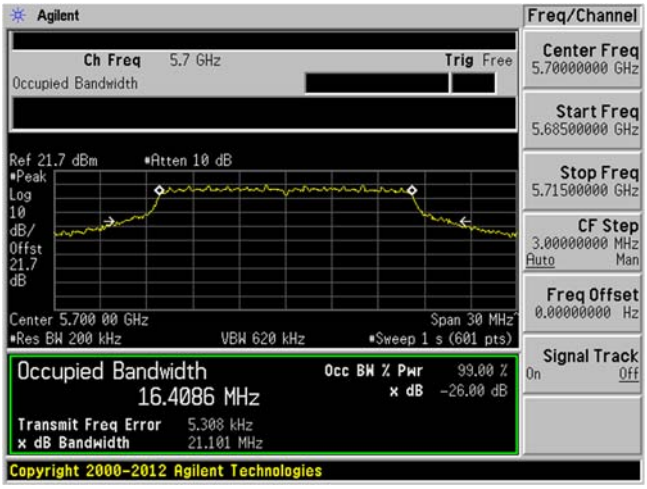
Mid Channel ANT J12



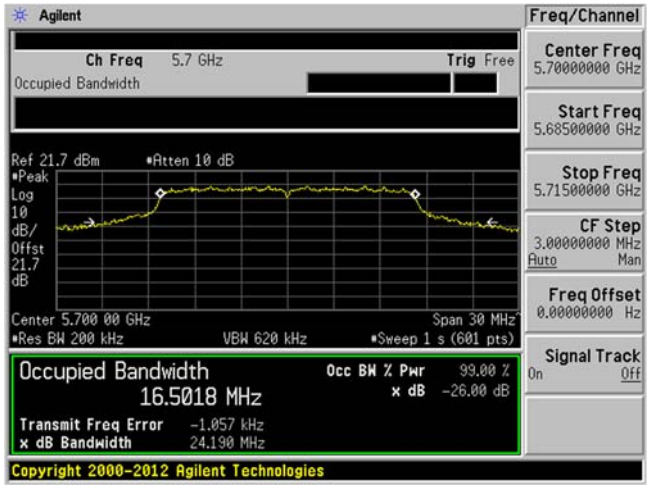
Mid Channel ANT J15



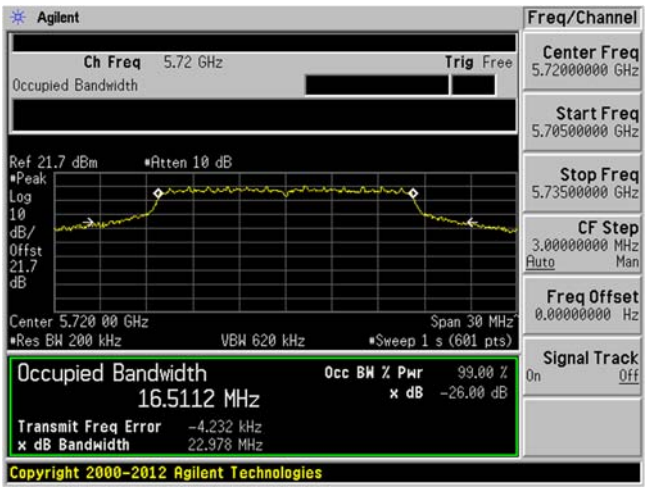
Second High Channel ANT J12



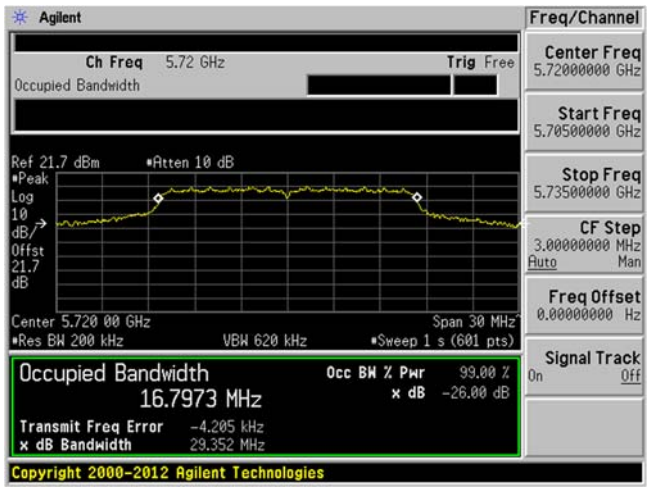
Second High Channel ANT J15



High Channel ANT J12

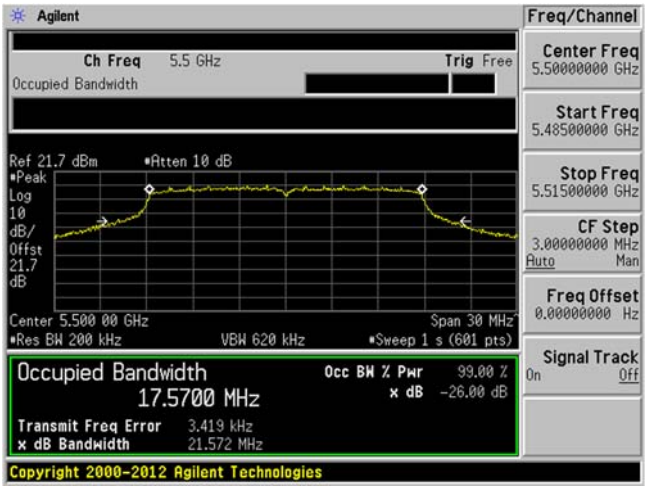


High Channel ANT J15

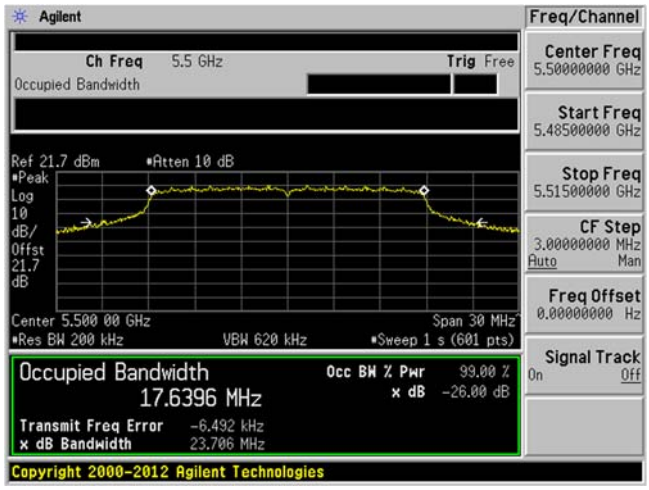


802.11ac20 Mode

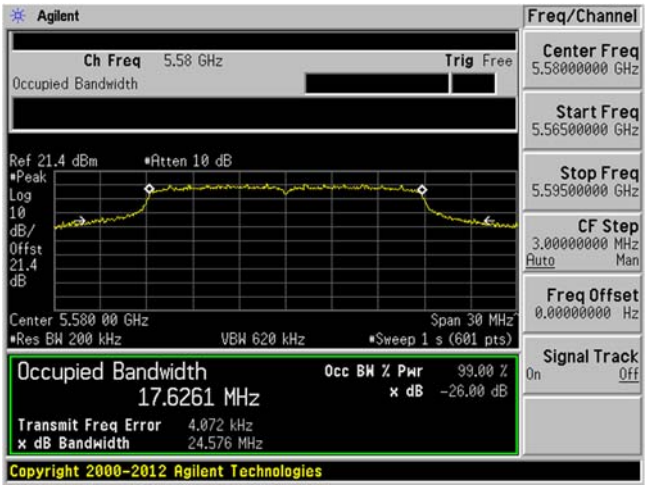
Low Channel ANT J12



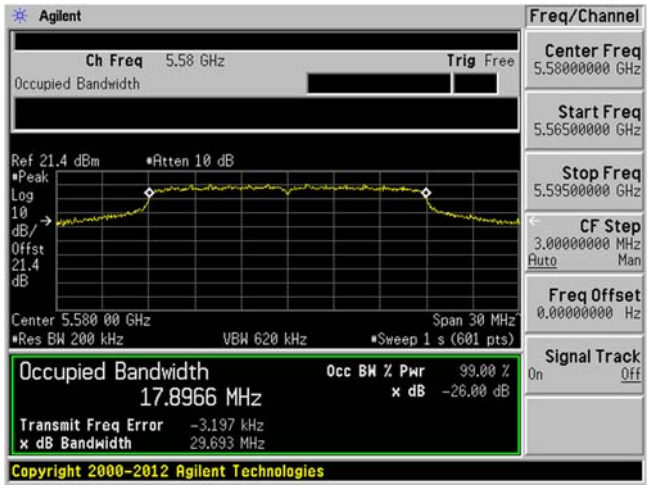
Low Channel ANT J15



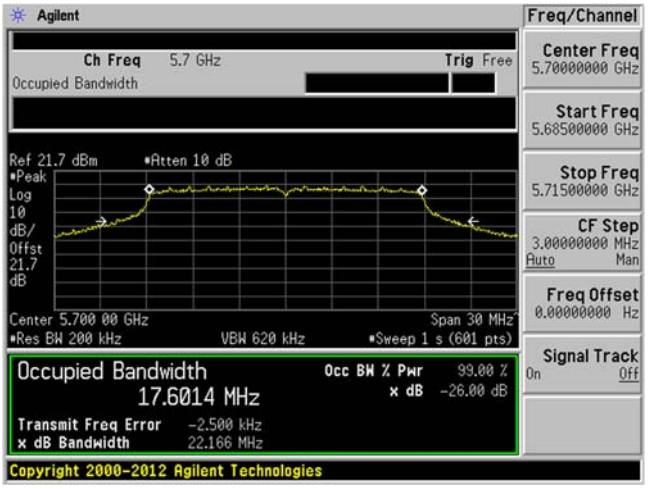
Mid Channel ANT J12



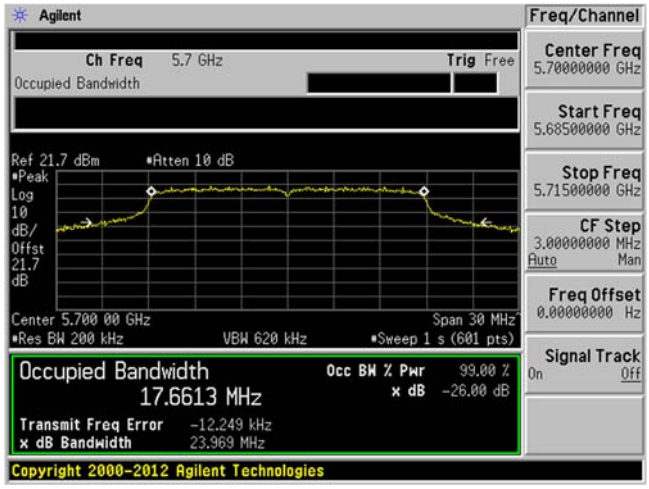
Mid Channel ANT J15



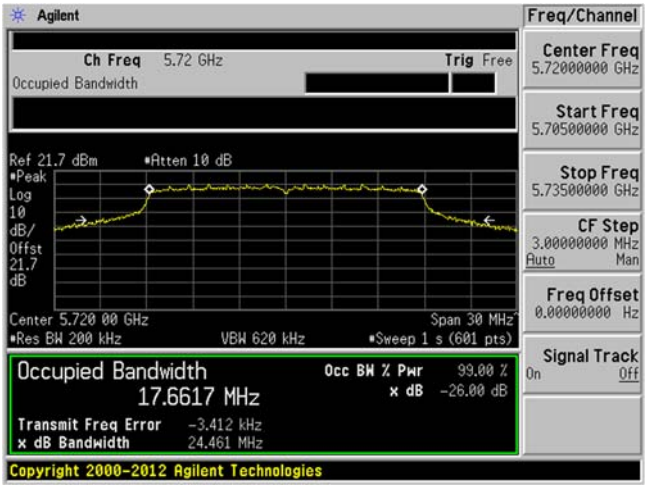
Second High Channel ANT J12



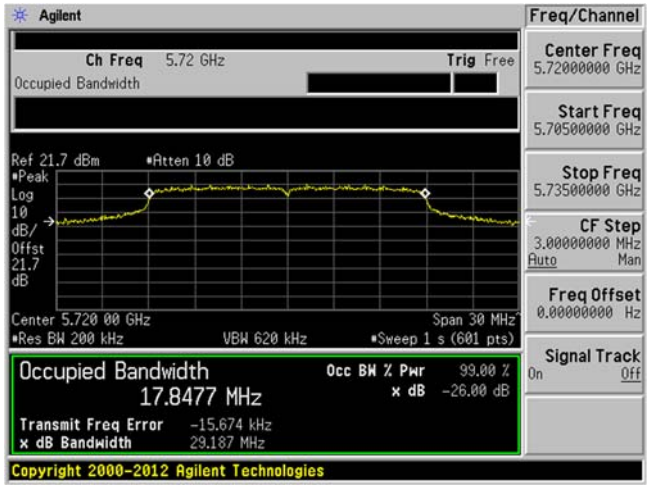
Second High Channel ANT J15



High Channel ANT J12

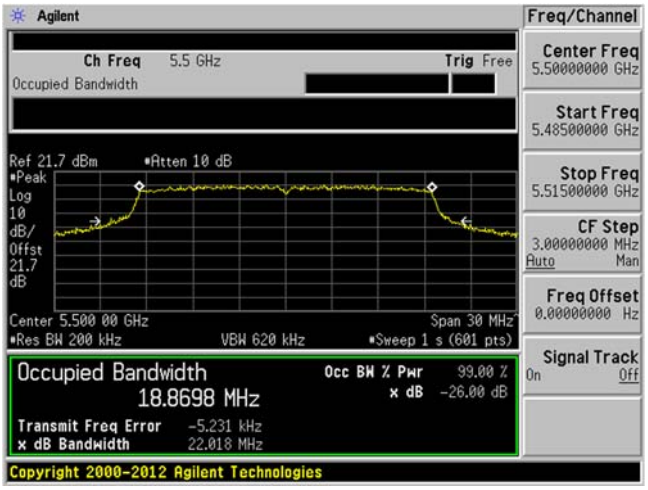


High Channel ANT J15

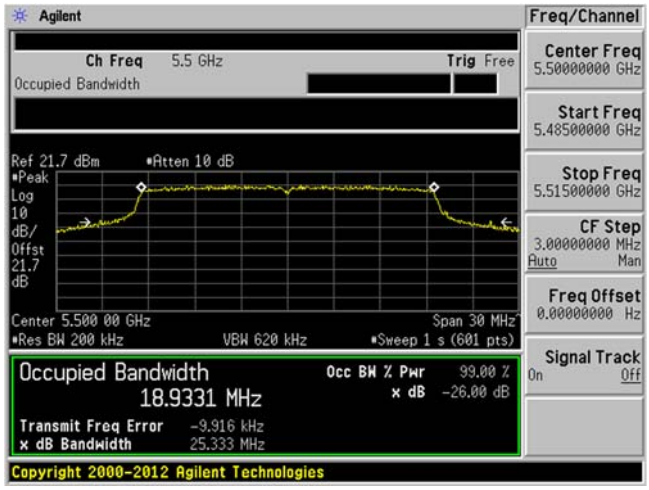


802.11ax20 Mode

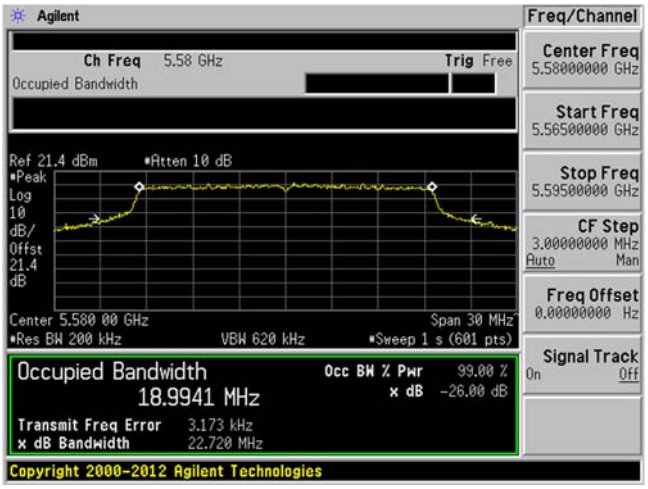
Low Channel ANT J12



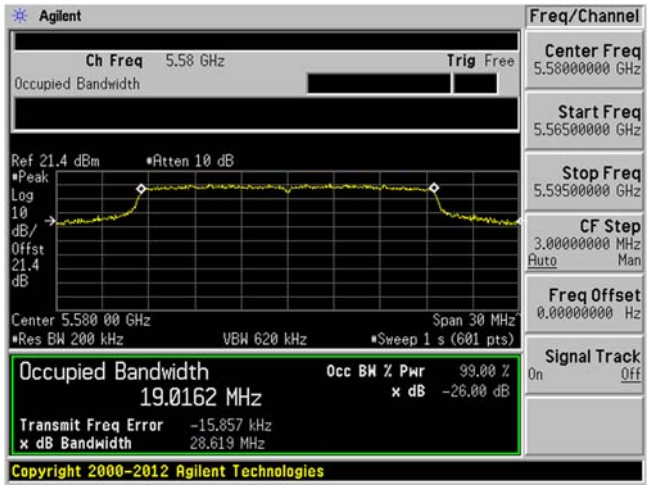
Low Channel ANT J15



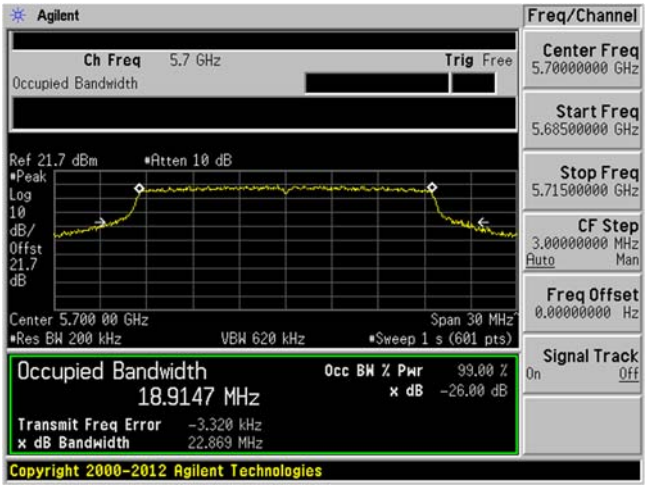
Mid Channel ANT J12



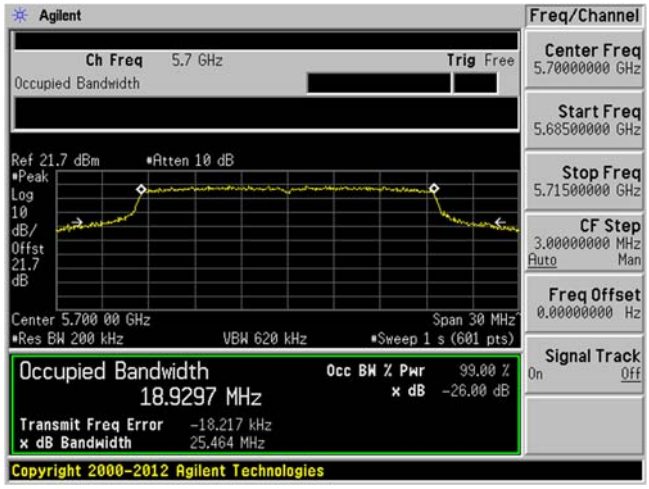
Mid Channel ANT J15



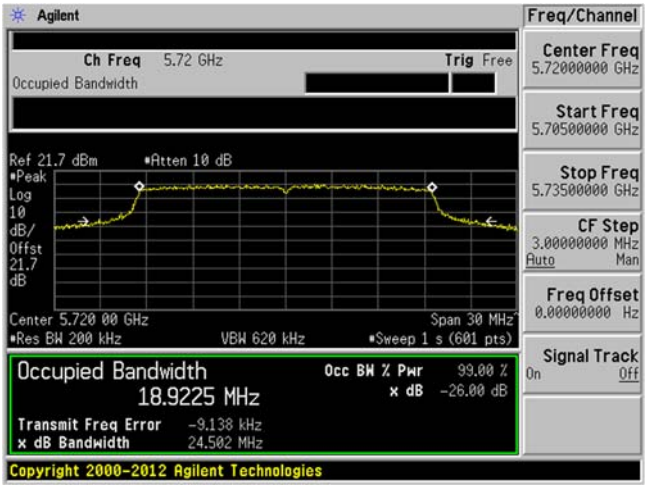
Second High Channel ANT J12



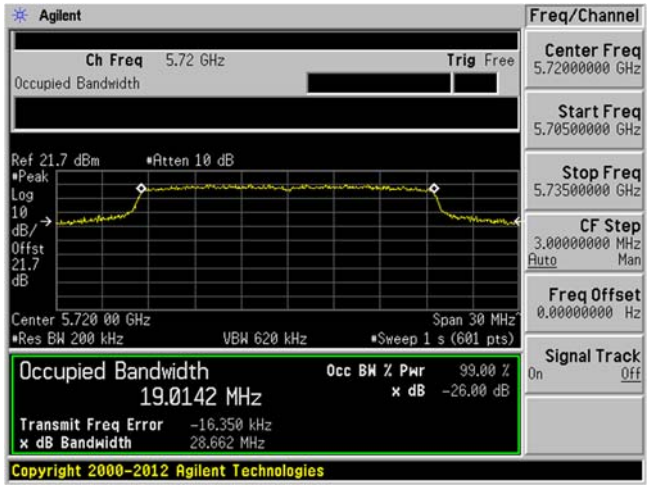
Second High Channel ANT J15



High Channel ANT J12

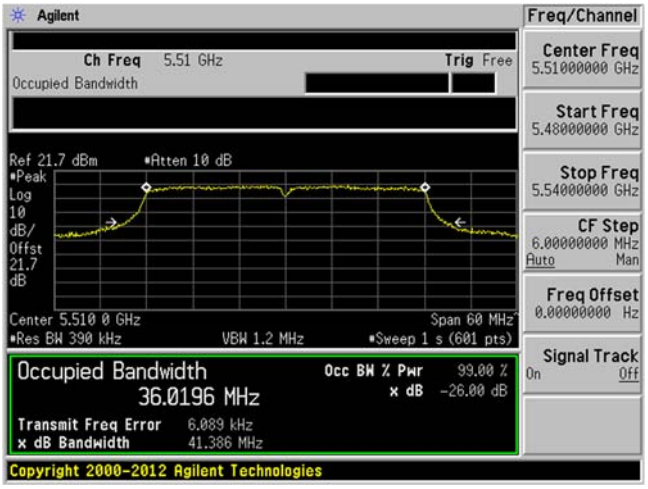


High Channel ANT J15

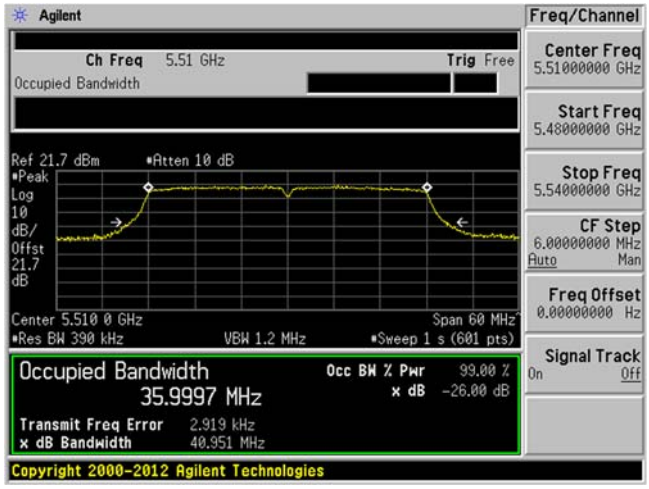


802.11ac40 Mode

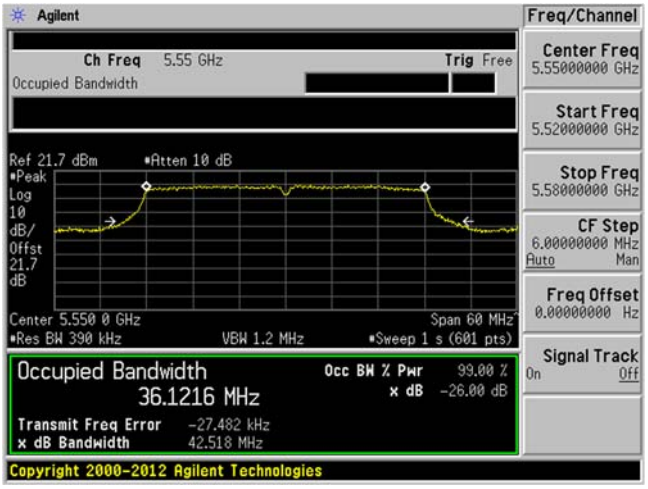
Low Channel ANT J12



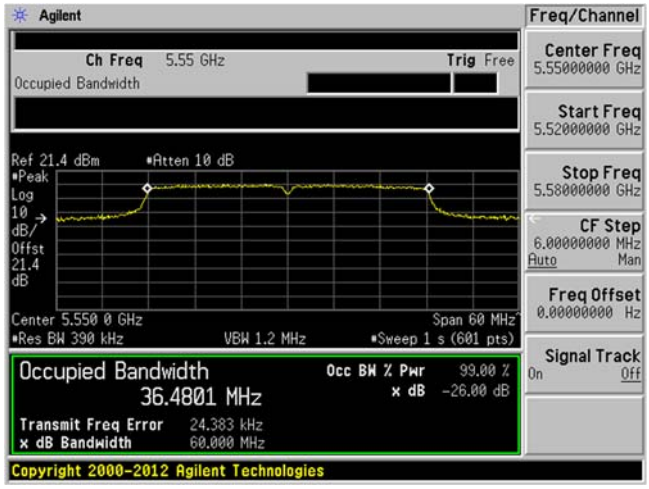
Low Channel ANT J15



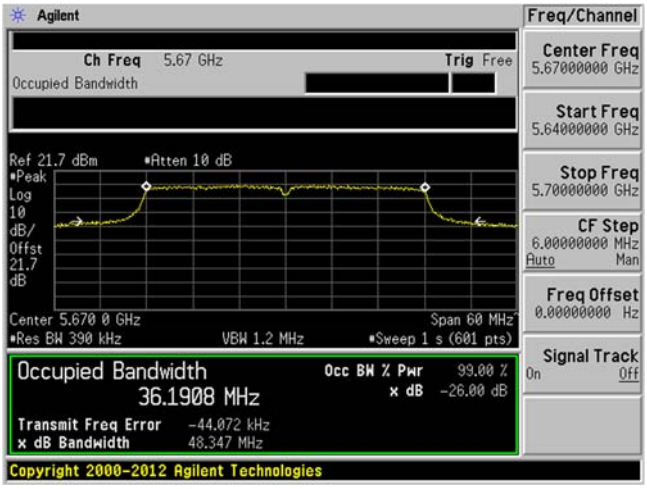
Mid Channel ANT J12



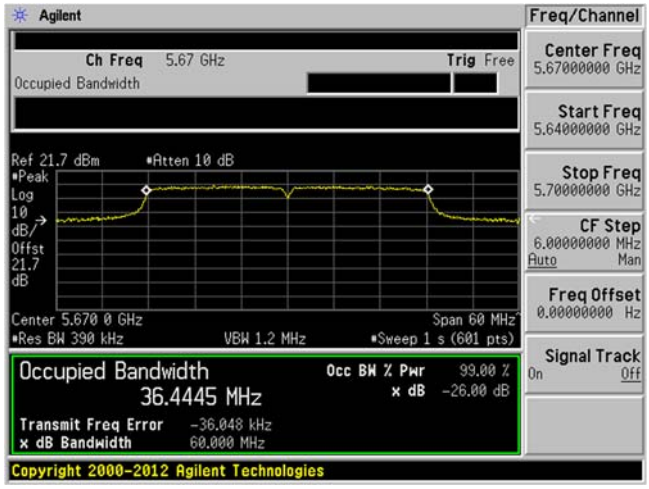
Mid Channel ANT J15



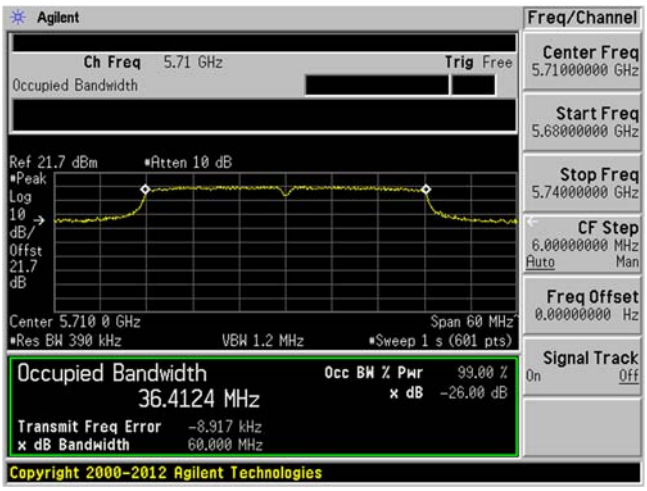
Second High Channel ANT J12



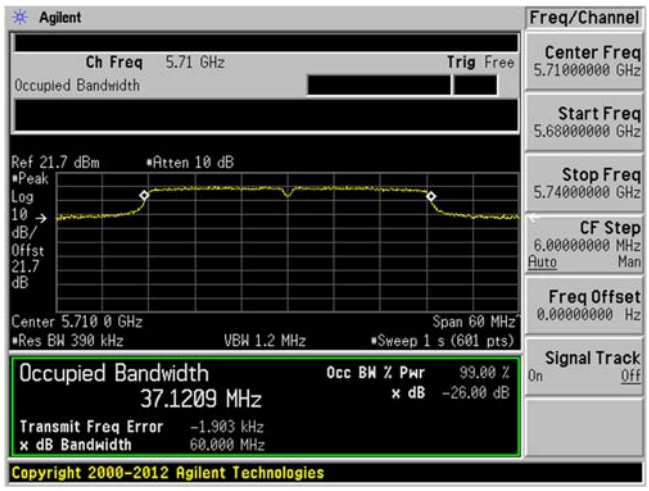
Second High Channel ANT J15



High Channel ANT J12

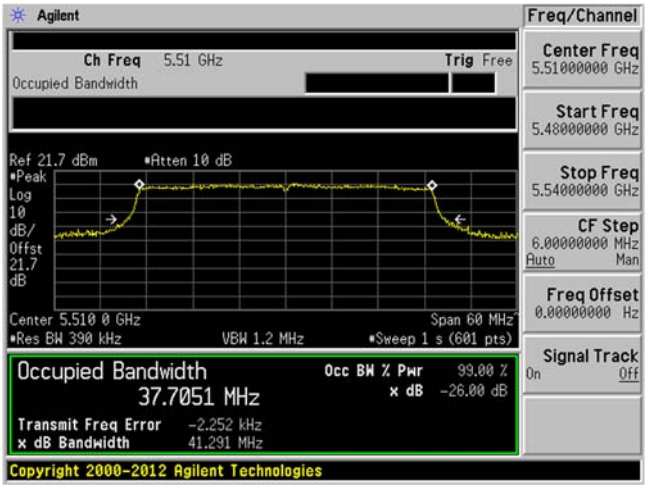


High Channel ANT J15

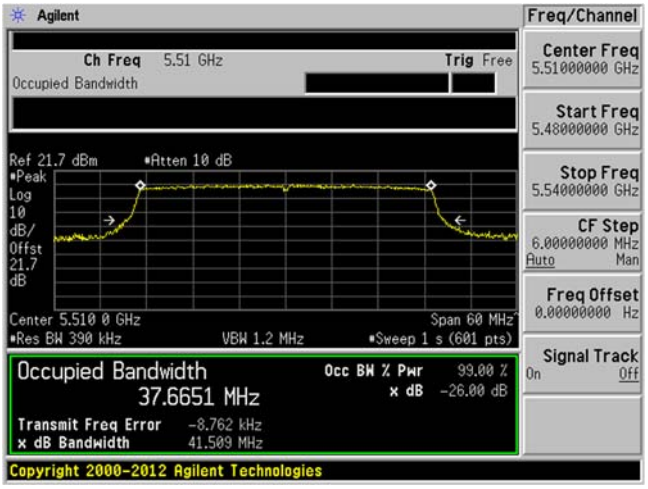


802.11ax40 Mode

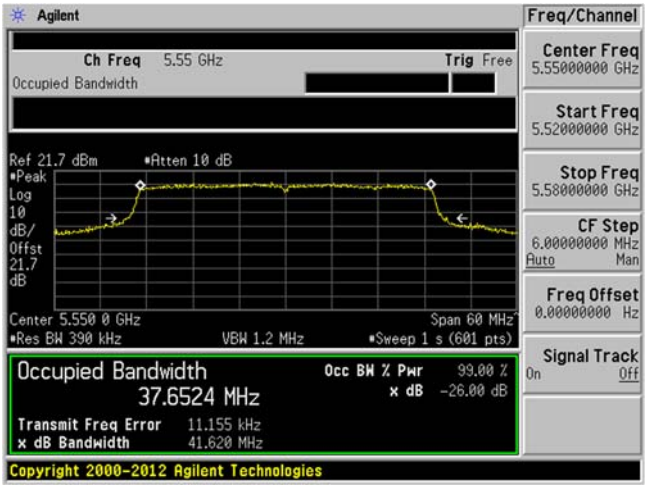
Low Channel ANT J12



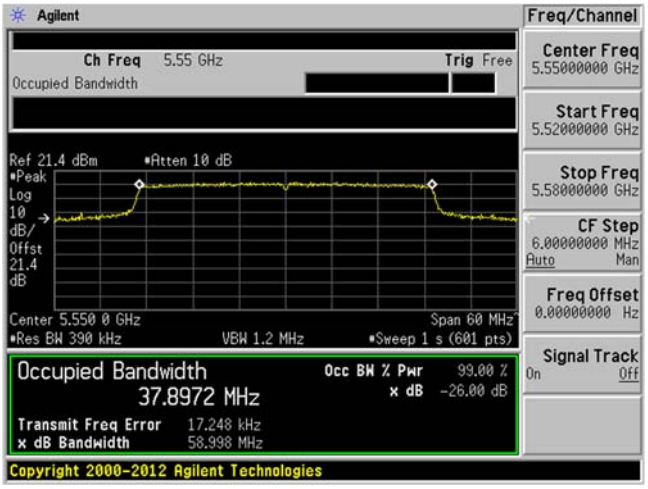
Low Channel ANT J15



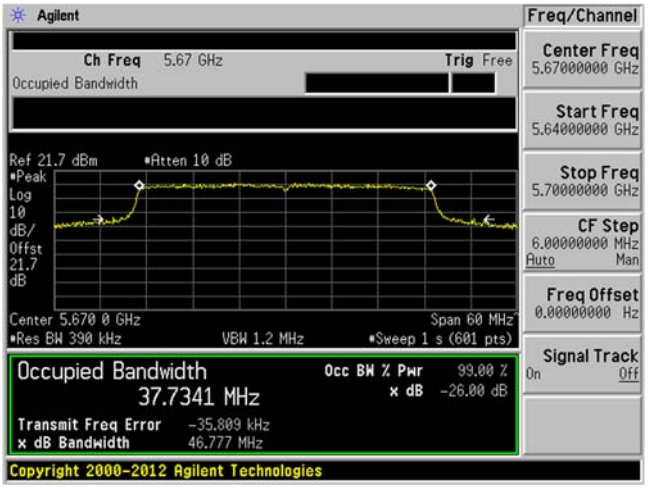
Mid Channel ANT J12



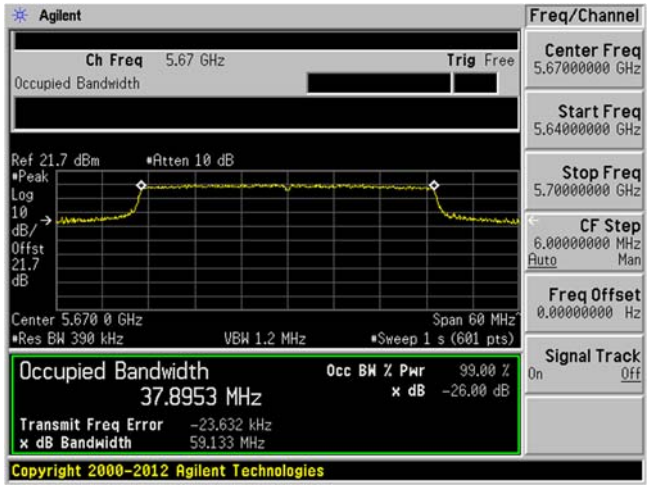
Mid Channel ANT J15



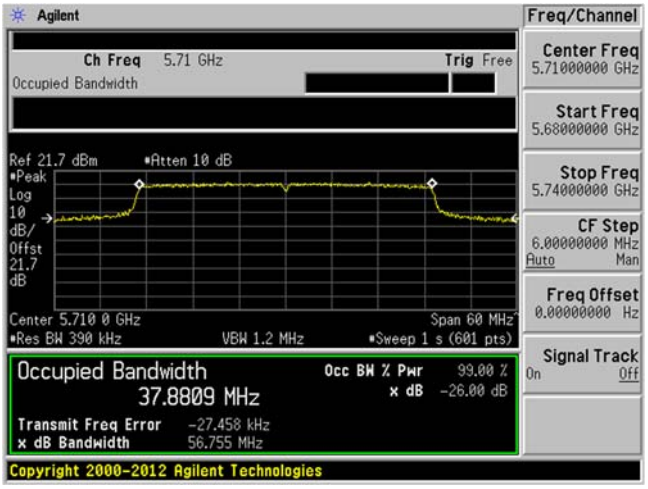
Second High Channel ANT J12



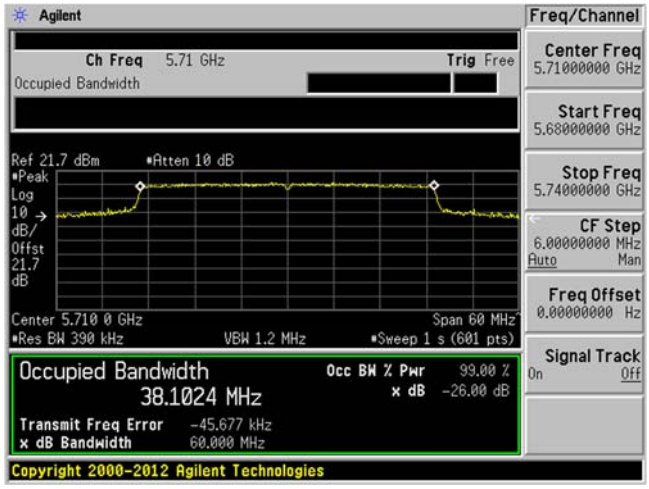
Second High Channel ANT J15



High Channel ANT J12

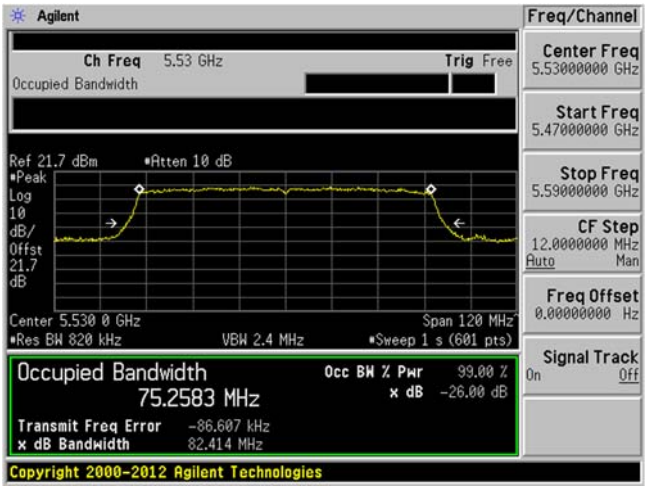


High Channel ANT J15

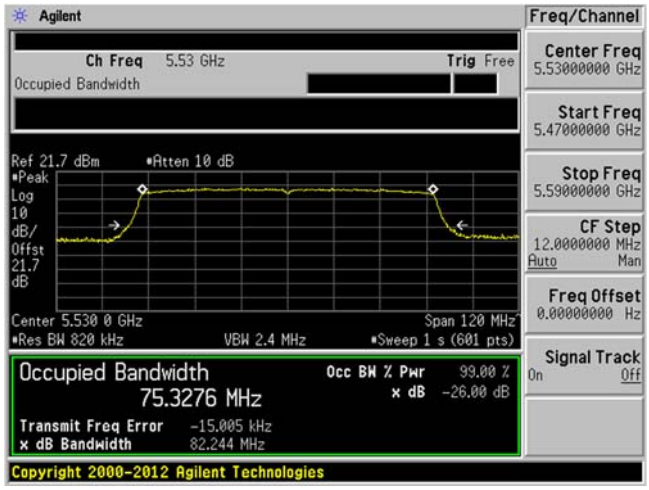


802.11ac80 Mode

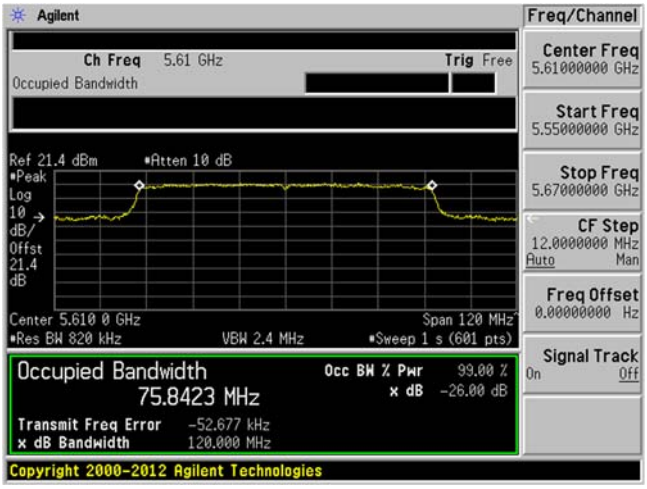
Low Channel ANT J12



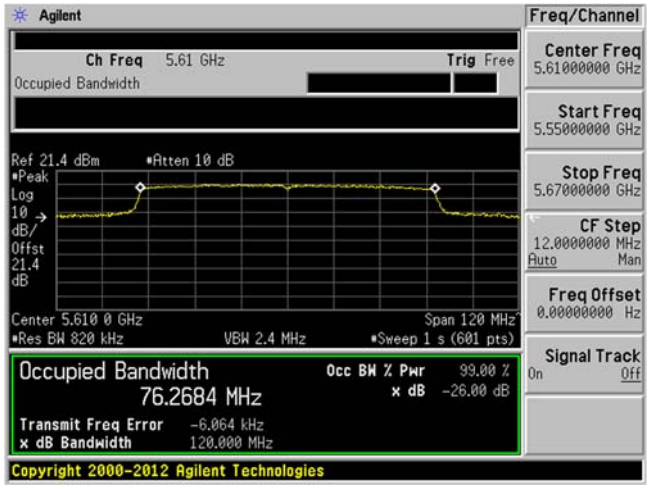
Low Channel ANT J15



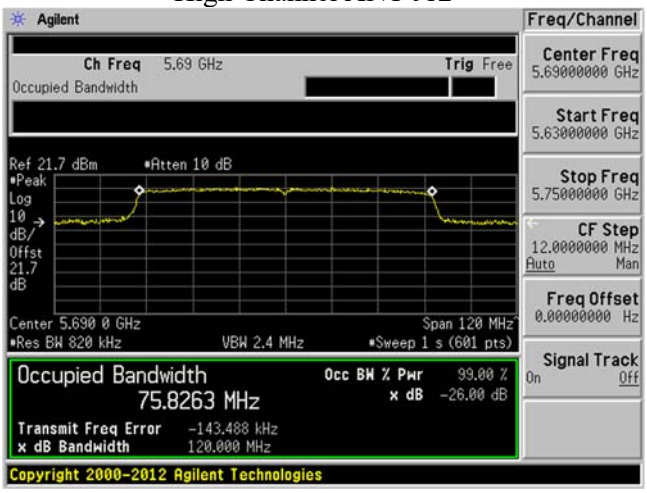
Mid Channel ANT J12



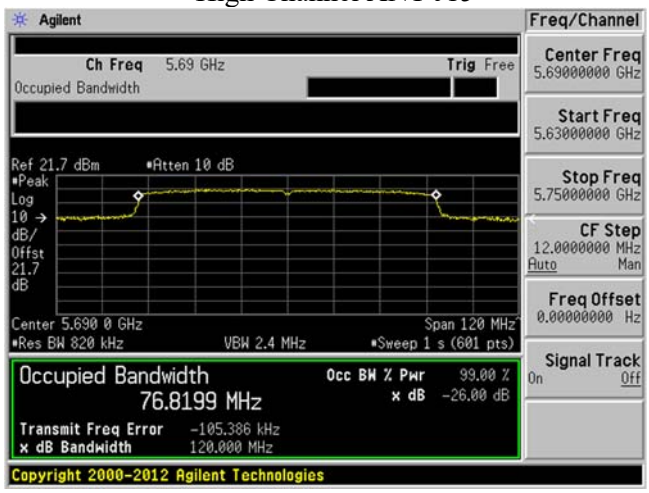
Mid Channel ANT J15



High Channel ANT J12

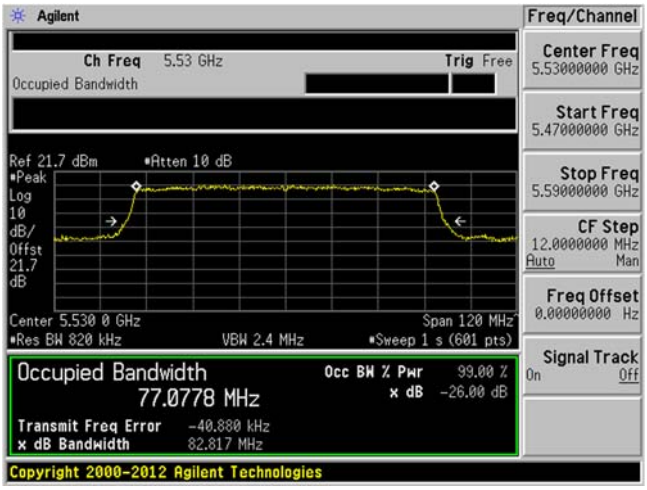


High Channel ANT J15

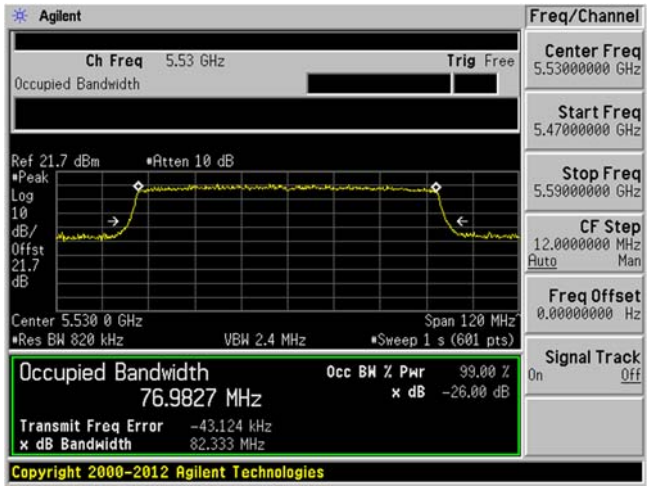


802.11ax80 Mode

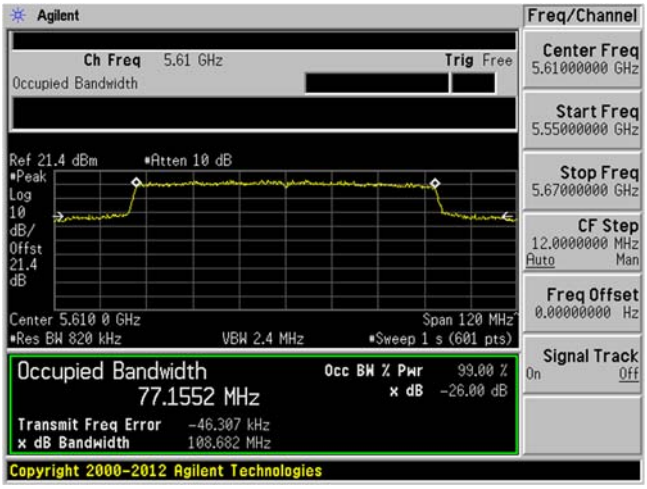
Low Channel ANT J12



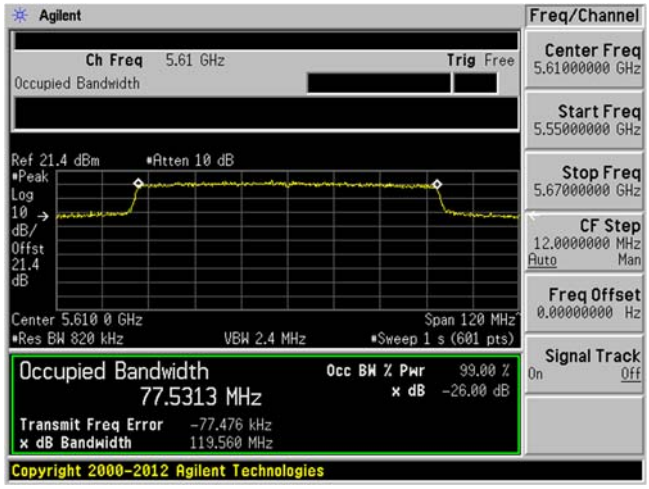
Low Channel ANT J15



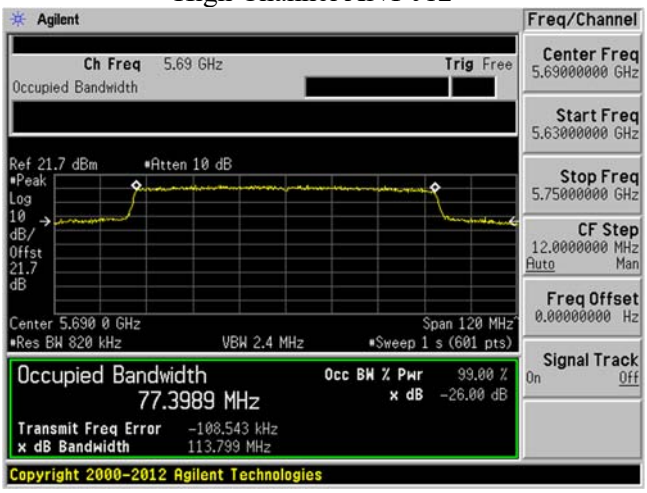
Mid Channel ANT J12



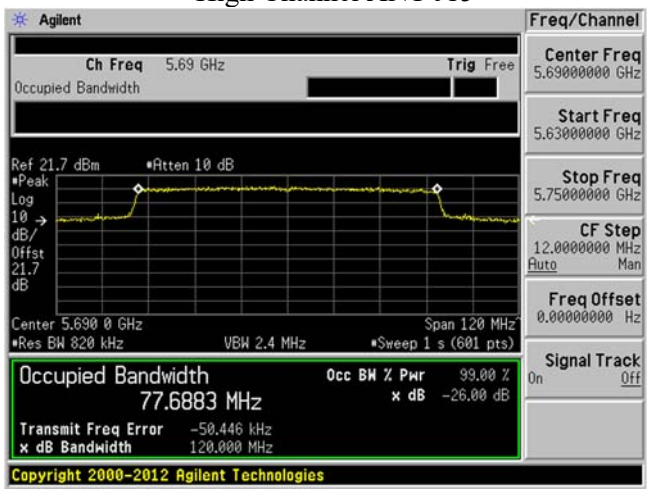
Mid Channel ANT J15



High Channel ANT J12



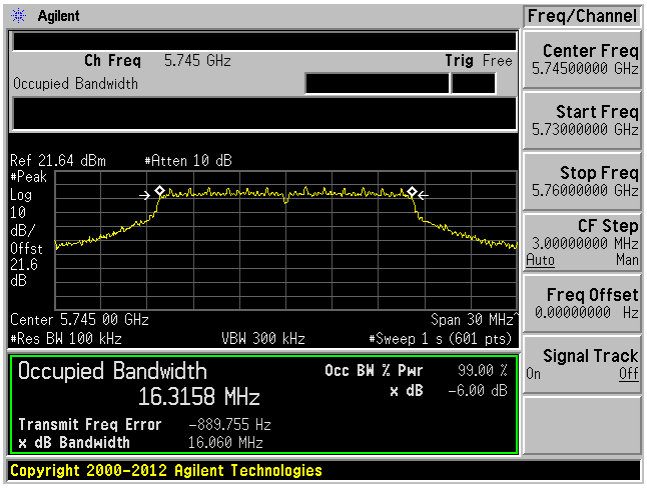
High Channel ANT J15



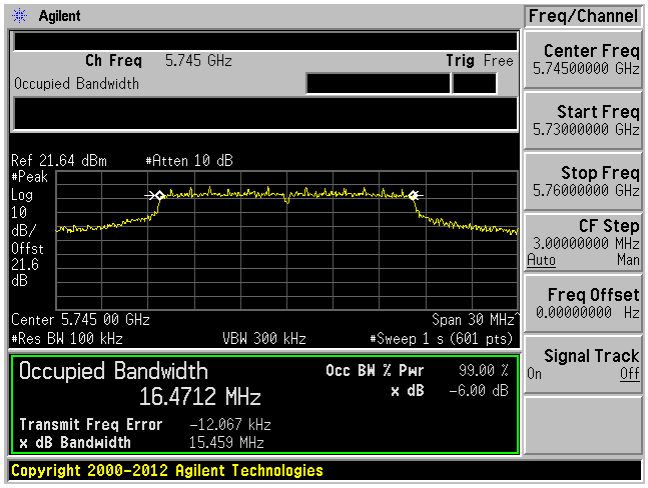
5725 - 5850 MHz

802.11a Mode

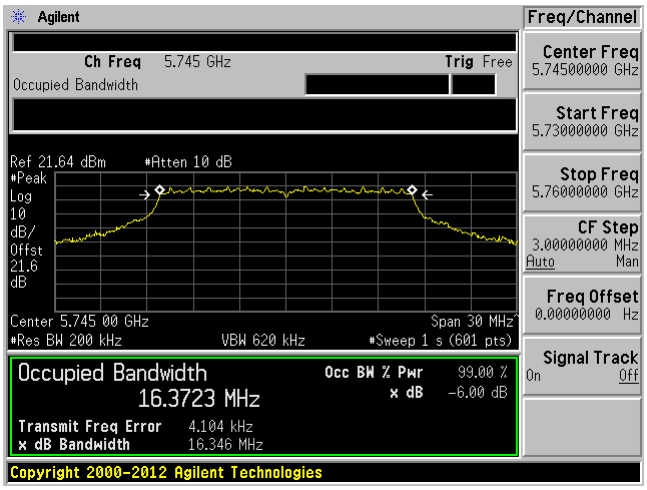
Low Channel 6 dB OBW ANT J12



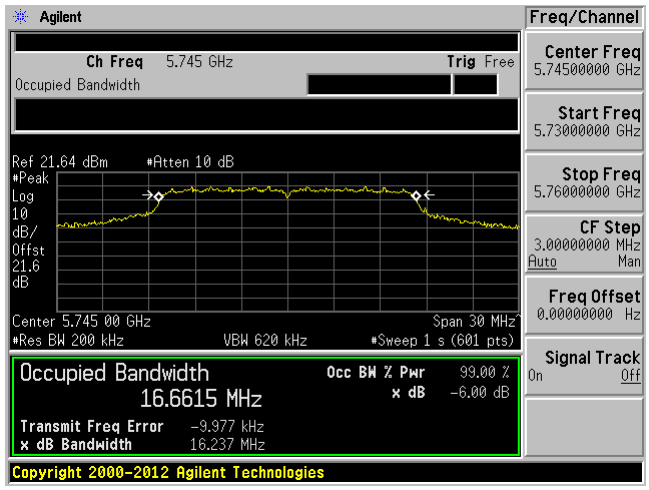
Low Channel 6 dB OBW ANT J15



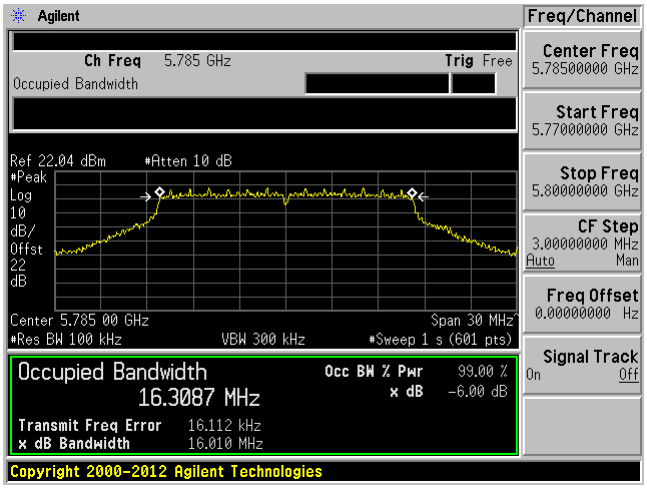
Low Channel 99% dB OBW ANT J12



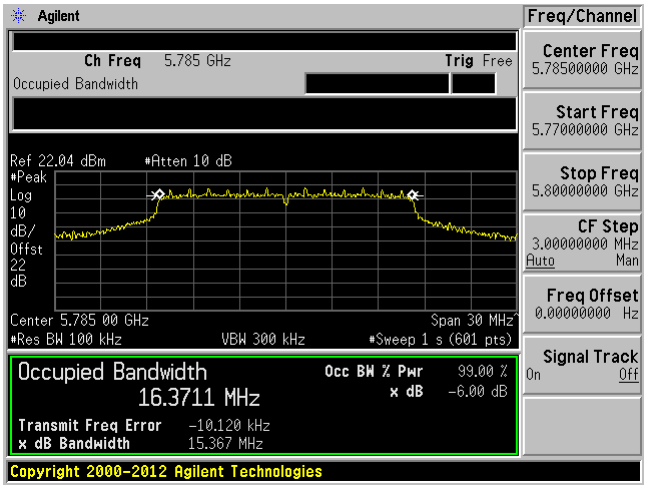
Low Channel 99% dB OBW ANT J15



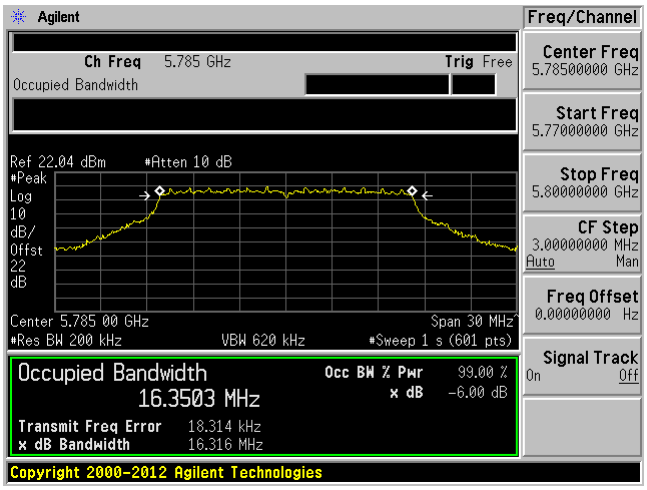
Middle Channel 6 dB OBW ANT J12



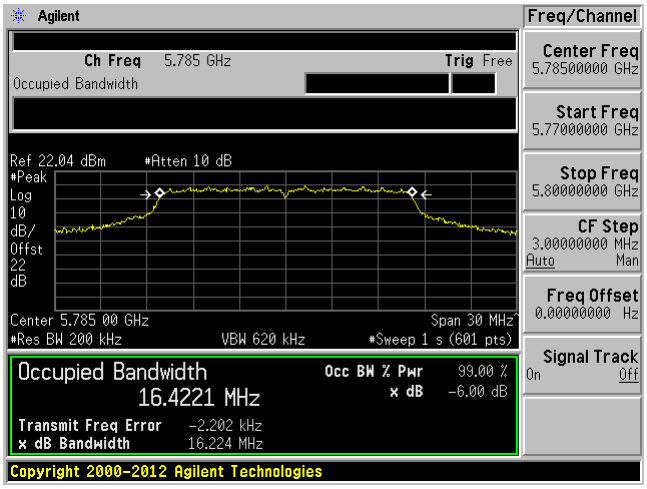
Middle Channel 6 dB OBW ANT J15



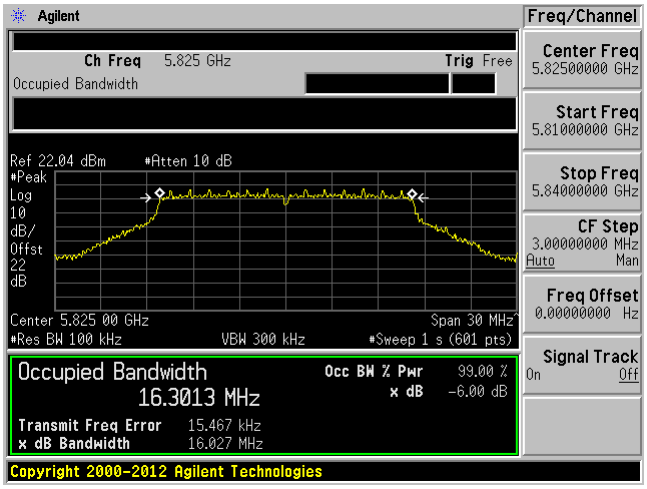
Middle Channel 99% dB OBW ANT J12



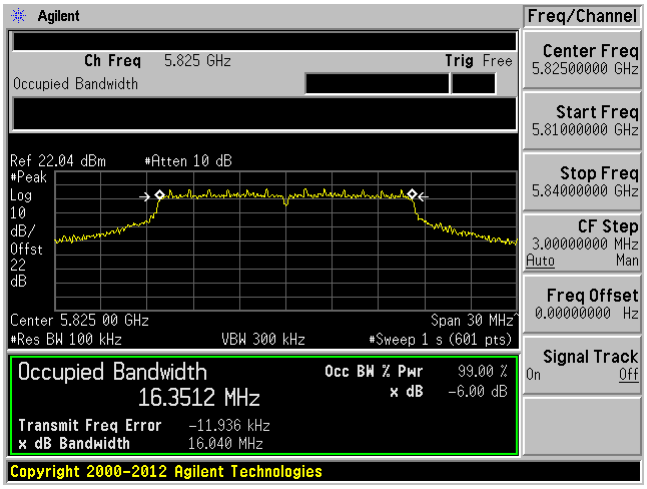
Middle Channel 99% dB OBW ANT J15



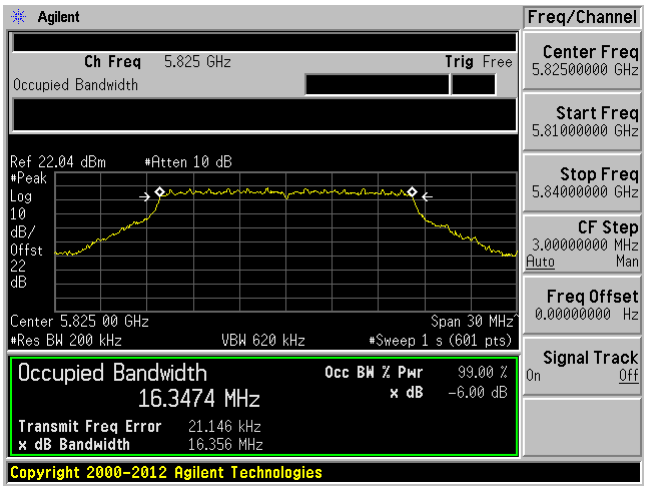
High Channel 6 dB OBW ANT J12



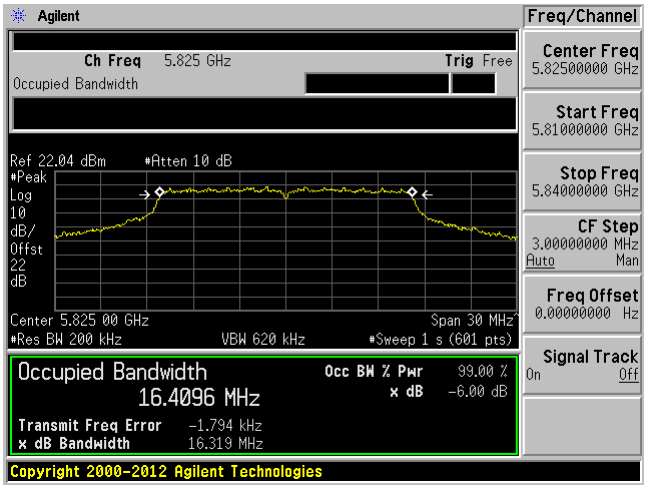
High Channel 6 dB OBW ANT J15



High Channel 99% dB OBW ANT J12

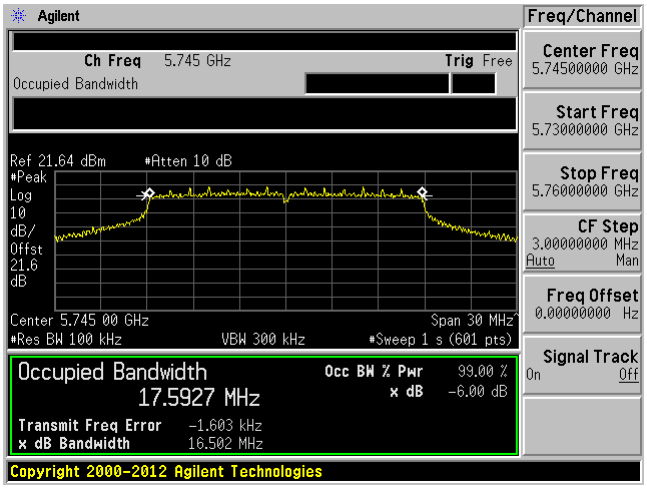


High Channel 99% dB OBW ANT J15



802.11ac20 Mode

Low Channel 6 dB OBW ANT J12



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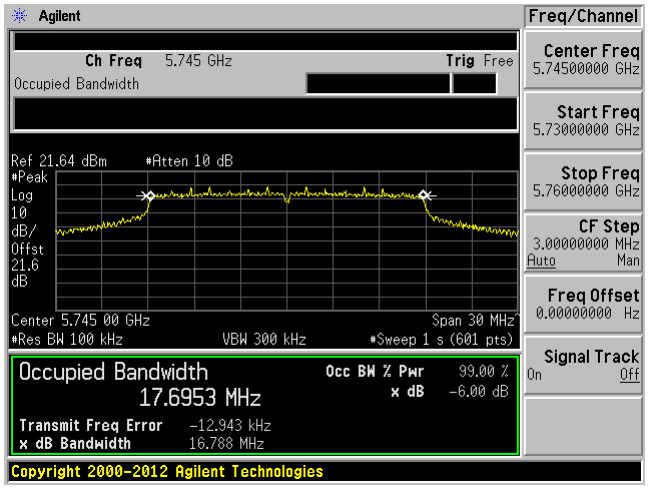

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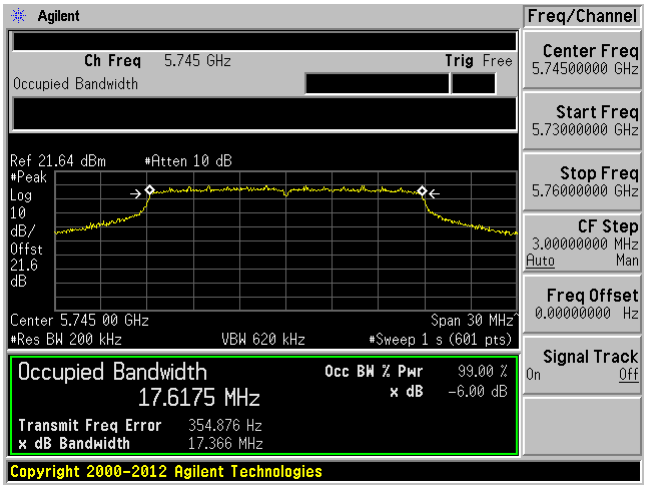

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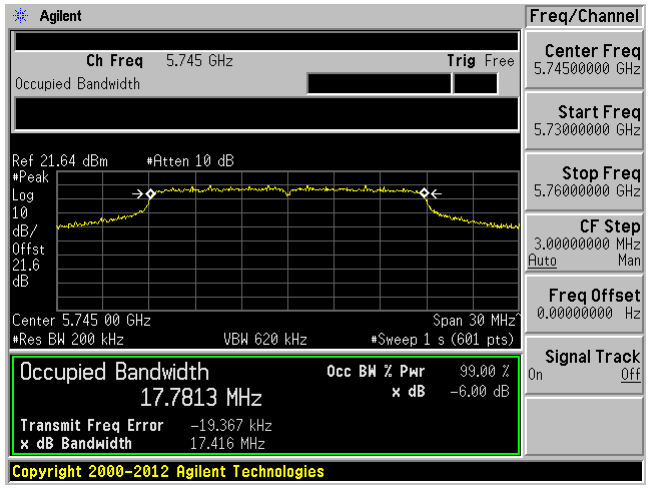
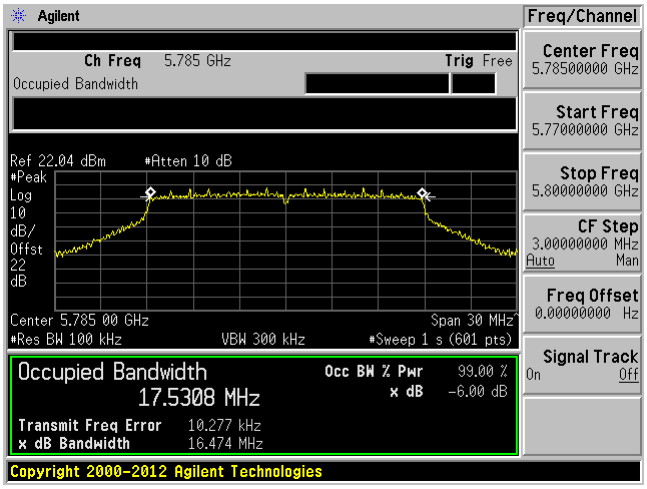
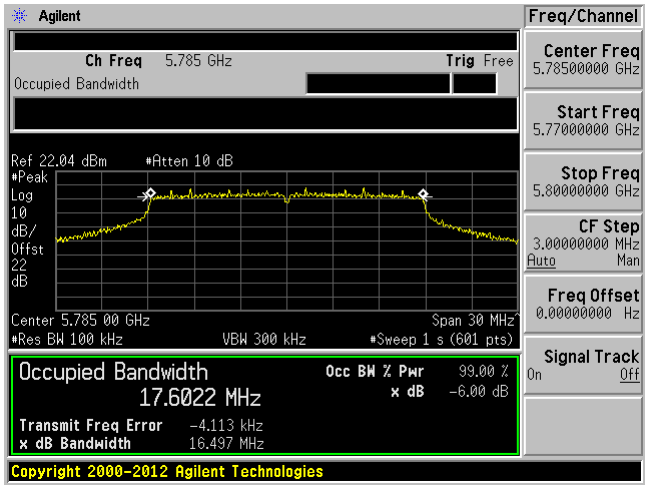


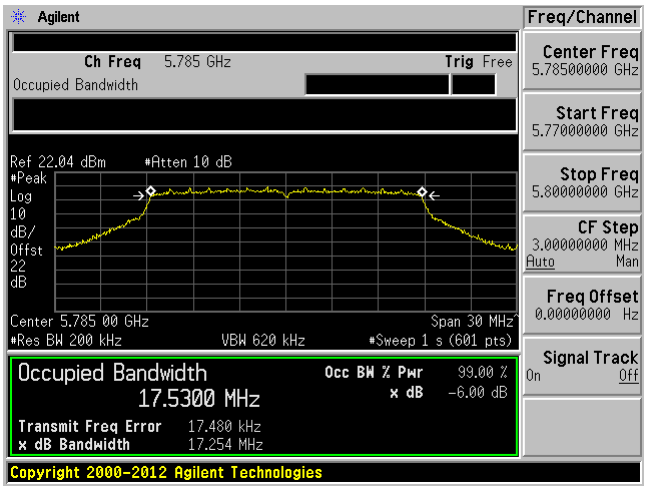
Middle Channel 6 dB OBW ANT J12



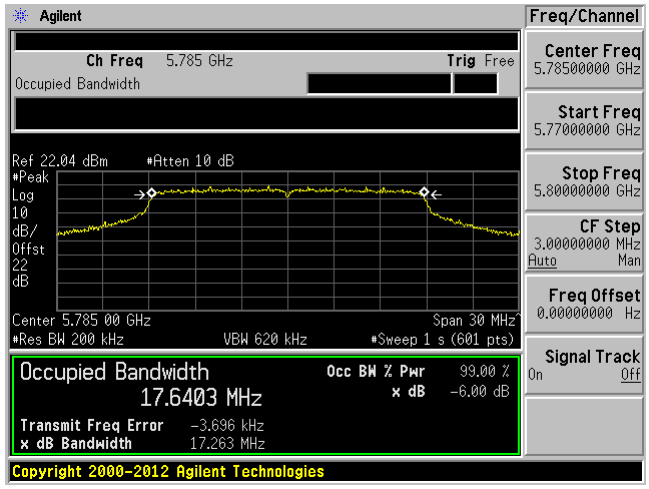
Middle Channel 6 dB OBW ANT J15



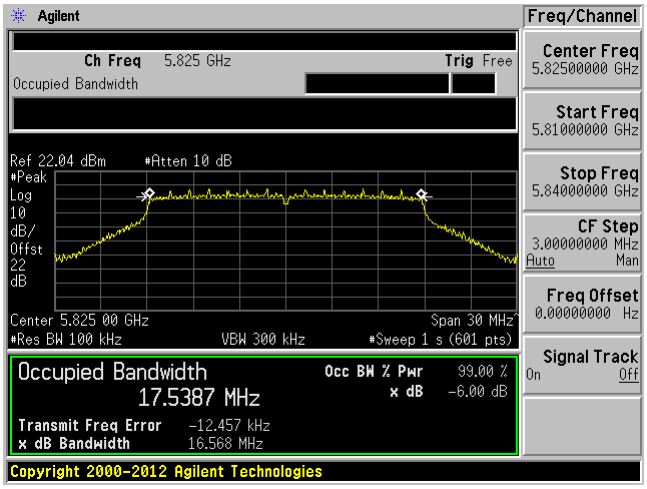
Middle Channel 99% dB OBW ANT J12



Middle Channel 99% dB OBW ANT J15



High Channel 6 dB OBW ANT J12



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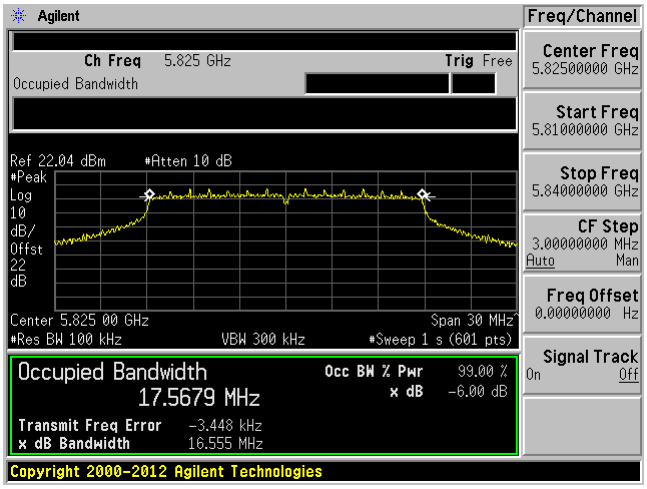

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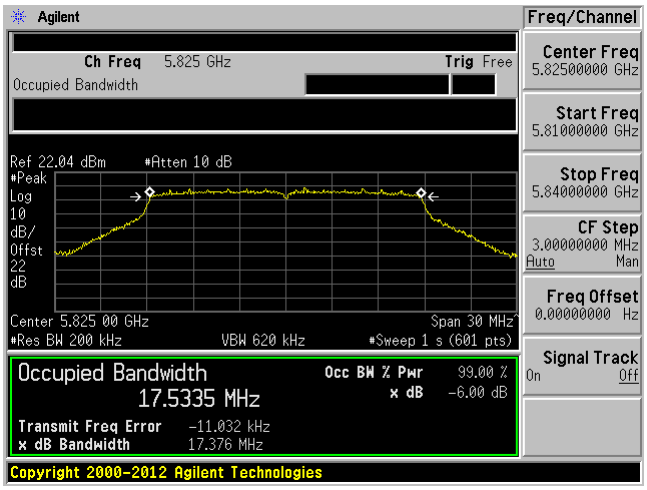
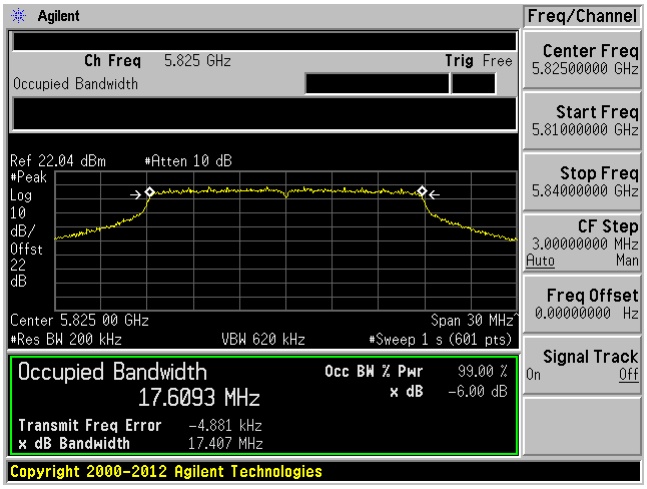
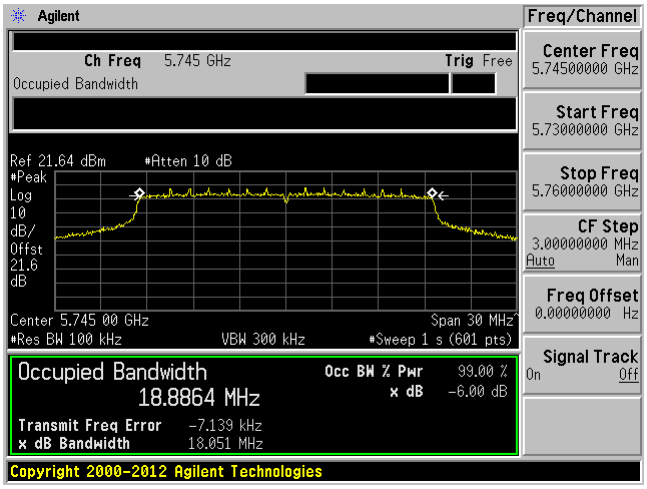


High Channel 99% dB OBW ANT J15

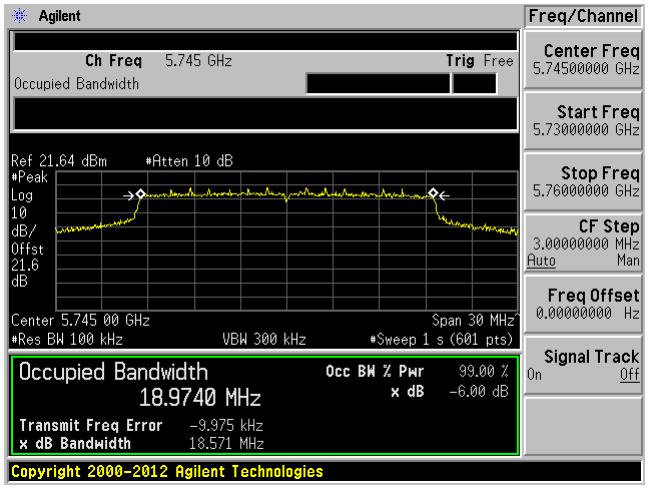


802.11ax20 Mode

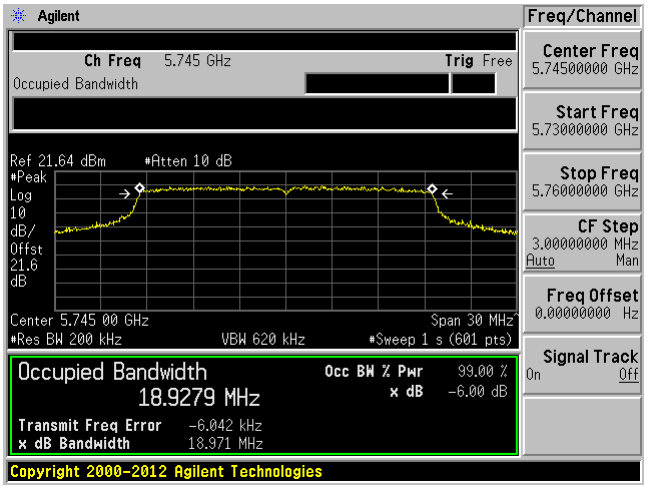
Low Channel 6 dB OBW ANT J12



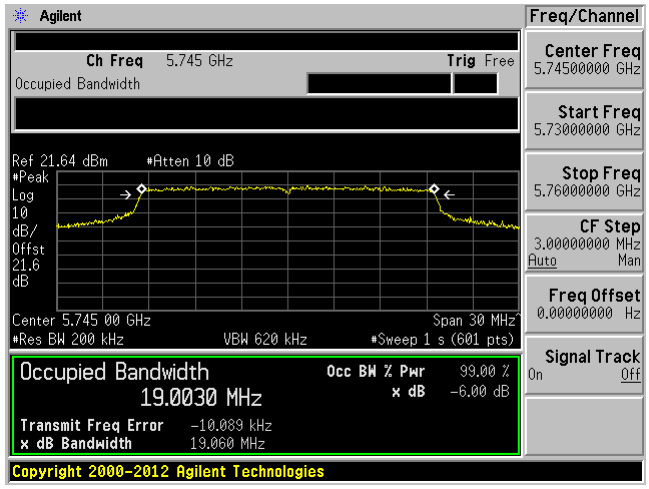
Low Channel 6 dB OBW ANT J15



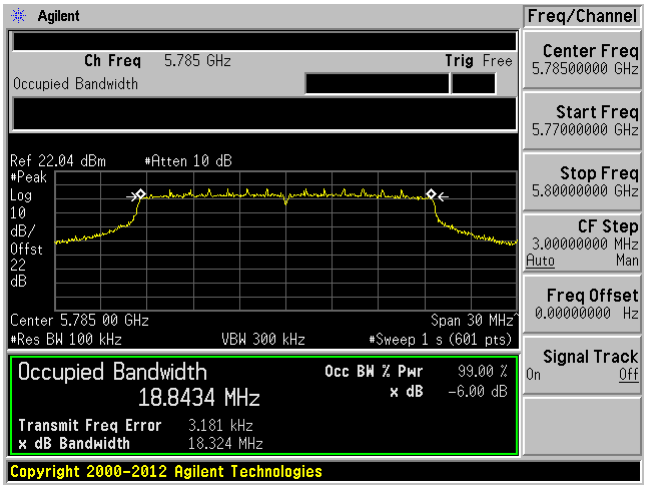
Low Channel 99% dB OBW ANT J12



Low Channel 99% dB OBW ANT J15



Middle Channel 6 dB OBW ANT J12



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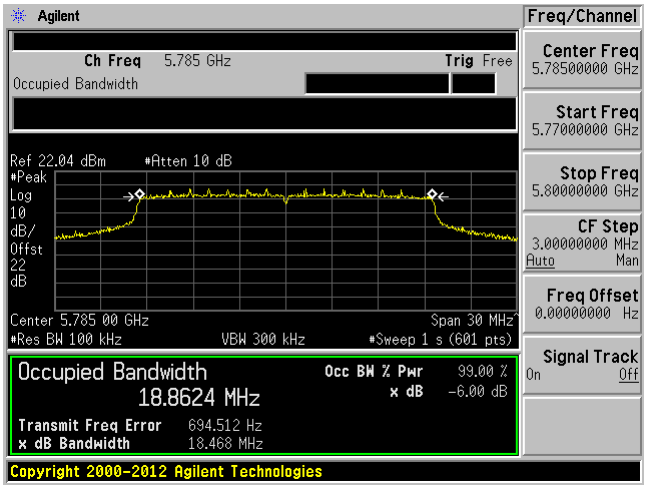
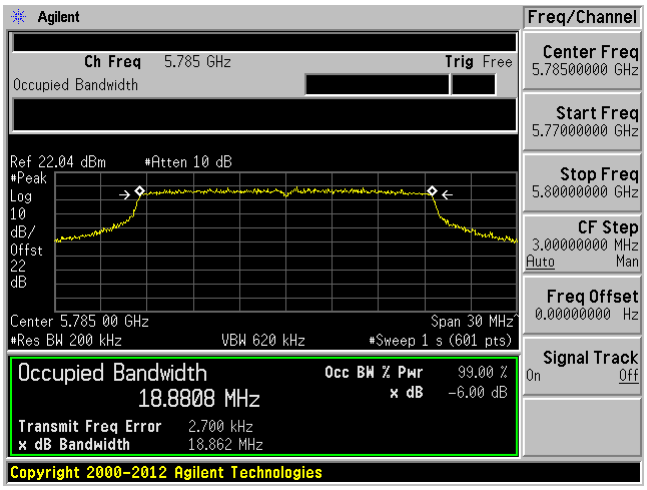
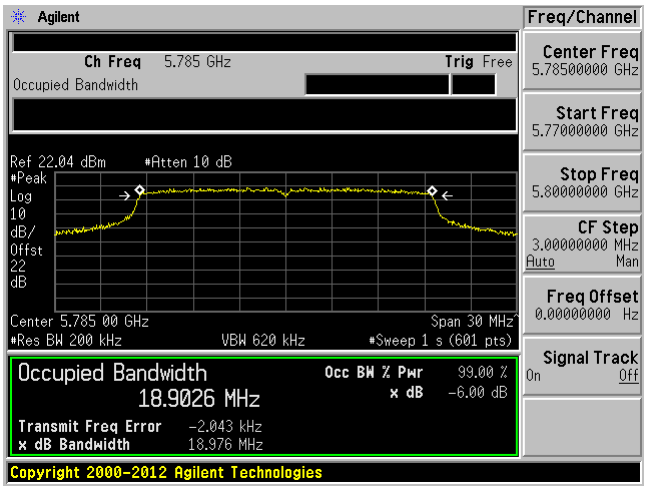


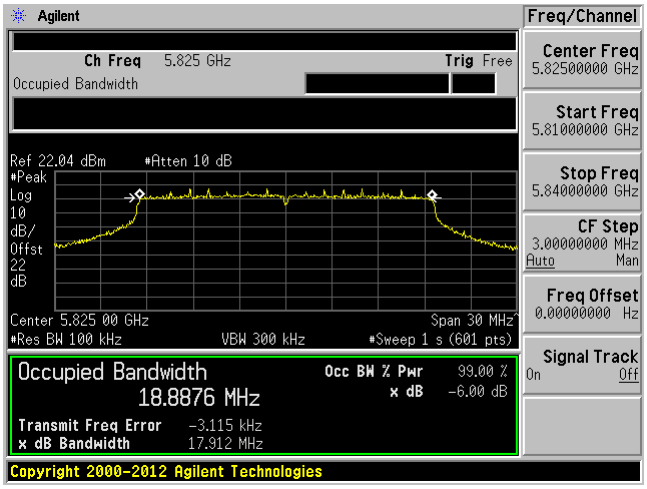
Middle Channel 99% dB OBW ANT J12



Middle Channel 99% dB OBW ANT J15



High Channel 6 dB OBW ANT J12



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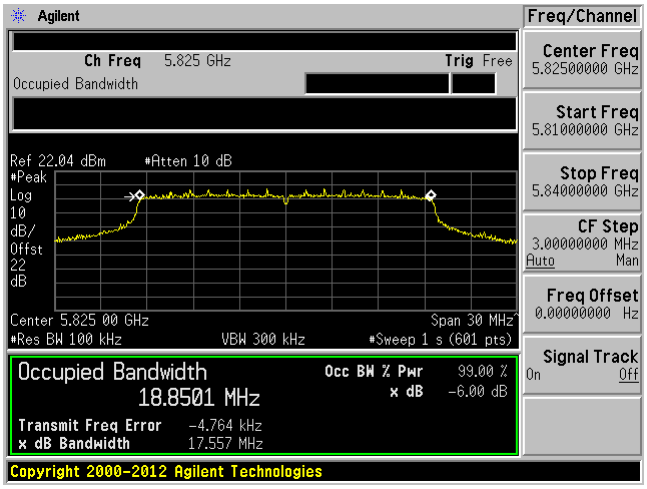

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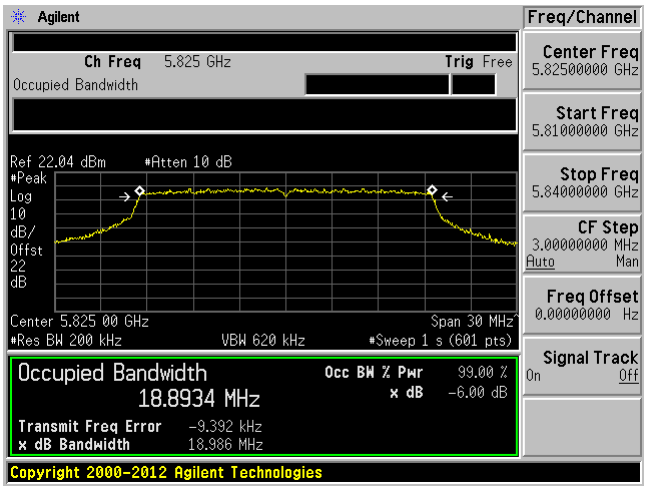
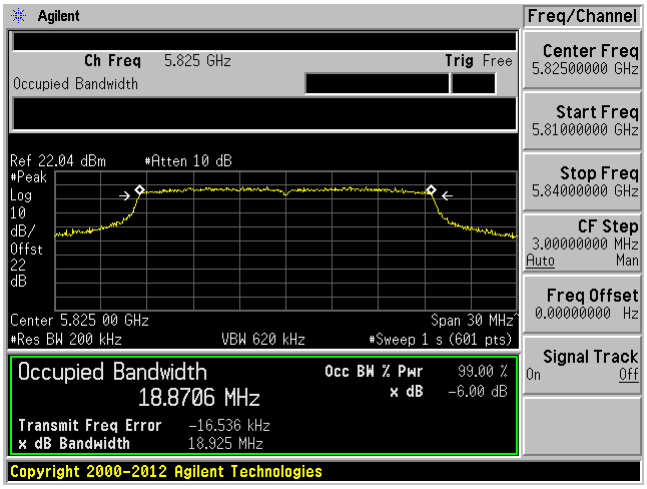
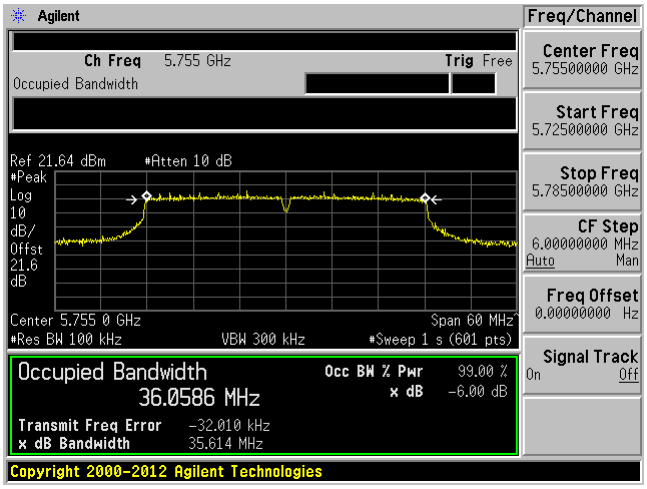


High Channel 99% dB OBW ANT J15

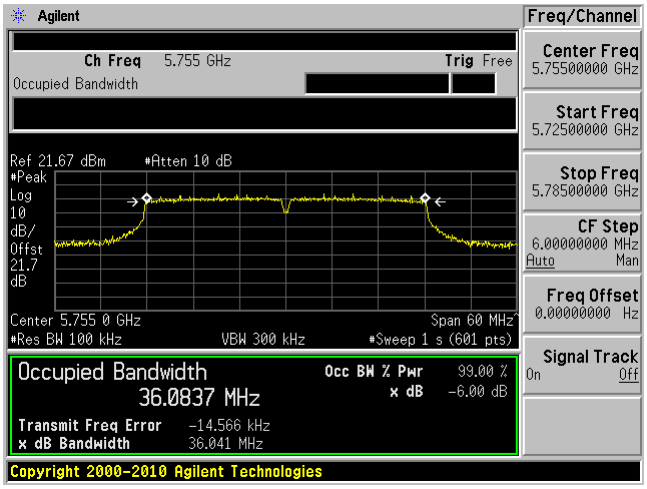


802.11ac40 Mode

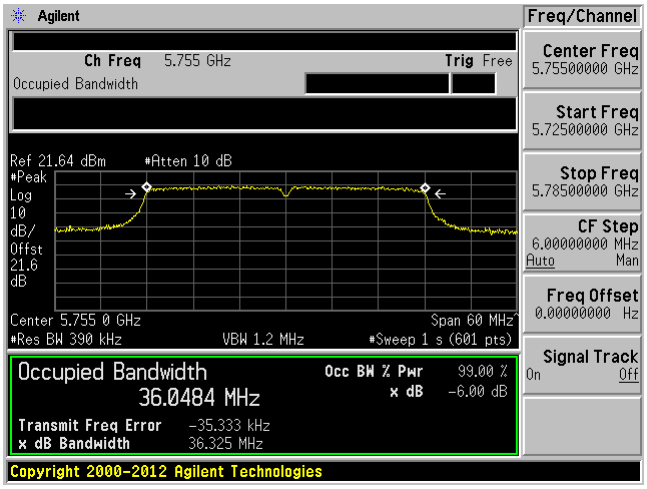
Low Channel 6 dB OBW ANT J12



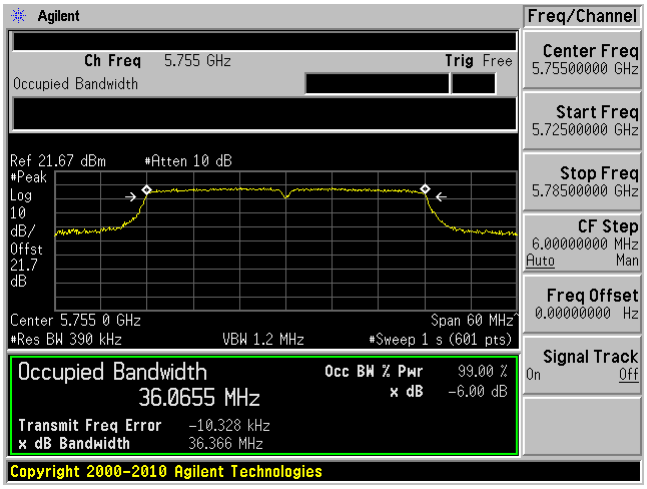
Low Channel 6 dB OBW ANT J15



Low Channel 99% dB OBW ANT J12



Low Channel 99% dB OBW ANT J15



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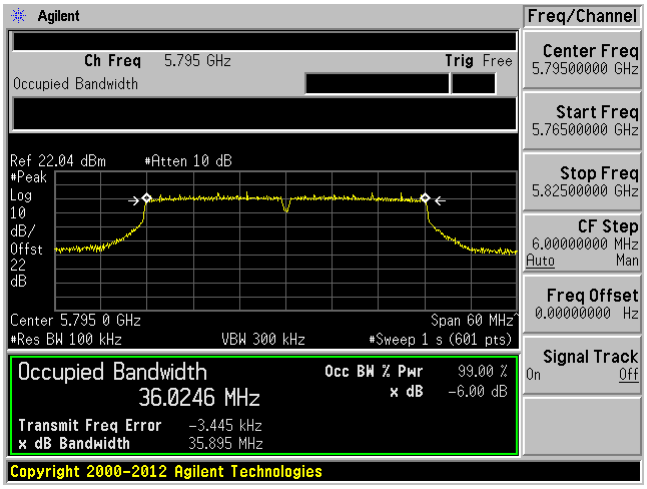
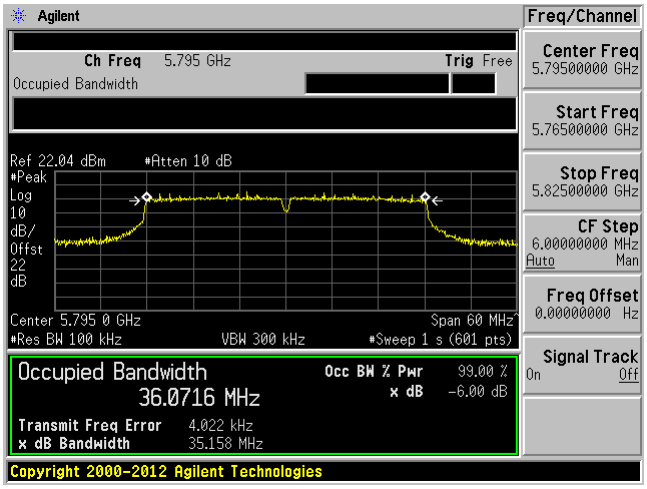


High Channel 6 dB OBW ANT J15



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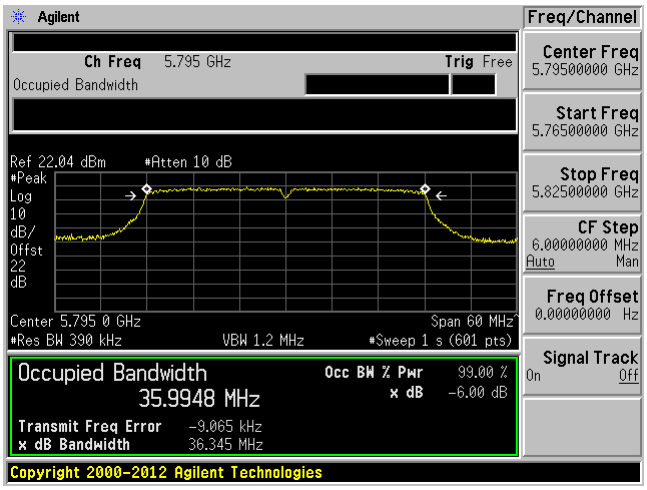
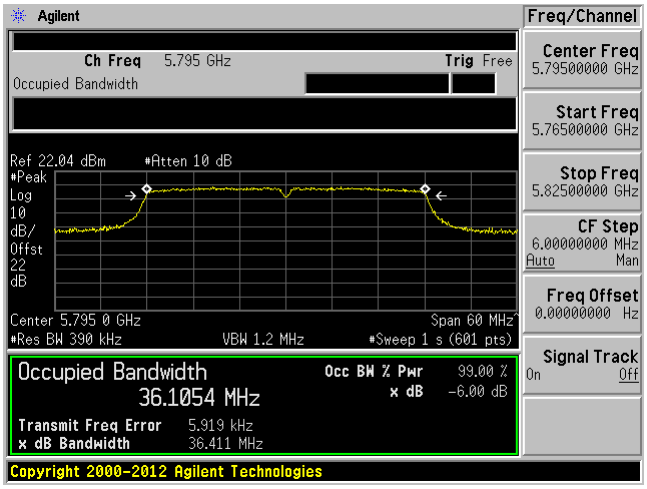
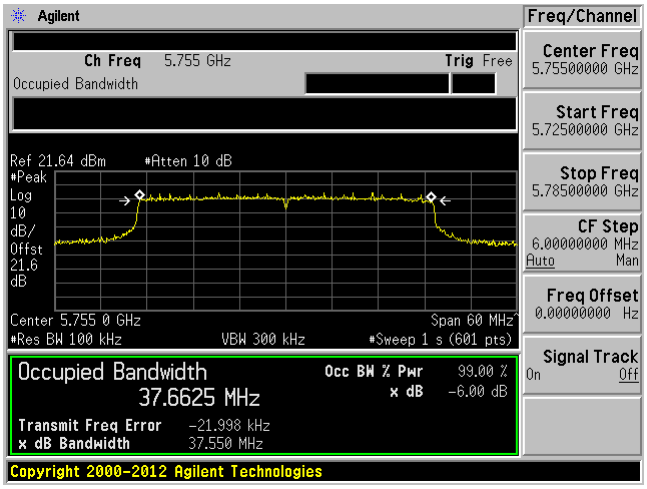


High Channel 99% dB OBW ANT J15



802.11ax40 Mode

Low Channel 6 dB OBW ANT J12



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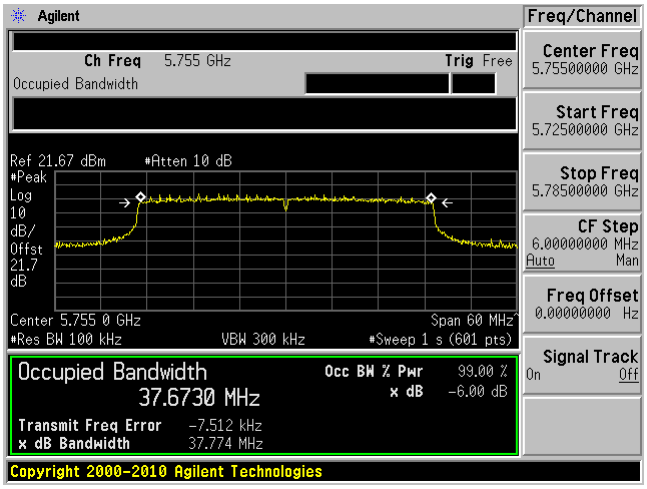
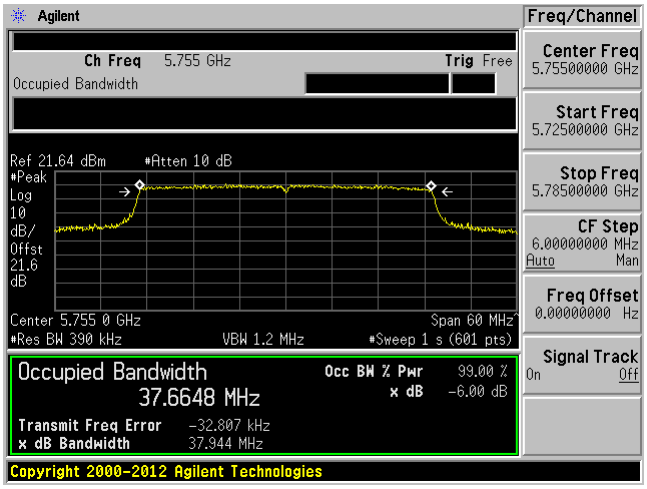
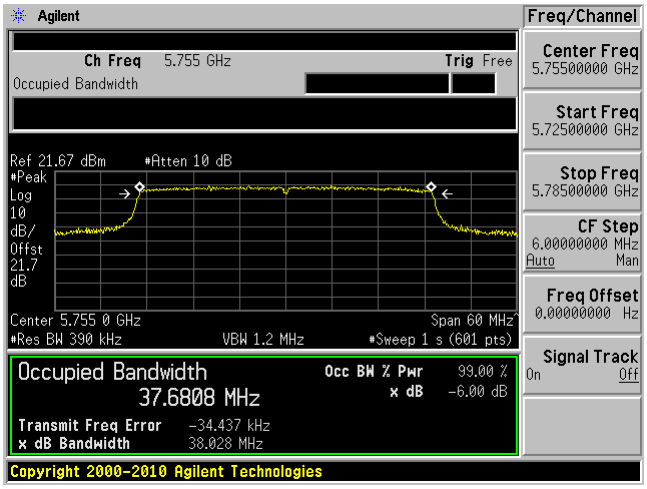


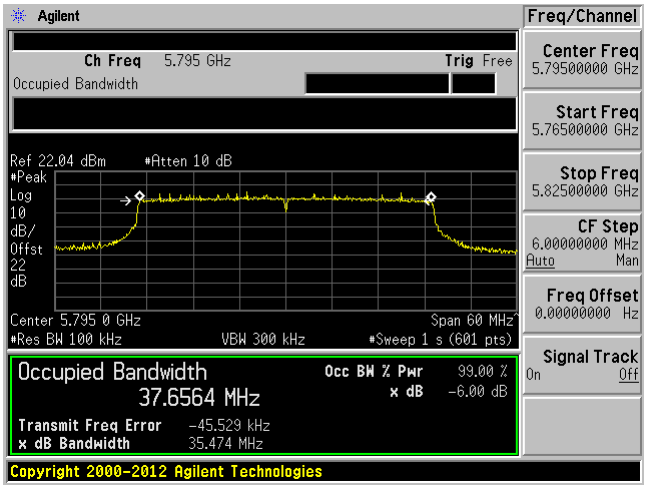
Low Channel 99% dB OBW ANT J12



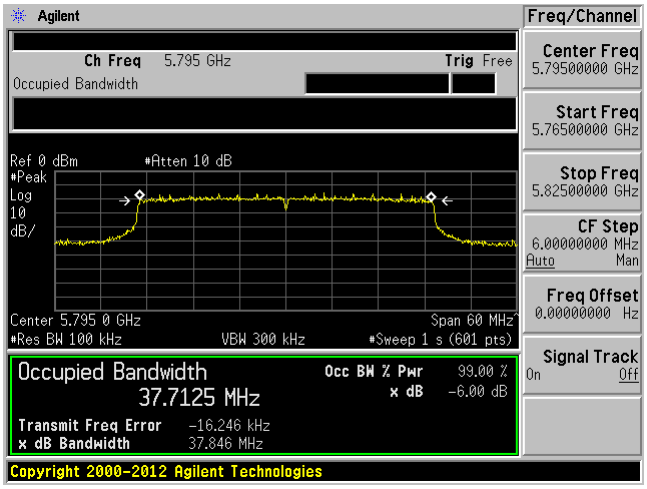
Low Channel 99% dB OBW ANT J15



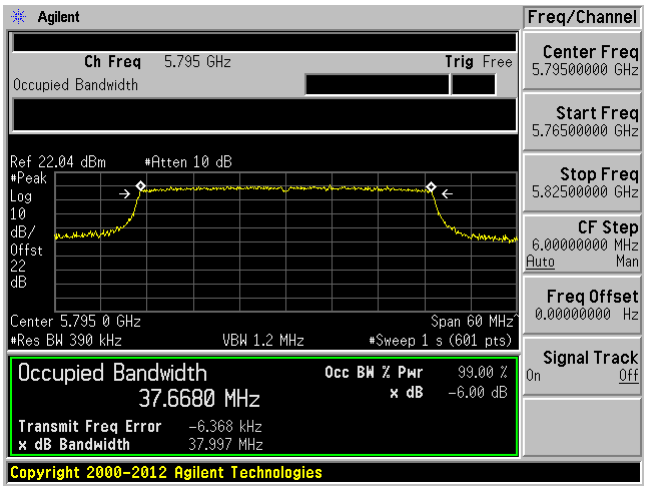
High Channel 6 dB OBW ANT J12



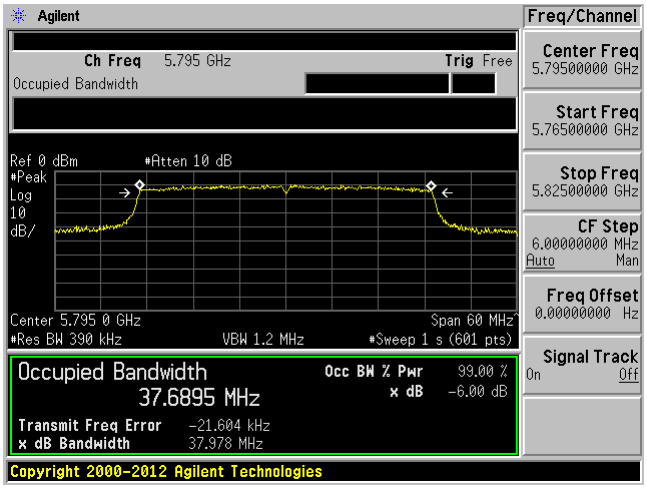
High Channel 6 dB OBW ANT J15



High Channel 99% dB OBW ANT J12

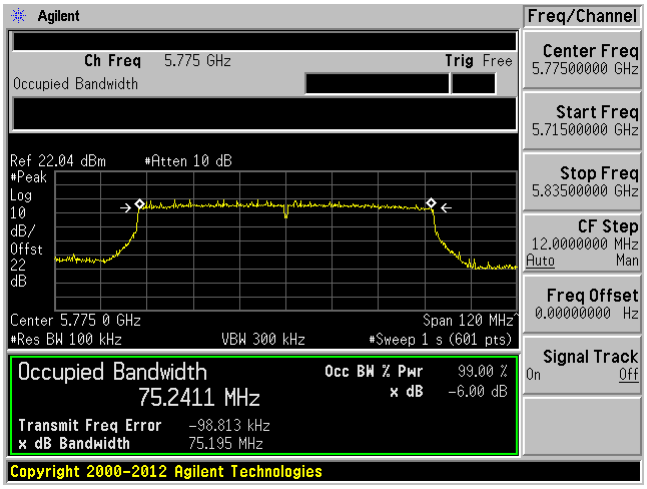


High Channel 99% dB OBW ANT J15

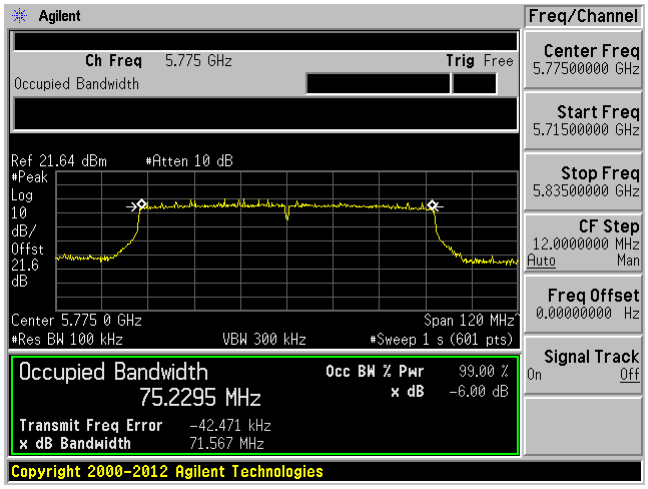


802.11ac80 Mode

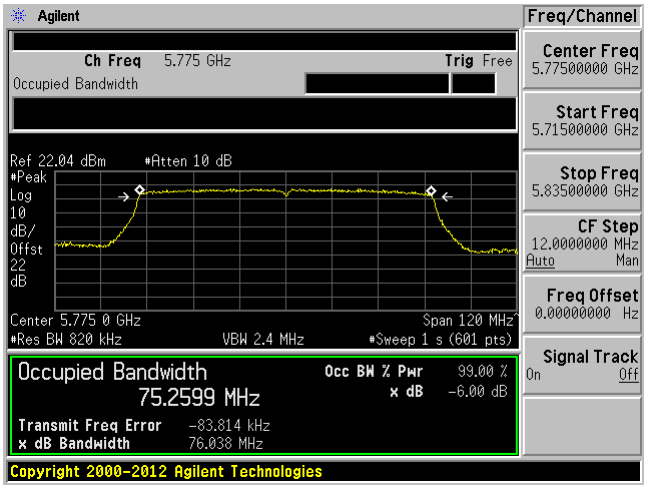
6 dB OBW ANT J12



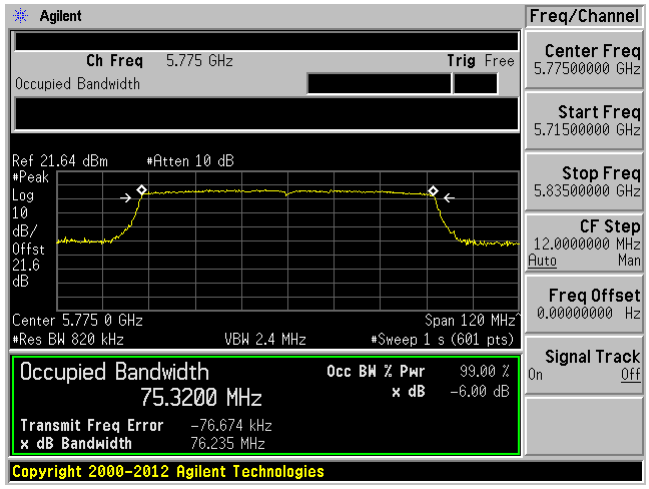
6 dB OBW ANT J15



99% dB OBW ANT J12

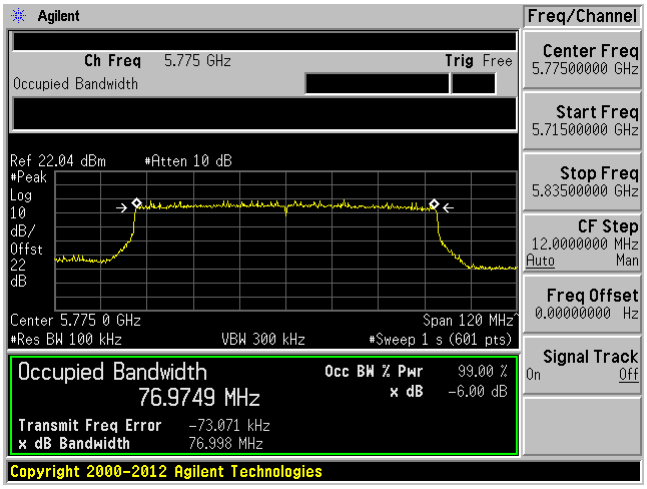


99% dB OBW ANT J15

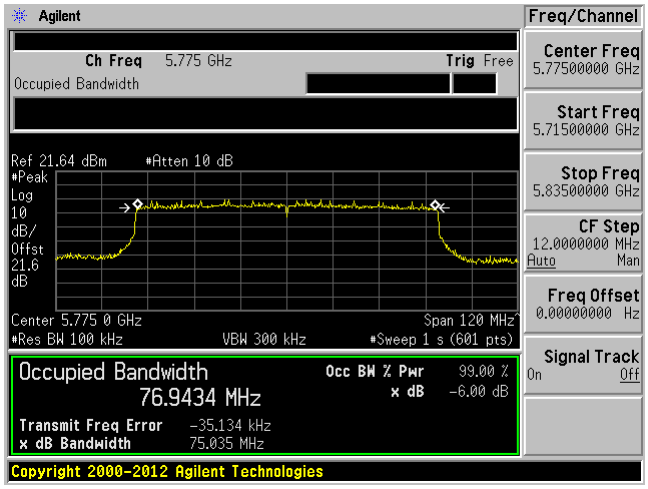


802.11ax80 Mode

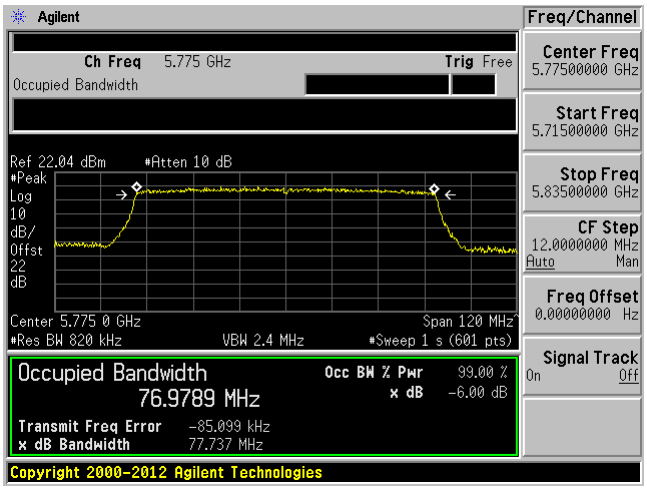
6 dB OBW ANT J12



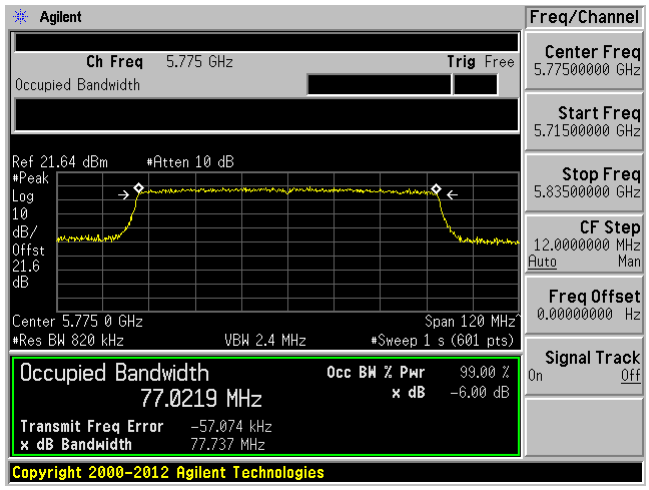
6 dB OBW ANT J15



99% dB OBW ANT J12



99% dB OBW ANT J15



9 FCC §407(a) & 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 $10 + 10 \log_{10}B$, 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.

9.2 Measurement Procedure

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

9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
-	RF cable	-	-	Each time[1]	N/A
-	20 dB attenuator	-	-	Each time[1]	N/A
ETS- Lingerin	Power Sensor	7002-006	160097	2018-12-31	2 years

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 the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

9.4 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	55 %
ATM Pressure:	102.2 KPa

The testing was performed by Zhao Zhao from 2021-01-05 to 2021-01-03 in RF site.

9.5 Test Results

5150 - 5250 MHz

FCC Results

Channel	Frequency (MHz)	Conducted Output Power (dBm)		Total Power (dBm)	FCC Limit (dBm)
		ANT J12	ANT J15		
802.11a mode					
36	5180	18.14	18.31	-	30
44	5220	18.64	18.36	-	30
48	5240	18.88	18.37	-	30
802.11n/ac20 mode					
36	5180	18.06	18.00	21.04	30
44	5220	18.3	18.11	21.22	30
48	5240	18.5	18.13	21.33	30
802.11ax20 mode					
36	5180	18.15	18.02	21.10	30
44	5220	18.51	18.01	21.28	30
48	5240	18.64	18.04	21.36	30
802.11n/ac40 mode					
38	5190	19.78	19.08	22.45	30
46	5230	18.83	18.23	21.55	30
802.11ax40 mode					
38	5190	19.3	18.94	22.13	30
46	5230	19.49	18.93	22.23	30
802.11ac80 mode					
42	5210	18.35	17.95	21.16	30
802.11ax80 mode					
42	5210	18.23	17.76	21.01	30

IC Result:

Channel	Frequency (MHz)	Conducted Output Power (dBm)		EIRP Power (dBm)		IC EIRP Limit (dBm)
		ANT J12	ANT J15	ANT J12	ANT J15	
802.11a mode						
36	5180	18.14	18.31	19.14	19.31	22.13
44	5220	18.64	18.36	19.64	19.36	22.14
48	5240	18.88	18.37	19.88	19.37	22.15
802.11n/ac20 mode						
36	5180	18.06	18.00	19.06	19.00	22.45
44	5220	18.3	18.11	19.3	19.11	22.44
48	5240	18.5	18.13	19.5	19.13	22.44
802.11ax20 mode						
36	5180	18.15	18.02	19.15	19.02	22.77
44	5220	18.51	18.01	19.51	19.01	22.77
48	5240	18.64	18.04	19.64	19.04	22.77
802.11n/ac40 mode						
38	5190	19.78	19.08	20.78	20.08	23
46	5230	18.83	18.23	19.83	19.23	23
802.11ax40 mode						
38	5190	19.3	18.94	20.3	19.94	23
46	5230	19.49	18.93	20.49	19.93	23
802.11ac80 mode						
42	5210	18.35	17.95	19.35	18.95	23
802.11ax80 mode						
42	5210	18.23	17.76	19.23	18.76	23

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

Note: According to MIMO FCC KDB 662911 D02 MIMO with Cross Polarized Antenna v01, where an FCC rule specifies limits in radiated terms such as EIRP or ERP, the limits apply to the maximum emission that would be observed by a linearly polarized measurement antenna. For radiated measurements, the maximum need be performed only over two polarizations for the receive antenna— horizontal and vertical.

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5250MHz – 5350MHz

Channel	Frequency (MHz)	Conducted Output Power (dBm)		Total Power (dBm)	FCC/ISEDC Limit (dBm)
		ANT J12	ANT J15		
802.11a mode					
52	5260	18.92	18.27	-	23.14
60	5300	19.28	18.43	-	23.14
64	5320	19.48	18.42	-	23.14
802.11n/ac20 mode					
52	5260	18.57	18.07	21.34	23.45
60	5300	19.1	18.05	21.62	23.44
64	5320	19.21	18.08	21.69	22.92
802.11ax20 mode					
52	5260	18.75	18.01	21.41	23.75
60	5300	19.1	18.01	21.60	23.75
64	5320	19.07	18.04	21.60	23.75
802.11n/ac40 mode					
54	5270	20.26	19.28	22.81	24
62	5310	20.45	19.26	22.91	24
802.11ax40 mode					
54	5270	19.92	18.86	22.43	24
62	5310	20.21	18.94	22.63	24
802.11ac80 mode					
58	5290	18.92	17.97	21.48	24
802.11ax80 mode					
58	5290	18.73	17.82	21.31	24

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

Note: The maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10}B$, dBm.
B was 99% OBW to present worst case.

5470 MHz - 5725 MHz

Channel	Frequency (MHz)	Conducted Output Power (dBm)		Total Power (dBm)	FCC/ISEDC Limit (dBm)
		ANT J12	ANT J15		
802.11a mode					
100	5500	19.53	19.33	-	23.13
116	5580	19.48	19.26	-	23.13
140	5700	19.12	19	-	23.14
144	5720	18.89	18.68	-	23.14
802.11n/ac20 mode					
100	5500	19.24	19.09	22.18	23.44
116	5580	19.03	19	22.03	23.43
140	5700	18.85	18.87	21.87	23.44
144	5720	18.82	18.55	21.70	23.44
802.11ax20 mode					
100	5500	19.12	18.79	21.97	23.75
116	5580	19.09	18.8	21.96	23.76
140	5700	18.86	18.82	21.85	23.76
144	5720	18.66	18.53	21.61	23.76
802.11n/ac40 mode					
102	5510	20.08	20.01	23.06	24
110	5550	20.35	19.89	23.14	24
134	5670	20.38	20.21	23.31	24
142	5710	20.13	19.99	23.07	24
802.11ax40 mode					
102	5510	19.66	19.69	22.69	24
110	5550	20.11	19.72	22.93	24
134	5670	20.16	20.03	23.11	24
142	5710	19.96	19.9	22.94	24
802.11ac80 mode					
106	5530	18.83	18.82	21.84	24
122	5610	20.90	20.61	23.77	24
138	5690	20.84	20.58	23.72	24
802.11ax80 mode					
106	5530	18.65	18.54	21.61	24
122	5610	20.74	20.46	23.61	24
138	5690	20.74	20.47	23.62	24

Note: Duty cycle correction factor has already been added to the measurements
Note: The maximum conducted output power shall not exceed 250 mW or 11 + 10 $\log_{10}$B, dBm.
B was 99% OBW to present worst case.

5725MHz – 5850MHz

Channel	Frequency (MHz)	Conducted Output Power (dBm)		Total Power (dBm)		FCC/ISEDC Limit (dBm)
		ANT J12	ANT J15			
802.11a mode						
149	5745	18.5	18.69	18.5	18.69	30
157	5785	18.5	18.56	18.5	18.56	30
165	5825	18.5	18.14	18.5	18.14	30
802.11n/ac20 mode						
149	5745	18.59	18.41	21.51		30
157	5785	18.43	18.24	21.35		30
165	5825	17.85	17.40	20.64		30
802.11ax20 mode						
149	5745	18.15	18.22	21.20		30
157	5785	18.07	17.84	20.97		30
165	5825	17.55	17.79	20.68		30
802.11n/ac40 mode						
151	5755	19.7	19.42	22.57		30
159	5795	19.17	19.00	22.10		30
802.11ax40 mode						
151	5755	19.22	19.26	22.25		30
159	5795	18.67	18.92	21.81		30
802.11ac80 mode						
155	5775	18.23	18.19	21.22		30
802.11ax80 mode						
155	5775	18.06	17.98	21.03		30

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