FCC PART 15.407
ISED RSS-247 ISSUE 2 FEBRUARY 2017

TEST REPORT

For

Vave Health Inc.

2955 Campus Drive, Suite 110,

San Mateo, CA 94403, USA

FCC ID: 2ARTI-VAVE2019A
IC: 24535-VAVE2019A

Report Type:	**Model:**
Original Report	Wi-Fi and BLE Module

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* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "*" (Rev.2)

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1810312-407	Original Report	2019-01-16

1 General Description

1.1 Product Description for Equipment under Test (EUT)

Manufacturer:	Vave Health Inc.
EUT Name:	Wi-Fi and BLE Module
EUT Model(s):	VAVE2019MODA
FCC ID:	2ARTI-VAVE2019A
IC:	24535-VAVE2019A
Serial Number(s):	R1810312-01

1.2 Objective

This report is prepared on behalf of *Vave Health Inc.* in accordance with FCC CFR47 §15.407, ISED RSS-247 Issue 2.

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

1.3 Related Submittal(s)/Grant(s)

R1810312-247 DTS (FCC ID: VAVE2019MODA)

1.4 Test Methodology

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

1.5 Measurement Uncertainty

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

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

1.6 Test Facility Registrations

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

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

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

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

1.7 **Test Facility Accreditations**

Bay Area Compliance Laboratories Corp. (BACL) is:

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

BACL's ISO/IEC 17025:2005 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide range of product categories. These product categories include Central Office Telecommunications Equipment [including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices,

Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

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

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

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

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

2 Commercial Food Service Equipment
for Commercial Dishwashers (ver. 2.0)
for Commercial Ice Machines (ver. 2.0)
for Commercial Ovens (ver. 2.1)
for Commercial Refrigerators and Freezers
3 Lighting Products
For Decorative Light Strings (ver. 1.5)
For Luminaires (including sub-components) and Lamps (ver. 1.2)
For Compact Fluorescent Lamps (CFLs) (ver. 4.3)
For Integral LED Lamps (ver. 1.4)
4 Heating, Ventilation, and AC Products
for Residential Ceiling Fans (ver. 3.0)
for Residential Ventilating Fans (ver. 3.2)
5 Other
For Water Coolers (ver. 3.0)

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

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

2 EUT Test Configuration

2.1 Justification

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

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

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

2.2 EUT Exercise Software

The test software used was Tera Term, commands were provided by *Vave Health Inc.,* the software is compliant with the standard requirements being tested against.

Modulation	Frequency (MHz)	Power Setting
802.11a	5180	20000
	5220	20000
	5240	20000
	5745	20000
	5785	20000
	5825	20000
802.11n20	5180	20000
	5220	20000
	5240	20000
	5745	20000
	5785	20000
	5825	20000
802.11n40	5190	13000
	5230	20000
	5755	20000
	5795	20000

Data Rates Tested:

802.11a mode: 6Mbps
802.11n20 mode: MCS0
802.11n40 mode: 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.

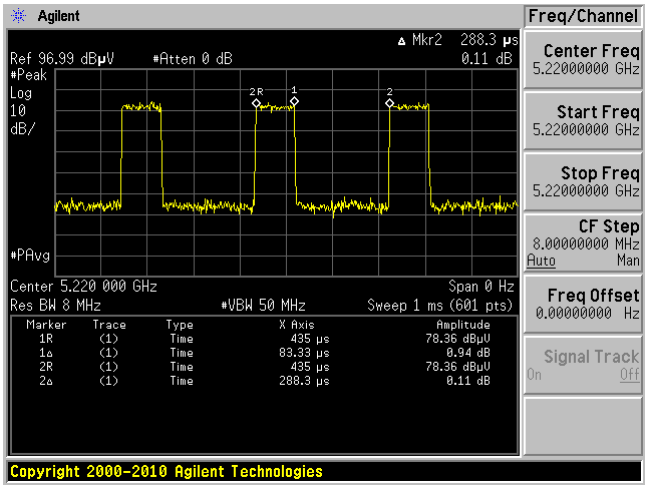
Radio Mode	On Time (us)	Period (us)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
5.2G a	83.33	288.3	28.90	5.39
5.2G n20	90	295	30.51	5.16
5.2G n40	65	270	24.07	6.18
5.8G a	83.33	290	28.73	5.42
5.8G n20	88.33	295	29.94	5.24
5.8G n40	63.33	268.3	23.60	6.27

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

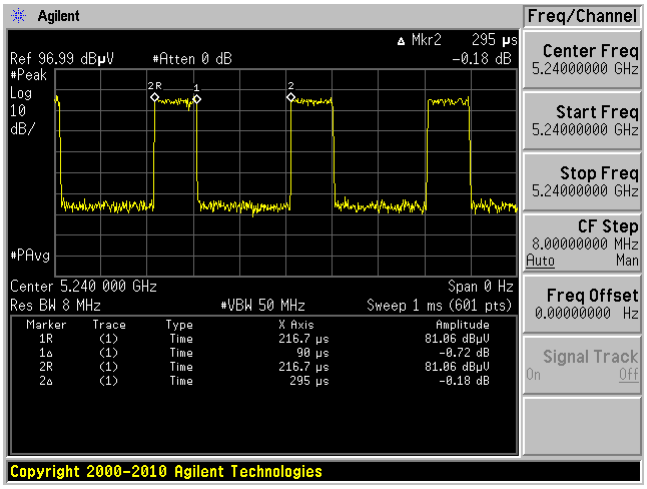
Please refer to the following plots.

5150-5250 MHz

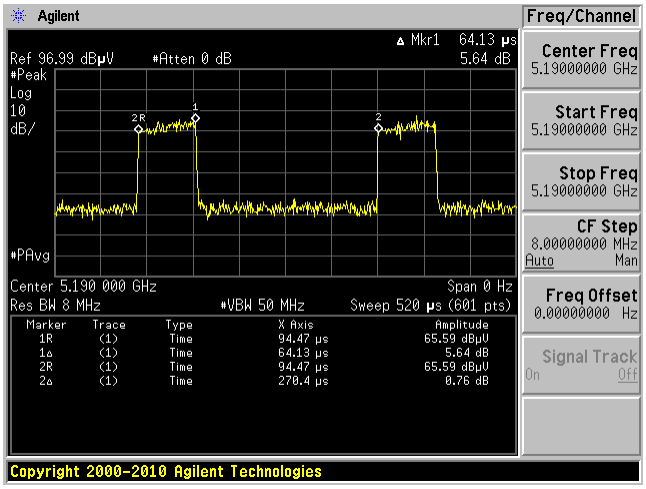
802.11a Mode



802.11n20 Mode

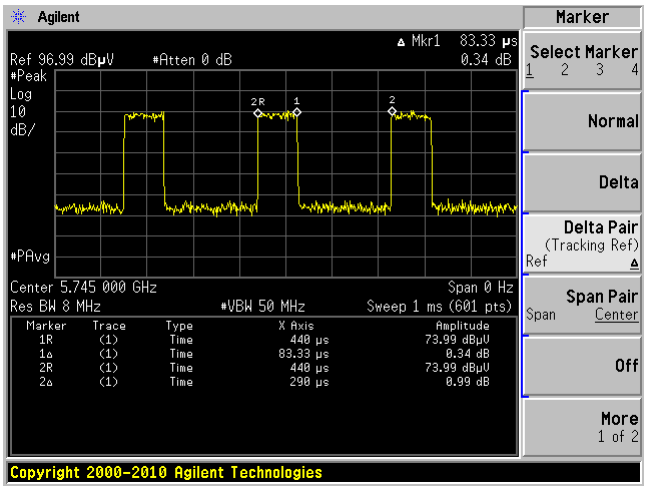


802.11n40 Mode

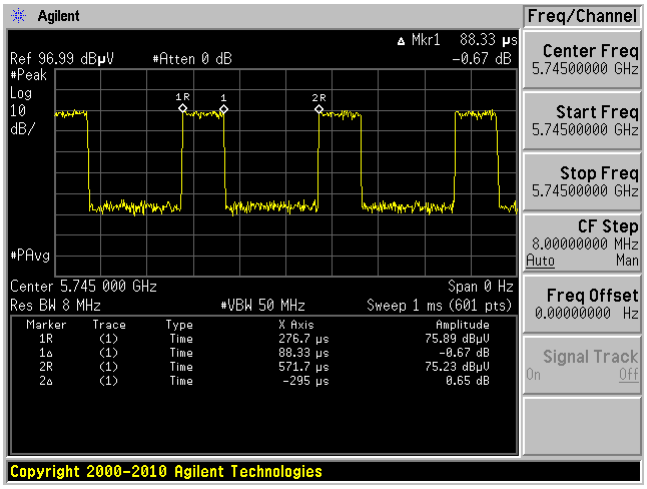


5725MHz-5850MHz

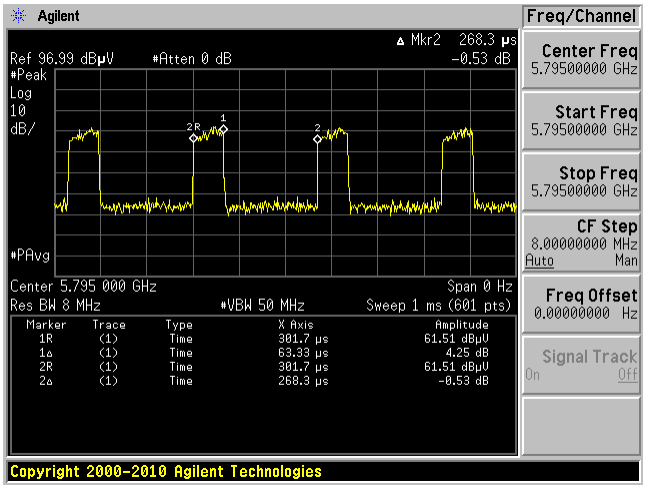
802.11a Mode



802.11n20 Mode



802.11n40 Mode



2.4 Equipment Modifications

The EUT was installed on a support board for testing. Please refer to EUT photographs.

2.5 Local Support Equipment

Manufacturer	Description	Model
Dell	Laptop	Latitude E6410

2.6 Support Equipment

Manufacturer	Description	Model
CUI Inc	Adapter	SWI18-5-N

2.7 Interface Ports and Cabling

Cable Description	Length (m)	To	From
USB	1	Laptop	Debug Board

3 Summary of Test Results

FCC 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 §6.7	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

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

4.1 Applicable Standards

According to FCC §15.247(i), §15.407(f) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for General Population/Uncontrolled Exposure

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

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

Before equipment certification is granted, the procedure of ISED 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

4.3 MPE Results for FCC

BLE:

Maximum average output power at antenna input terminal (dBm):	5.52
Maximum average output power at antenna input terminal (mW):	3.56
Prediction distance (cm):	20
Prediction frequency (MHz):	2440
Maximum Antenna Gain, typical (dBi):	2.4
Maximum Antenna Gain (numeric):	1.74
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0012
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

5.2 GHz band:

Maximum average output power at antenna input terminal (dBm):	16.15
Maximum average output power at antenna input terminal (mW):	41.21
Prediction distance (cm):	20
Prediction frequency (MHz):	5240
Maximum Antenna Gain, typical (dBi):	2.5
Maximum Antenna Gain (numeric):	1.78
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0146
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

5.8 GHz band:

Maximum average output power at antenna input terminal (dBm):	15.47
Maximum average output power at antenna input terminal (mW):	35.24
Prediction distance (cm):	20
Prediction frequency (MHz):	5745
Maximum Antenna Gain, typical (dBi):	2.5
Maximum Antenna Gain (numeric):	1.78
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0125
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

Radio Co-location

BLE + 5 GHz Wi-Fi:

0.0012/1 + 0.0146/1 = 0.0158 < 1

Conclusion

The device is compliant with the requirement MPE limit for uncontrolled exposure. All transceiver modules must be installed with a separation distance of no less than **20** cm from all persons.

4.4 RF exposure evaluation exemption for IC

Frequency Band	Channel Frequency (MHz)	Maximum e.i.r.p. (dBm)	Maximum e.i.r.p. (W)	ISED RF Exposure Exemption Threshold (W)	Result
BLE	2440	7.92	0.006	2.705	Exempt
U-NII-1	5240	18.65	0.073	4.561	Exempt
U-NII-3	5745	17.97	0.063	4.857	Exempt

Conclusion

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: Transmit Antenna

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

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

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

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

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

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

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

5.2 Antenna List

The antennas used by the EUT applies unique connector. The following antenna specifications were provided by the applicant.

Antenna usage	External/Internal/Integral	Band of Operation (MHz)	Maximum Antenna Gain (dBi)
Bluetooth & Wi-Fi	External	2400-2483.5	2.4
		5000-6000	2.5

6 FCC §15.207 & ISEDC RSS-Gen §8.8 - AC 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 were FCC §15.207 limits.

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

The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

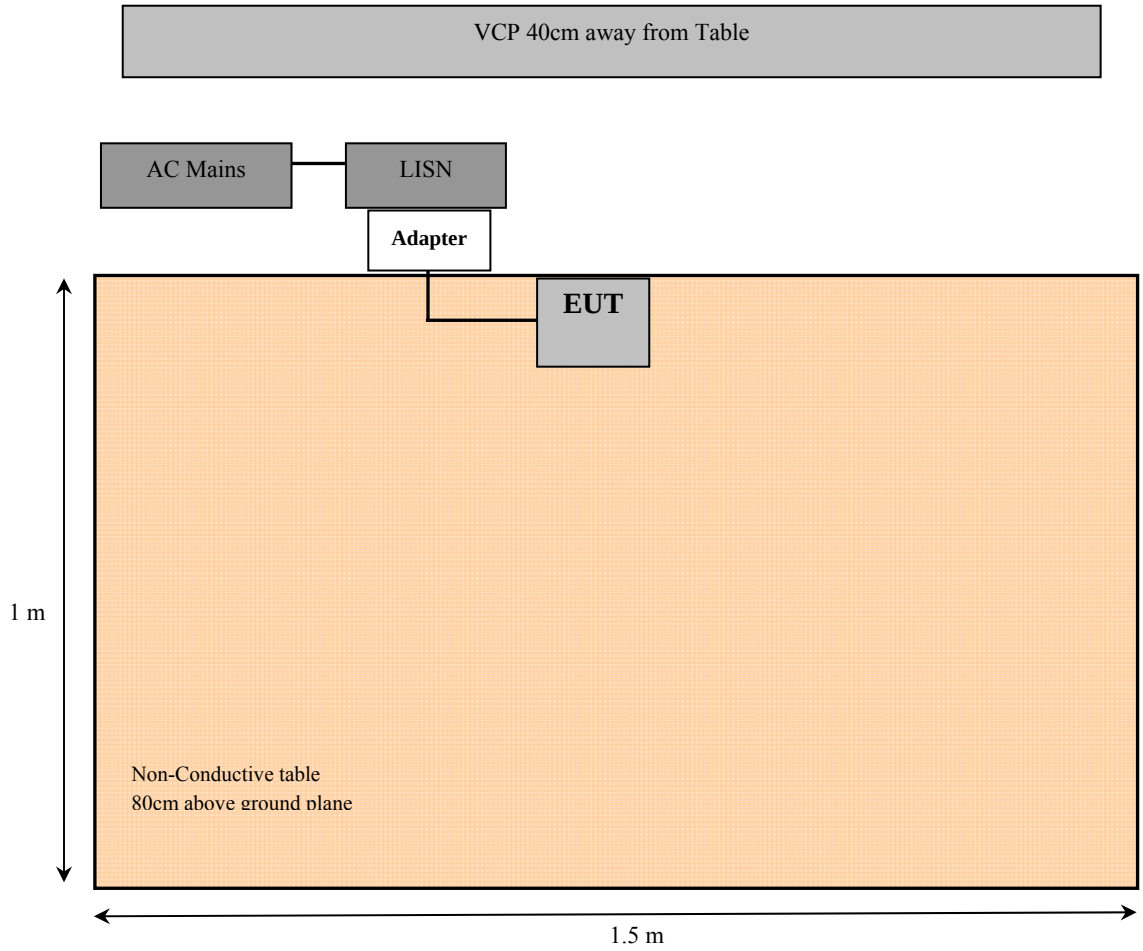
6.3 Test Procedure

During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-1.

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

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

6.4 Test Setup Block Diagram



6.5 Corrected Amplitude and Margin Calculation

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

CA = Ai + CL + Atten

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

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

Margin = Corrected Amplitude – Limit

6.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Impulse Limiter	ESH3-Z2	101964	2018-07-27	1 year
Solar Electronics Company	High Pass Filter	Type 7930-100	7930150203	2018-02-28	1 year
Suirong	30 ft conductive emission cable	LMR 400	-	N/R	N/A
FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160129	2018-04-04	1 year
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R
Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950.03	100044	2018-10-26	2 years

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

6.7 Test Environmental Conditions

Temperature:	24º C
Relative Humidity:	37 %
ATM Pressure:	102.1 kPa

The testing was performed by Zhao Zhao on 2018-01-07 in ground plane test site.

6.8 Summary of Test Results

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

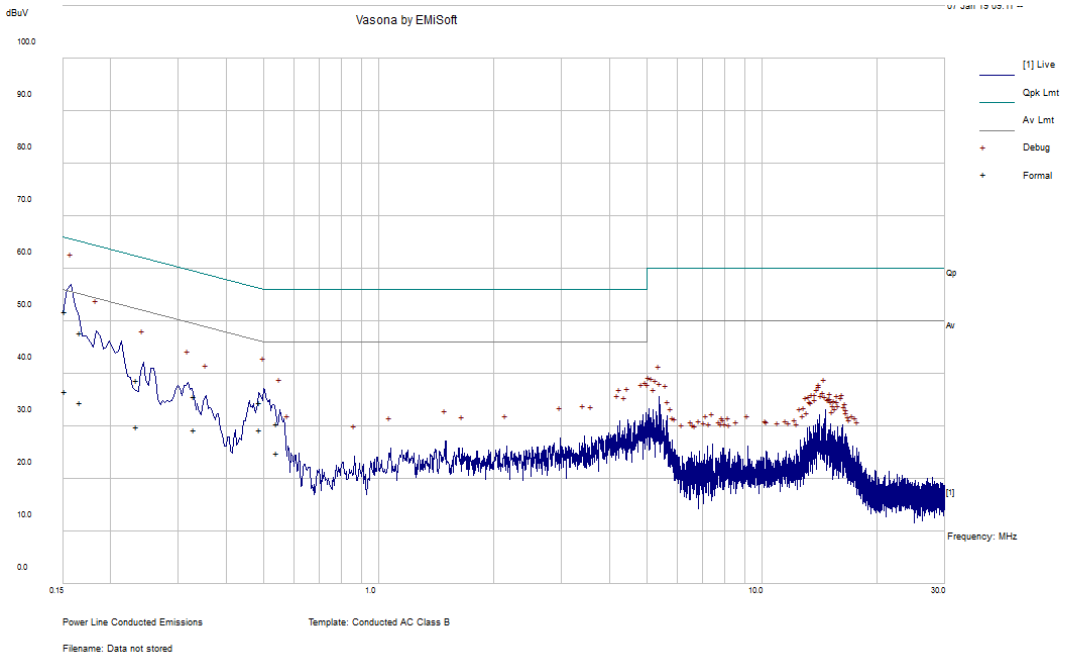
Colocation 5 GHz Wi-Fi and 2.4 GHz BLE

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-14	0.150018	Nuetral	0.15-0.3

6.9 Conducted Emissions Test Plots and Data

Worst Case Colocation, 5 GHz Wi-Fi a mode (5240 MHz) and 2.4 GHz BLE (2440 MHz)

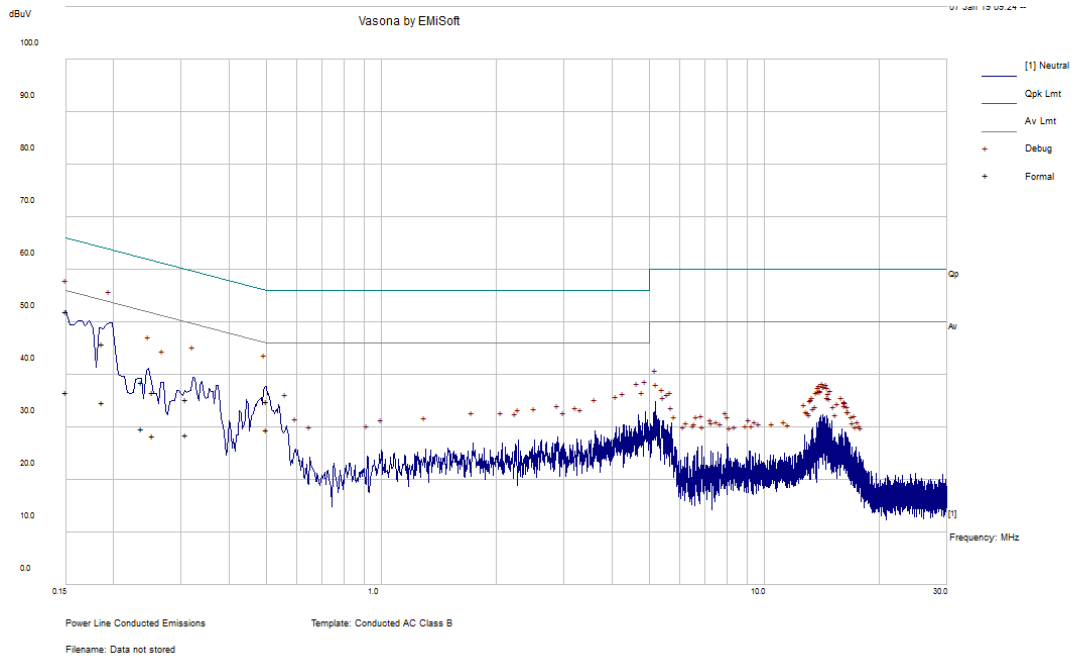
120V 60Hz Line



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.151739	51.78	Line	65.9	-14.12	QP
0.166376	47.79	Line	65.14	-17.35	QP
0.490303	34.47	Line	56.16	-21.7	QP
0.234432	38.82	Line	62.29	-23.47	QP
0.330644	35.71	Line	59.44	-23.73	QP
0.543138	30.57	Line	56	-25.43	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.151739	36.65	Line	55.9	-19.26	Ave.
0.166376	34.47	Line	55.14	-20.67	Ave.
0.490303	29.41	Line	46.16	-16.75	Ave.
0.234432	29.86	Line	52.29	-22.44	Ave.
0.330644	29.37	Line	49.44	-20.06	Ave.
0.543138	24.91	Line	46	-21.09	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.150018	52	Neutral	66	-14	QP
0.18657	45.8	Neutral	64.19	-18.39	QP
0.502106	34.89	Neutral	56	-21.11	QP
0.309067	35.35	Neutral	60	-24.65	QP
0.236147	38.63	Neutral	62.23	-23.6	QP
0.253298	36.67	Neutral	61.65	-24.98	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.150018	36.67	Neutral	56	-19.33	Ave.
0.18657	34.75	Neutral	54.19	-19.44	Ave.
0.502106	29.55	Neutral	46	-16.45	Ave.
0.309067	28.68	Neutral	50	-21.32	Ave.
0.236147	29.66	Neutral	52.23	-22.57	Ave.
0.253298	28.41	Neutral	51.65	-23.24	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 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band:

(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.

(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.

(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

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:

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

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 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:

.....Peak:
RBW = 1MHz / VBW = 3MHz / Sweep = 100 ms
.....Average:
RBW = 1MHz / VBW = 1 / T or 10 Hz / 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/m) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

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

Margin = Corrected Amplitude – Limit

7.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde and Schwarz	Receiver, EMI Test	ESCI 1166.5950K03	100338	2018-07-05	2 years
Agilent	Analyzer, Spectrum	E4446A	MY48250238	2018-05-08	1 year
Sunol Sciences	System Controller	SC99V	011003-1	N/R	N/A
Sunol Sciences	Antenna, Biconi-Log	JB1	A013105-3	2018-02-26	2 years
Agilent	Amplifier, Pre	8447D	2944A10187	2018-04-02	1 year
IW	2.92mm (M) X2, 1501 Armor Neoprene, 396"	KPS-1501AN-3960-KPS	DC 1807	2018-03-13	1 year
Wisewave	Antenna, Horn	ARH-4223-02	10555-02	2017-12-15	2 years
Wisewave	Antenna, Horn	ARH-2823-02	10555-01	2018-01-18	2 years
A.H. Systems	Pre-Amplifer	PAM 1840V	170	2018-09-10	1 Year
-	SMA cable	-	C00011	Each time[1]	N/A
-	N-Type Cable	-	C00012	Each time[1]	N/A
-	N-Type Cable	-	C00014	Each time[1]	N/A
HP	Pre-Amplifier	8449B	3147A00400	2018-02-02	1 year
Sunol Sciences	Antenna, Horn	DRH-118	A052704	2017-03-27	2 years
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

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

7.6 Test Environmental Conditions

Temperature:	23 ºC
Relative Humidity:	33 %
ATM Pressure:	102.2 kPa

The testing was performed by Zhao Zhao on 2018-12-19 in 5m chamber 3.

7.7 Summary of Test Results

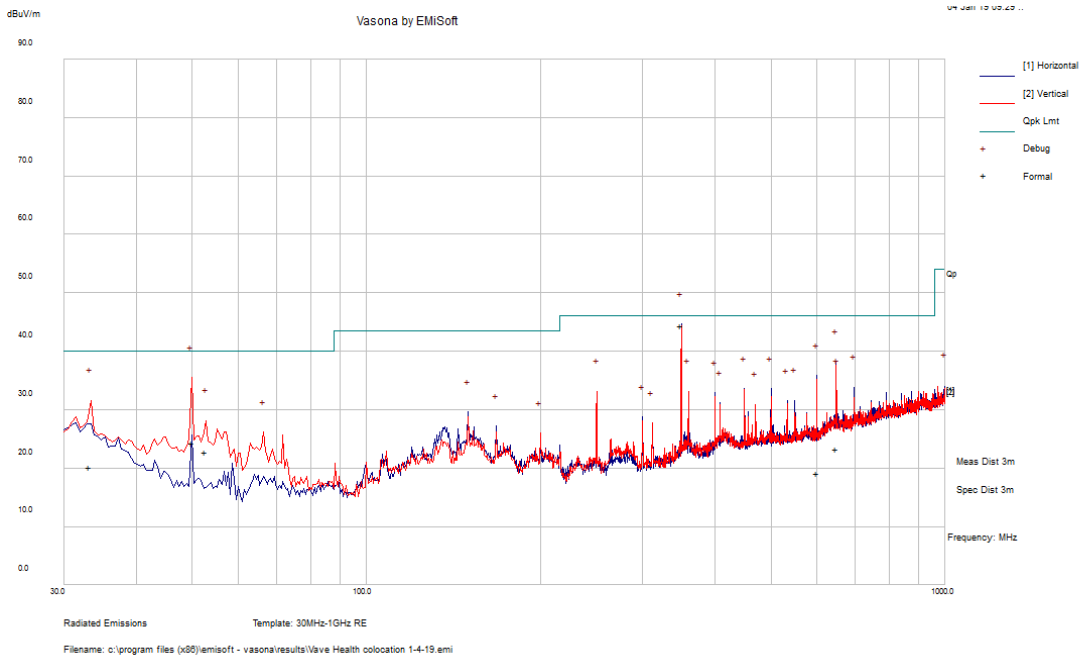
According to the data hereinafter, the EUT complied with the FCC Part 15.407 standards' radiated emissions limits, and had the worst margin of:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-0.65	5150	Vertical	802.11a 5180MHz

7.8 Radiated Emissions Test Result Data

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

Worst Case Colocation, 5 GHz Wi-Fi a mode (5240 MHz) and 2.4 GHz BLE (2440 MHz)



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Pass/Fail
349.9948	44.48	101	H	202	46	-1.52	Pass
49.99825	24.32	299	V	59	40	-15.68	Pass
648.5873	23.3	139	H	69	46	-22.7	Pass
33.21375	20.21	213	V	77	40	-19.79	Pass
600.136	19.11	132	H	259	46	-26.89	Pass
52.661	22.73	110	V	24	40	-17.27	Pass

2) 1–40 GHz, Measured at 1 meter

5150 - 5250 MHz

802.11a mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5180 MHz a mode power setting 20000											
5150	29.83	45	198	H	33.53	7.81	0.00	71.17	84	-12.83	PK
5150	20.57	45	198	H	33.53	7.81	0.00	61.91	64	-2.09	AV
5150	33.35	360	198	V	33.42	7.81	0.00	74.58	84	-9.42	PK
5150	22.12	360	198	V	33.42	7.81	0.00	63.35	64	-0.65	AV
1320	54.86	207	199	H	25.11	4.21	37.13	47.05	84	-36.95	PK
1320	50.04	207	199	H	25.11	4.21	37.13	42.23	64	-21.77	AV
1320	54.36	240	211	V	25.04	4.21	37.13	46.47	84	-37.53	PK
1320	46.24	240	211	V	25.04	4.21	37.13	38.35	64	-25.65	AV
10360	46.05	0	100	H	38.15	14.66	34.93	63.92	84	-20.08	PK
10360	36.07	0	100	H	38.15	14.66	34.93	53.94	64	-10.06	AV
10360	45.39	0	100	V	38.13	14.66	34.93	63.25	84	-20.76	PK
10360	36.53	0	100	V	38.13	14.66	34.93	54.39	64	-9.61	AV
Middle Channel 5220 MHz a mode power setting 20000											
1320	54.86	207	199	H	25.11	4.21	37.13	47.05	84	-36.95	PK
1320	50.04	207	199	H	25.11	4.21	37.13	42.23	64	-21.77	AV
1320	54.36	240	211	V	25.04	4.21	37.13	46.47	84	-37.53	PK
1320	46.24	240	211	V	25.04	4.21	37.13	38.35	64	-25.65	AV
10440	44.95	0	100	V	38.22	14.66	34.93	62.90	84	-21.10	PK
10440	36.13	0	100	V	38.22	14.66	34.93	54.08	64	-9.92	AV
High Channel 5240 MHz a mode power setting 20000											
1320	54.86	207	199	H	25.11	4.21	37.13	47.05	84	-36.95	PK
1320	50.04	207	199	H	25.11	4.21	37.13	42.23	64	-21.77	AV
1320	54.36	240	211	V	25.04	4.21	37.13	46.47	84	-37.53	PK
1320	46.24	240	211	V	25.04	4.21	37.13	38.35	64	-25.65	AV
10480	45.57	0	100	V	38.26	14.66	34.85	63.64	84	-20.37	PK
10480	35.39	0	100	V	38.26	14.66	34.85	53.46	64	-10.55	AV

802.11n20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5180 MHz HT20 mode power setting 20000											
5150	35.15	260	236	H	33.53	7.81	0.00	76.49	84	-7.51	PK
5150	21.13	260	236	H	33.53	7.81	0.00	62.47	64	-1.53	AV
5150	37.68	284	230	V	33.42	7.81	0.00	78.91	84	-5.09	PK
5150	21.76	284	230	V	33.42	7.81	0.00	62.99	64	-1.01	AV
1320	54.86	207	199	H	25.11	4.21	37.13	47.05	84	-36.95	PK
1320	50.04	207	199	H	25.11	4.21	37.13	42.23	64	-21.77	AV
1320	54.36	240	211	V	25.04	4.21	37.13	46.47	84	-37.53	PK
1320	46.24	240	211	V	25.04	4.21	37.13	38.35	64	-25.65	AV
10380	45.22	0	100	H	38.20	14.61	34.93	63.09	84	-20.91	PK
10380	37.05	0	100	H	38.20	14.61	34.93	54.92	64	-9.08	AV
10380	44.87	0	100	V	38.12	14.61	34.93	62.66	84	-21.34	PK
10380	36.83	0	100	V	38.12	14.61	34.93	54.62	64	-9.38	AV
Middle Channel 5220 MHz HT20 mode power setting 20000											
1320	54.86	207	199	H	25.11	4.21	37.13	47.05	84	-36.95	PK
1320	50.04	207	199	H	25.11	4.21	37.13	42.23	64	-21.77	AV
1320	54.36	240	211	V	25.04	4.21	37.13	46.47	84	-37.53	PK
1320	46.24	240	211	V	25.04	4.21	37.13	38.35	64	-25.65	AV
10440	45.76	0	100	V	38.22	14.66	34.93	63.71	84	-20.29	PK
10440	36.63	0	100	V	38.22	14.66	34.93	54.58	64	-9.42	AV
High Channel 5240 MHz HT20 mode power setting 20000											
1320	54.86	207	199	H	25.11	4.21	37.13	47.05	84	-36.95	PK
1320	50.04	207	199	H	25.11	4.21	37.13	42.23	64	-21.77	AV
1320	54.36	240	211	V	25.04	4.21	37.13	46.47	84	-37.53	PK
1320	46.24	240	211	V	25.04	4.21	37.13	38.35	64	-25.65	AV
10480	45.26	0	100	V	38.26	14.66	34.85	63.33	84	-20.68	PK
10480	36.44	0	100	V	38.26	14.66	34.85	54.51	64	-9.49	AV

802.11n40 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5190 MHz HT40 mode power setting 13000											
5150	28.28	290	234	H	33.53	7.81	0.00	69.62	84	-14.38	PK
5150	19.73	290	234	H	33.53	7.81	0.00	61.07	64	-2.93	AV
5150	33.70	298	230	V	33.42	7.81	0.00	74.93	84	-9.07	PK
5150	21.37	298	230	V	33.42	7.81	0.00	62.60	64	-1.40	AV
1320	54.86	207	199	H	25.11	4.21	37.13	47.05	84	-36.95	PK
1320	50.04	207	199	H	25.11	4.21	37.13	42.23	64	-21.77	AV
1320	54.36	240	211	V	25.04	4.21	37.13	46.47	84	-37.53	PK
1320	46.24	240	211	V	25.04	4.21	37.13	38.35	64	-25.65	AV
10380	45.22	0	100	H	38.20	14.61	34.93	63.09	84	-20.91	PK
10380	37.05	0	100	H	38.20	14.61	34.93	54.92	64	-9.08	AV
10380	44.87	0	100	V	38.12	14.61	34.93	62.66	84	-21.34	PK
10380	36.83	0	100	V	38.12	14.61	34.93	54.62	64	-9.38	AV
High Channel 5230 MHz HT40 mode power setting 20000											
5150	28.13	300	235	H	33.53	7.81	0.00	69.47	84	-14.53	PK
5150	19.92	300	235	H	33.53	7.81	0.00	61.26	64	-2.74	AV
5150	28.65	300	235	V	33.42	7.81	0.00	69.88	84	-14.12	PK
5150	20.06	300	235	V	33.42	7.81	0.00	61.29	64	-2.71	AV
1320	54.86	207	199	H	25.11	4.21	37.13	47.05	84	-36.95	PK
1320	50.04	207	199	H	25.11	4.21	37.13	42.23	64	-21.77	AV
1320	54.36	240	211	V	25.04	4.21	37.13	46.47	84	-37.53	PK
1320	46.24	240	211	V	25.04	4.21	37.13	38.35	64	-25.65	AV
10460	45.13	0	100	H	38.22	14.64	34.85	63.14	84	-20.86	PK
10460	36.71	0	100	H	38.22	14.64	34.85	54.72	64	-9.28	AV

5725 - 5850 MHz

802.11a mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5745 MHz a mode power setting 20000											
1320	54.86	207	199	H	25.11	4.21	37.13	47.05	84	-36.95	PK
1320	50.04	207	199	H	25.11	4.21	37.13	42.23	64	-21.77	AV
1320	54.36	240	211	V	25.04	4.21	37.13	46.47	84	-37.53	PK
1320	46.24	240	211	V	25.04	4.21	37.13	38.35	64	-25.65	AV
11490	43.52	0	100	H	38.45	15.82	34.34	63.46	84	-20.55	PK
11490	34.79	0	100	H	38.45	15.82	34.34	54.73	64	-9.28	AV
11490	43.31	0	100	V	38.38	15.82	34.34	63.18	84	-20.82	PK
11490	34.59	0	100	V	38.38	15.82	34.34	54.46	64	-9.54	AV
Middle Channel 5785 MHz a mode power setting 20000											
1320	54.86	207	199	H	25.11	4.21	37.13	47.05	84	-36.95	PK
1320	50.04	207	199	H	25.11	4.21	37.13	42.23	64	-21.77	AV
1320	54.36	240	211	V	25.04	4.21	37.13	46.47	84	-37.53	PK
1320	46.24	240	211	V	25.04	4.21	37.13	38.35	64	-25.65	AV
11570	43.05	0	100	V	38.38	16.48	34.38	63.52	84	-20.48	PK
11570	34.87	0	100	V	38.38	16.48	34.38	55.34	64	-8.66	AV
High Channel 5825 MHz a mode power setting 20000											
1320	54.86	207	199	H	25.11	4.21	37.13	47.05	84	-36.95	PK
1320	50.04	207	199	H	25.11	4.21	37.13	42.23	64	-21.77	AV
1320	54.36	240	211	V	25.04	4.21	37.13	46.47	84	-37.53	PK
11650	42.88	0	100	V	38.55	16.48	34.38	63.52	84	-20.48	PK
11650	34.42	0	100	V	38.55	16.48	34.38	55.06	64	-8.94	AV

802.11n20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5745 MHz HT20 mode power setting 20000											
1320	54.86	207	199	H	25.11	4.21	37.13	47.05	84	-36.95	PK
1320	50.04	207	199	H	25.11	4.21	37.13	42.23	64	-21.77	AV
1320	54.36	240	211	V	25.04	4.21	37.13	46.47	84	-37.53	PK
1320	46.24	240	211	V	25.04	4.21	37.13	38.35	64	-25.65	AV
11490	43.38	0	100	H	38.45	15.82	34.34	63.32	84	-20.68	PK
11490	34.30	0	100	H	38.45	15.82	34.34	54.24	64	-9.76	AV
11490	43.92	0	100	V	38.38	15.82	34.34	63.79	84	-20.21	PK
11490	34.93	0	100	V	38.38	15.82	34.34	54.80	64	-9.20	AV
Middle Channel 5785 MHz HT20 mode power setting 20000											
1320	54.86	207	199	H	25.11	4.21	37.13	47.05	84	-36.95	PK
1320	50.04	207	199	H	25.11	4.21	37.13	42.23	64	-21.77	AV
1320	54.36	240	211	V	25.04	4.21	37.13	46.47	84	-37.53	PK
1320	46.24	240	211	V	25.04	4.21	37.13	38.35	64	-25.65	AV
11570	43.83	0	100	V	38.38	16.48	34.38	64.30	84	-19.70	PK
11570	34.85	0	100	V	38.38	16.48	34.38	55.32	64	-8.68	AV
High Channel 5825 MHz HT20 mode power setting 20000											
1320	54.86	207	199	H	25.11	4.21	37.13	47.05	84	-36.95	PK
1320	50.04	207	199	H	25.11	4.21	37.13	42.23	64	-21.77	AV
1320	54.36	240	211	V	25.04	4.21	37.13	46.47	84	-37.53	PK
1320	46.24	240	211	V	25.04	4.21	37.13	38.35	64	-25.65	AV
11650	44.53	0	100	V	38.55	16.48	34.38	65.17	84	-18.83	PK
11650	35.12	0	100	V	38.55	16.48	34.38	55.76	64	-8.24	AV

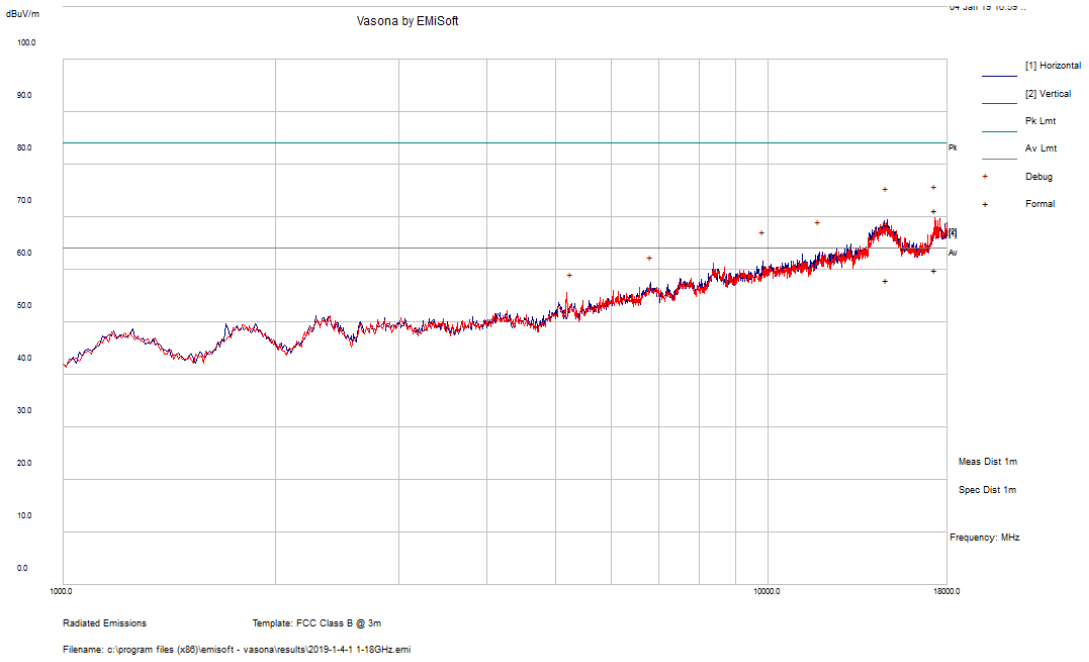
802.11HT40 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 5755 MHz HT40 mode power setting 20000											
1320	54.86	207	199	H	25.11	4.21	37.13	47.05	84	-36.95	PK
1320	50.04	207	199	H	25.11	4.21	37.13	42.23	64	-21.77	AV
1320	54.36	240	211	V	25.04	4.21	37.13	46.47	84	-37.53	PK
1320	46.24	240	211	V	25.04	4.21	37.13	38.35	64	-25.65	AV
11510	43.35	0	100	H	38.45	16.49	34.35	63.93	84	-20.07	PK
11510	34.80	0	100	H	38.45	16.49	34.35	55.38	64	-8.62	AV
11510	44.08	0	100	V	38.38	16.49	34.35	64.59	84	-19.41	PK
11510	35.54	0	100	V	38.38	16.49	34.35	56.05	64	-7.95	AV
Low Channel 5795 MHz HT40 mode power setting 20000											
1320	54.86	207	199	H	25.11	4.21	37.13	47.05	84	-36.95	PK
1320	50.04	207	199	H	25.11	4.21	37.13	42.23	64	-21.77	AV
1320	54.36	240	211	V	25.04	4.21	37.13	46.47	84	-37.53	PK
1320	46.24	240	211	V	25.04	4.21	37.13	38.35	64	-25.65	AV
11590	43.13	0	100	H	38.53	16.49	34.38	63.76	84	-20.24	PK
11590	34.66	0	100	H	38.53	16.49	34.38	55.29	64	-8.71	AV
11590	43.33	0	100	V	38.46	16.49	34.38	63.90	84	-20.10	PK
11590	35.15	0	100	V	38.46	16.49	34.38	55.72	64	-8.28	AV

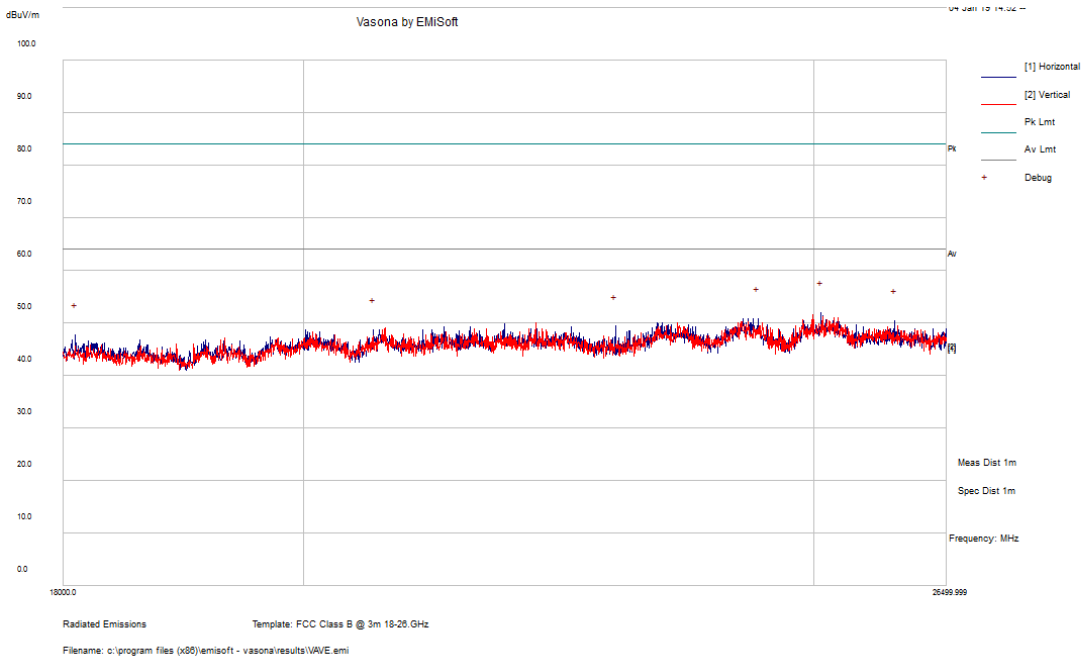
Note 1: All emissions not recorded are more than 20 dB below the limit. Any emissions above 12 GHz are emissions from the noise floor.

Worst Case Colocation, 5 GHz Wi-Fi a mode (5240 MHz) and 2.4 GHz BLE (2440 MHz)

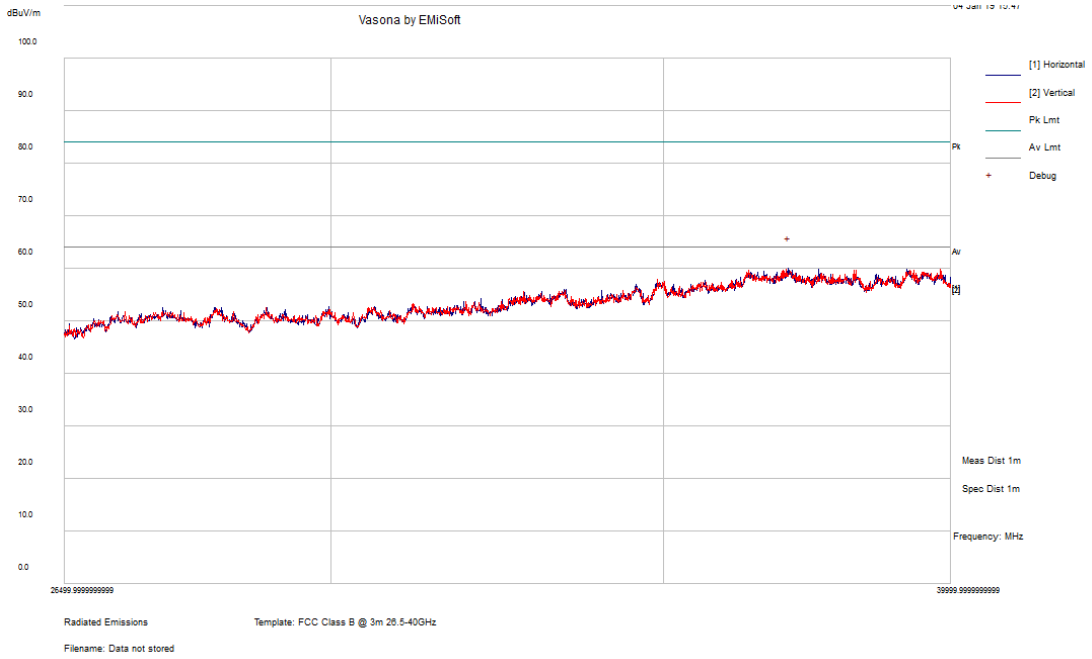
1-18 GHz Measured at 1 meter



18-26.5 GHz Measured at 1 meter



26.5-40 GHz Measured at 1 meter



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

8.1 Applicable Standards

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

8.2 Measurement Procedure

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

8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	MY48250238	2018-05-08	1 year
-	RF cable	-	-	Each time[1]	N/A
-	20dB attenuator	-	-	Each time[1]	N/A

Note1: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

8.4 Test Environmental Conditions

Temperature:	23 ºC
Relative Humidity:	37 %
ATM Pressure:	102.2 kPa

The testing was performed by Zhao Zhao on 2018-11-16 in RF site.

8.5 Test Results

Please refer to the following table

5150 - 5250 MHz

Channel	Frequency (MHz)	99% OBW (MHz)	26 dB OBW (MHz)
802.11a mode			
Low	5180	18.1377	30.000
Middle	5220	18.0900	30.000
High	5240	18.6691	30.000
802.11n20 mode			
Low	5180	18.4423	29.966
Middle	5220	18.6383	30.000
High	5240	18.4218	30.000
802.11n40 mode			
Low	5190	35.8046	42.664
High	5230	36.1274	58.632

5725 - 5850 MHz

Channel	Frequency (MHz)	99% OBW (MHz)	6 dB OBW (MHz)	6 dB OBW limit (kHz)
802.11a mode				
Low	5745	15.159	17.6012	≥500
Middle	5785	15.151	17.6419	≥500
High	5825	15.157	17.7806	≥500
802.11n20 mode				
Low	5745	15.157	18.1006	≥500
Middle	5785	15.159	18.0437	≥500
High	5825	15.161	18.1245	≥500
802.11n40 mode				
Low	5755	33.862	36.1945	≥500
High	5795	33.854	36.1429	≥500

Please refer to Annex A for plots.

9 FCC §15.407(a) & ISEDC RSS-247 §6.2 - Output Power

9.1 Applicable Standards

According to FCC §15.407(a):

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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

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

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

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

The maximum conducted output power shall not exceed 1 W. The power spectral density shall not exceed 30 dBm in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

9.2 Measurement Procedure

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

9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
ETS-LINDGREN	Power Sensor	7002-006	160097	2016-12-31	2 year
-	RF cable	-	-	Each time[1]	N/A
-	20dB attenuator	-	-	Each time[1]	N/A

Note1: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

9.4 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	37 %
ATM Pressure:	102.2 KPa

The testing was performed by Zhao Zhao on 2018-11-16 in RF site.

9.5 Test Results

5150 - 5250 MHz (FCC)

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Margin (dBm)
802.11a mode				
Low	5180	15.98	24.00	-8.02
Middle	5200	16.1	24.00	-7.9
High	5240	16.15	24.00	-7.85
802.11n20 mode				
Low	5180	15.63	24.00	-8.47
Middle	5200	15.75	24.00	-8.25
High	5240	15.19	24.00	-8.81
802.11n40 mode				
Low	5180	8.91	24.00	-15.09
High	5240	13.9	24.00	-10.1

5150 - 5250 MHz (IC)

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dBm)
802.11a mode						
Low	5180	15.98	2.5	18.48	22.59	-4.11
Middle	5200	16.1	2.5	18.6	22.57	-3.97
High	5240	16.15	2.5	18.65	22.71	-4.06
802.11n20 mode						
Low	5180	15.63	2.5	18.13	22.66	-4.53
Middle	5200	15.75	2.5	18.25	22.7	-4.45
High	5240	15.19	2.5	17.69	22.65	-4.96
802.11n40 mode						
Low	5180	8.91	2.5	11.41	23	-11.59
High	5240	13.9	2.5	16.4	23	-6.6

5745 - 5825 MHz

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Margin (dBm)
802.11a mode				
Low	5745	15.47	30.00	-14.53
Middle	5785	15.45	30.00	-14.55
High	5825	15.26	30.00	-14.74
802.11n20 mode				
Low	5745	15.31	30.00	-14.69
Middle	5785	15.29	30.00	-14.71
High	5825	15.12	30.00	-14.88
802.11n40 mode				
Low	5755	13.45	30.00	-16.55
High	5795	13.33	30.00	-16.67

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

10.1 Applicable Standards

According to FCC §15.407(a):

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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

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

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

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

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

The maximum conducted output power shall not exceed 1 W. The power spectral density shall not exceed 30 dBm in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

10.2 Measurement Procedure

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

10.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	MY48250238	2018-05-08	1 year
-	RF cable	-	-	Each time[1]	N/A
-	20dB attenuator	-	-	Each time[1]	N/A

Note1: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

10.4 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	37 %
ATM Pressure:	102.2 KPa

The testing was performed by Zhao Zhao on 2018-11-16 in RF site.

10.5 Test Results

5150 - 5250 MHz (FCC)

Channel	Frequency (MHz)	PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
802.11a mode				
Low	5180	0.974	11.00	-10.026
Middle	5200	1.468	11.00	-9.532
High	5240	2.116	11.00	-8.884
802.11n20 mode				
Low	5180	0.542	11.00	-10.458
Middle	5200	0.854	11.00	-10.146
High	5240	1.155	11.00	-9.845
802.11n40 mode				
Low	5180	-9.203	11.00	-20.203
High	5240	-4.589	11.00	-15.589

5150 - 5250 MHz (IC)

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	Antenna Gain (dBi)	PSD e.i.r.p (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
802.11a mode						
Low	5180	0.974	2.5	3.47	10.00	-6.53
Middle	5200	1.468	2.5	3.97	10.00	-6.03
High	5240	2.116	2.5	4.62	10.00	-5.38
802.11n20 mode						
Low	5180	0.542	2.5	3.04	10.00	-6.96
Middle	5200	0.854	2.5	3.35	10.00	-6.65
High	5240	1.155	2.5	3.66	10.00	-6.34
802.11n40 mode						
Low	5180	-9.203	2.5	-6.70	10.00	-16.70
High	5240	-4.589	2.5	-2.09	10.00	-12.09

5745 - 5825 MHz

Channel	Frequency (MHz)	PSD (dBm/100 kHz)	Corrected PSD (dBm/500 kHz)	Limit (dBm/500 kHz)	Margin (dB)
802.11a mode					
Low	5745	-7.486	4.2749	30.00	-25.7251
Middle	5785	-7.599	4.1619	30.00	-25.8381
High	5825	-7.459	4.3019	30.00	-25.6981
802.11n20 mode					
Low	5745	-6.954	4.8069	30.00	-25.1931
Middle	5785	-6.986	4.7749	30.00	-25.2251
High	5825	-7.168	4.5929	30.00	-25.4071
802.11n40 mode					
Low	5755	-12.688	-0.1647	30.00	-30.1647
High	5795	-12.603	-0.0797	30.00	-30.0797

Note: For the 5725-5850 MHz band, the Corrected PSD (dBm/500 kHz) is equal to:
Correct PSD (dBm/500 kHz) = PSD (dBm/100 kHz) + Duty Cycle Correction (dB) + 10*log(500 kHz/100 kHz)

Please refer to Annex C for plots.

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

11.1 Applicable Standards

According to FCC §15.407(b):

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

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

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

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

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

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

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

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

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

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

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

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

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

11.2 Measurement Procedure

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

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

11.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	MY48250238	2018-05-08	1 year
-	RF cable	-	-	Each time[1]	N/A
-	20dB attenuator	-	-	Each time[1]	N/A

Note1: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

11.4 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	37 %
ATM Pressure:	102.2 KPa

The testing was performed by Zhao Zhao on 2018-11-16 in RF site.

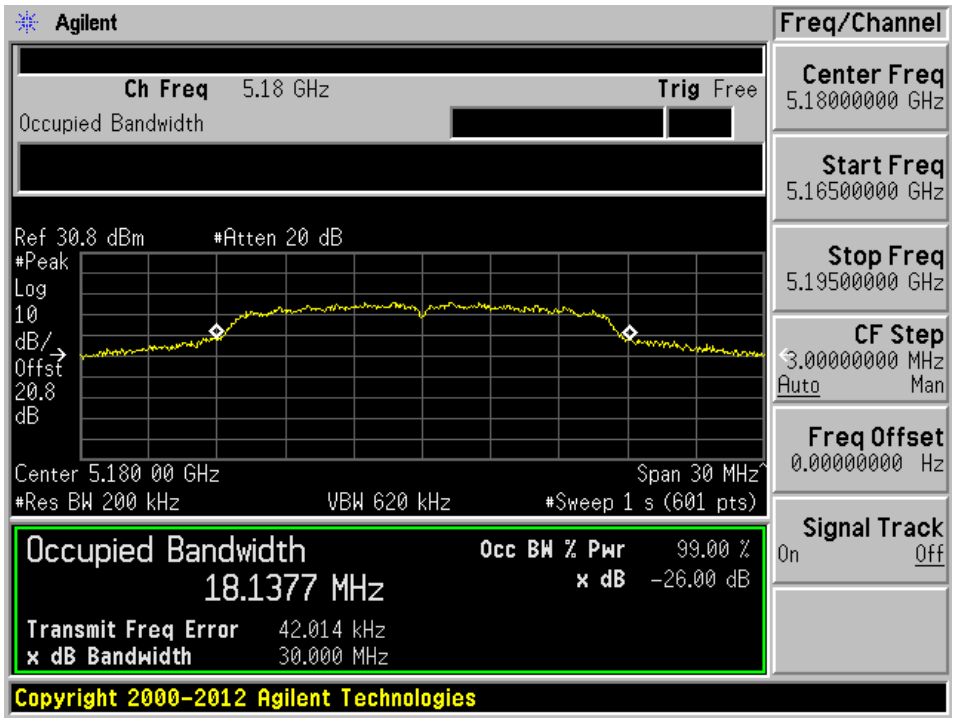
11.5 Test Results

Compliant

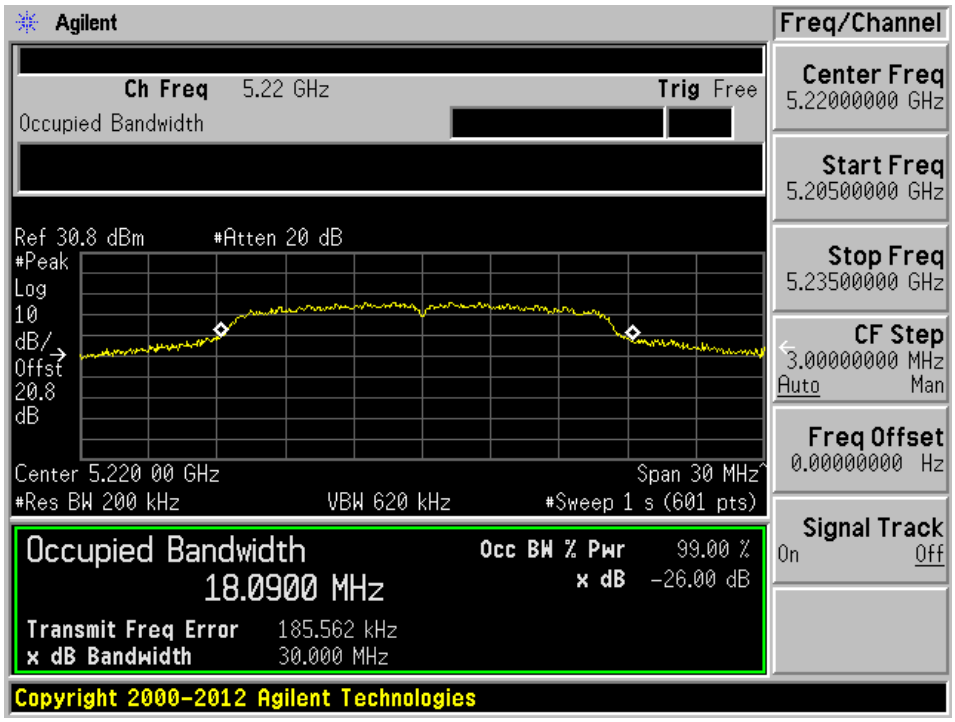
Please refer to Annex B and Annex D for plots.

12 Appendix A (Normative) – Plots for Occupied Bandwidth

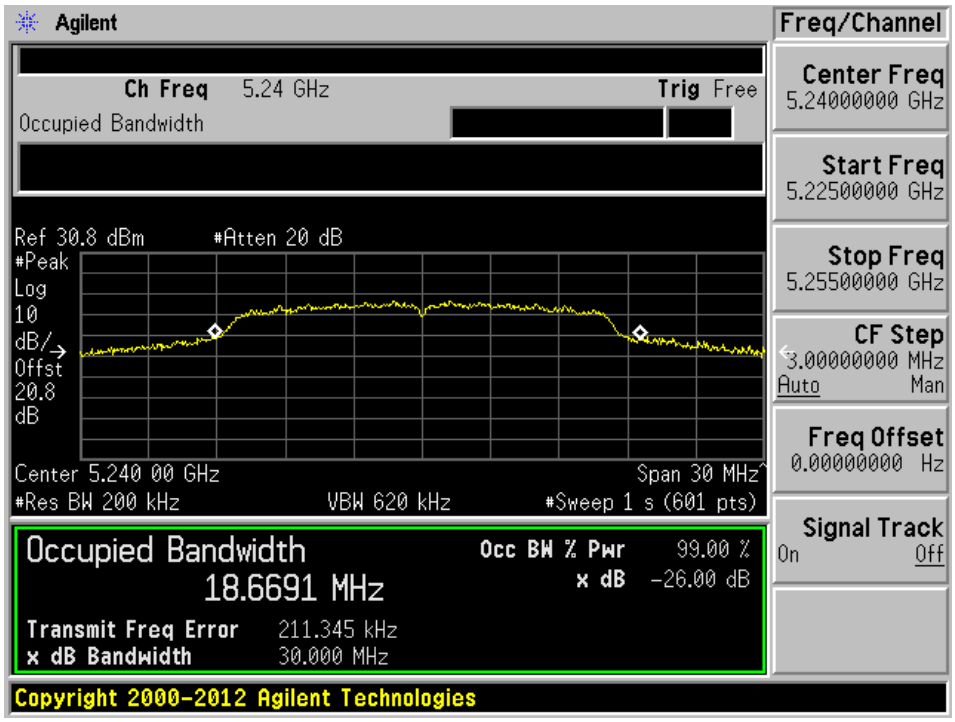
802.11a Mode 5180 MHz Low Channel OBW



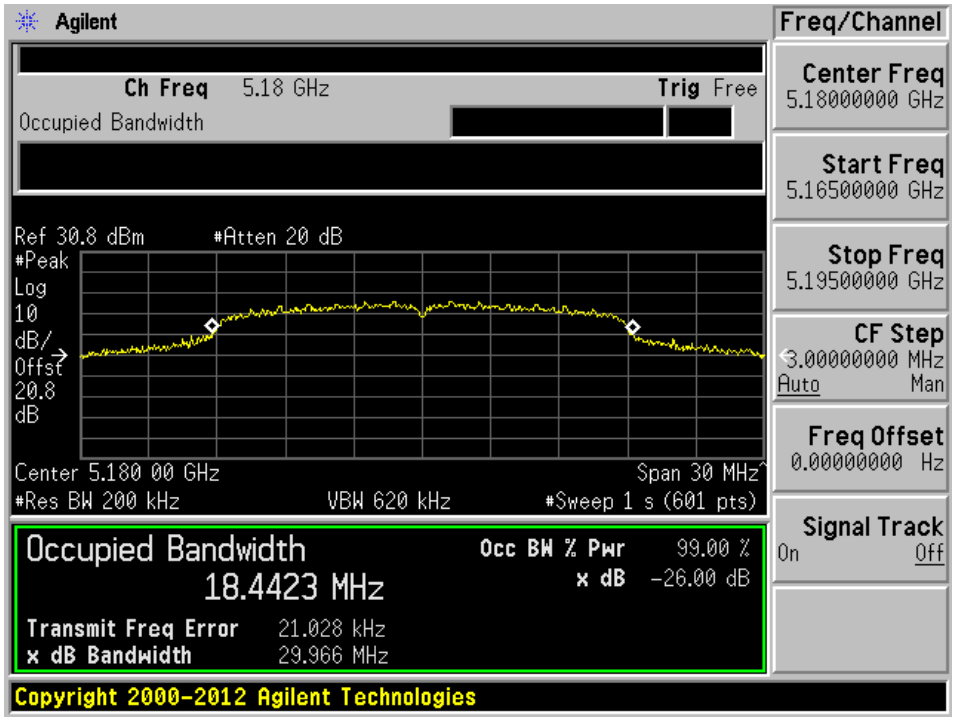
802.11a Mode 5220 MHz Mid Channel OBW



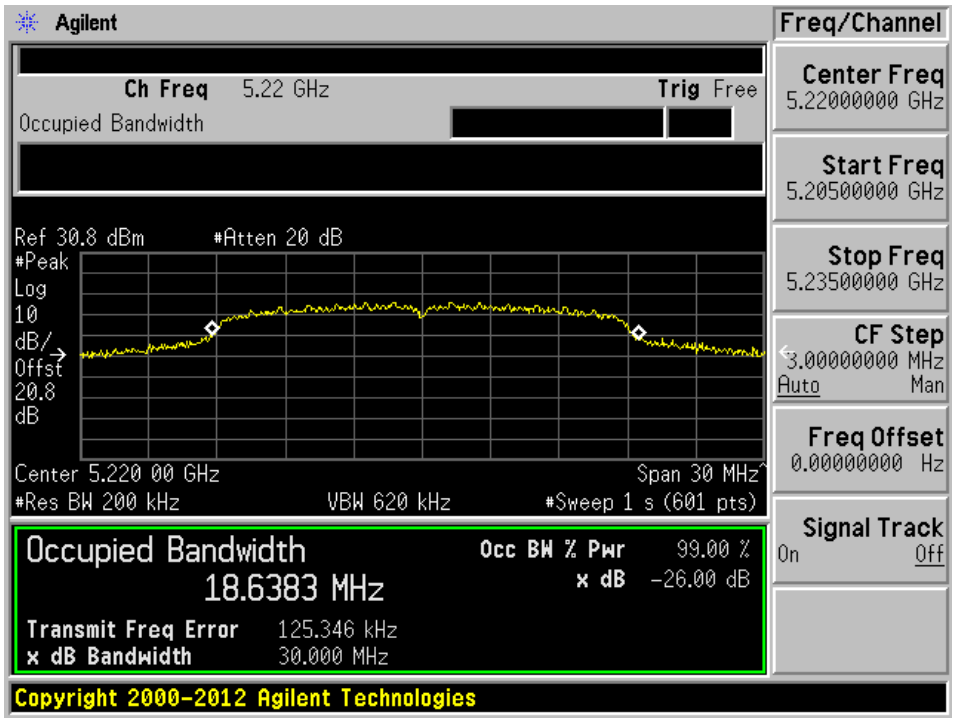
802.11a Mode 5240 MHz High Channel OBW



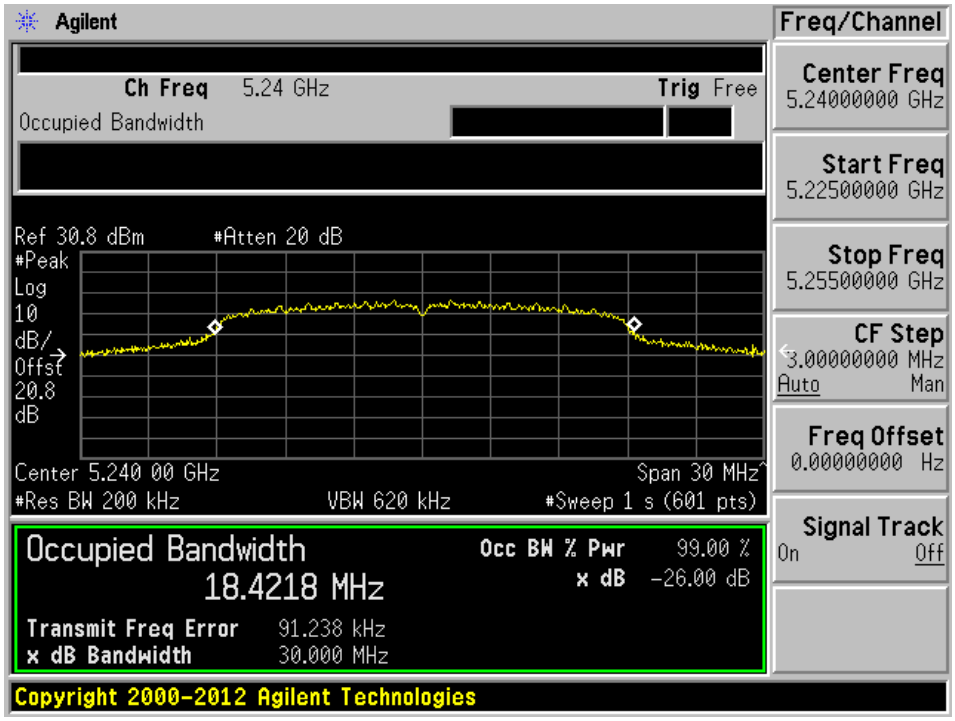
802.11n HT20 Mode 5180 MHz Low Channel OBW



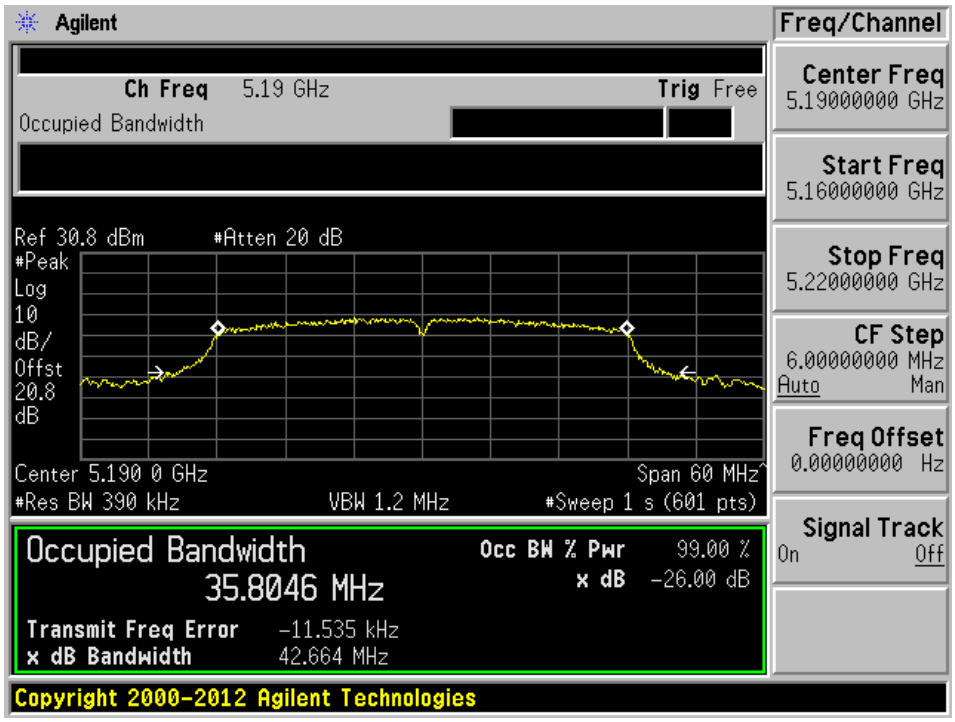
802.11n HT20 Mode 5220 MHz Mid Channel OBW



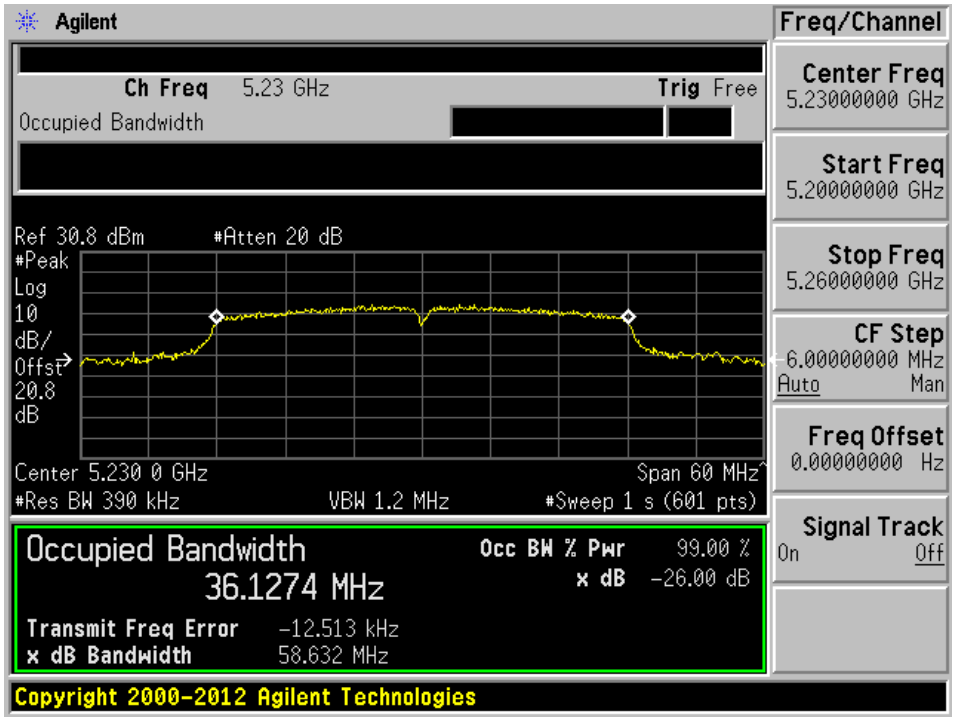
802.11n HT20 Mode 5240 MHz High Channel OBW



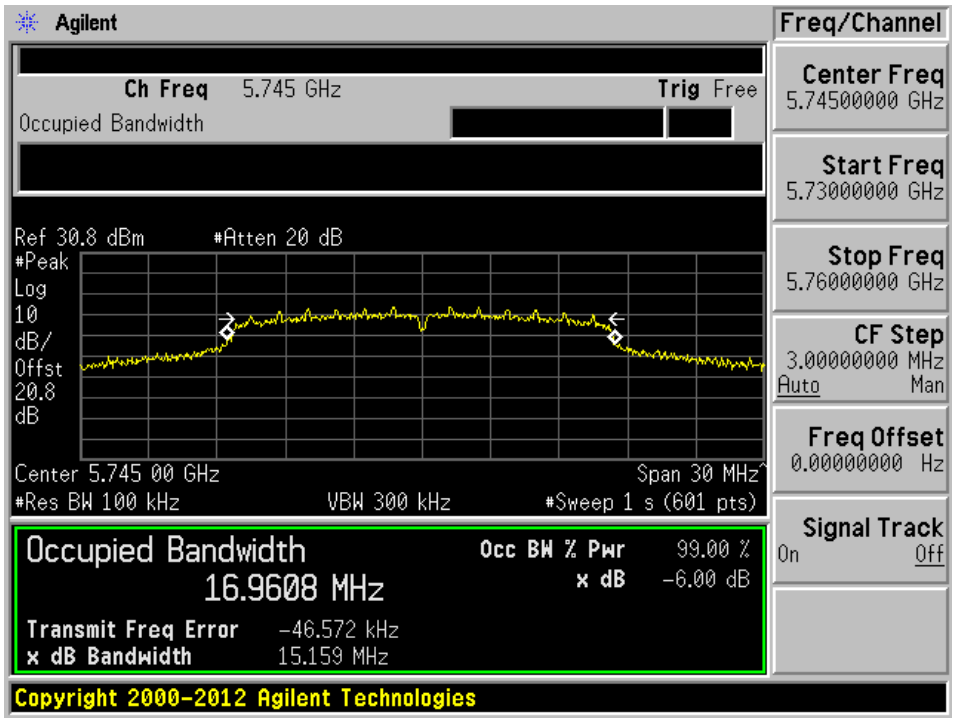
802.11n HT40 Mode 5190 MHz Low Channel OBW



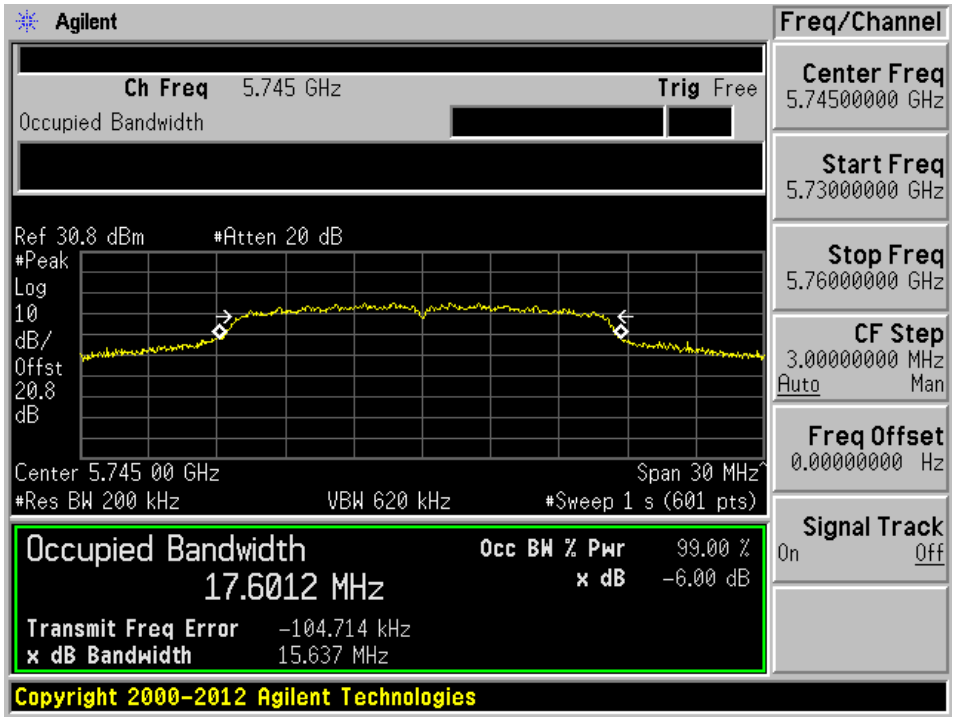
802.11n HT40 Mode 5230 MHz High Channel OBW



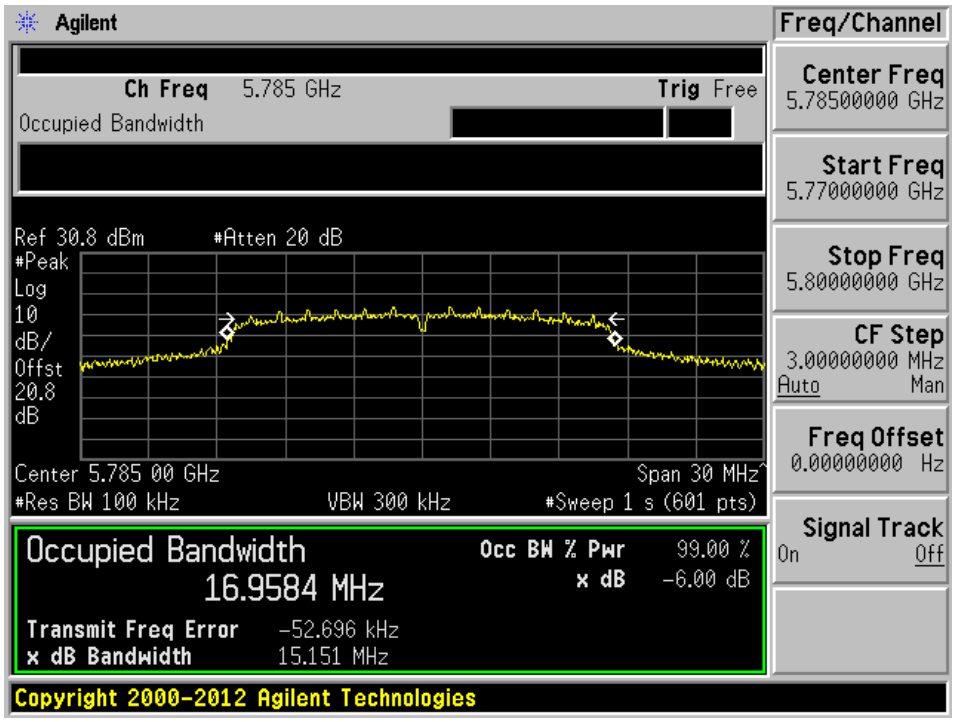
802.11a Mode 5745 MHz Low Channel 6 dB BW



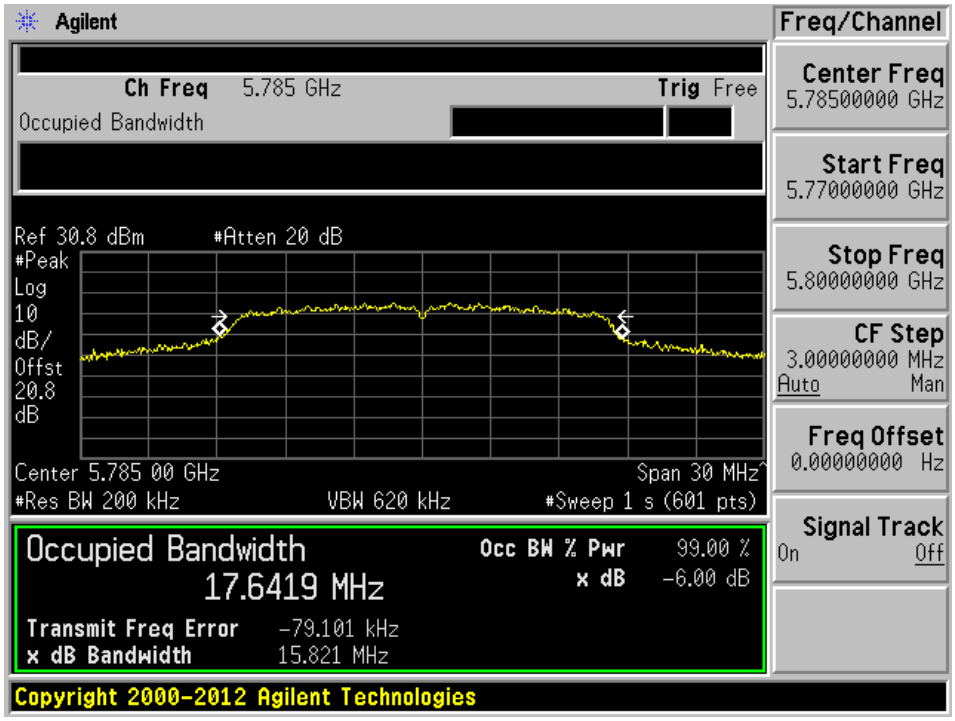
802.11a Mode 5745 MHz Low Channel 99% OBW



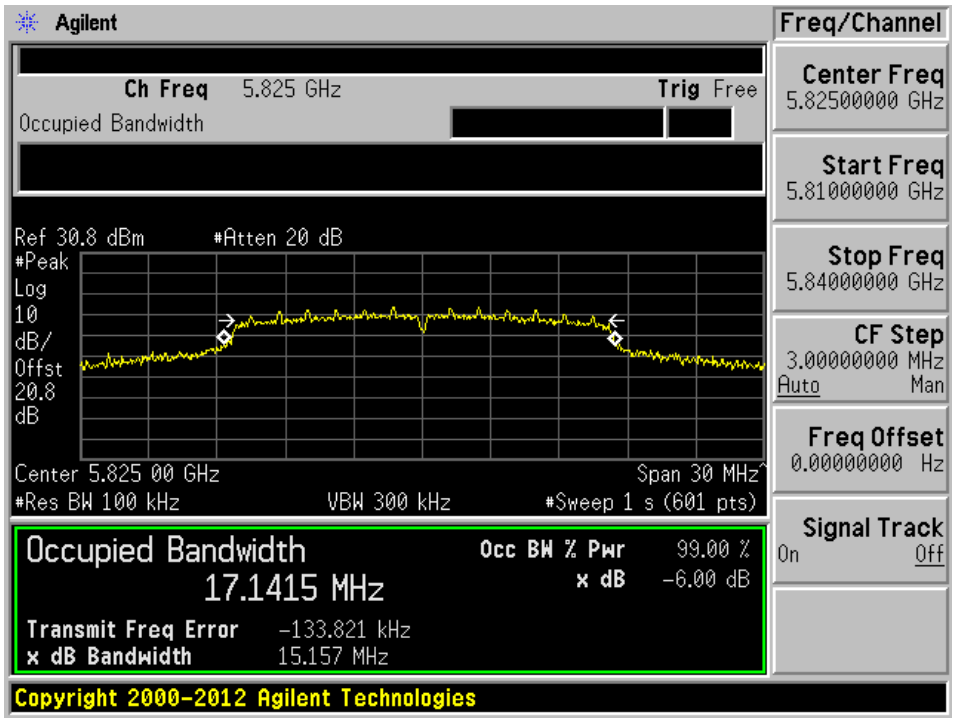
802.11a Mode 5785 MHz Mid Channel 6 dB BW



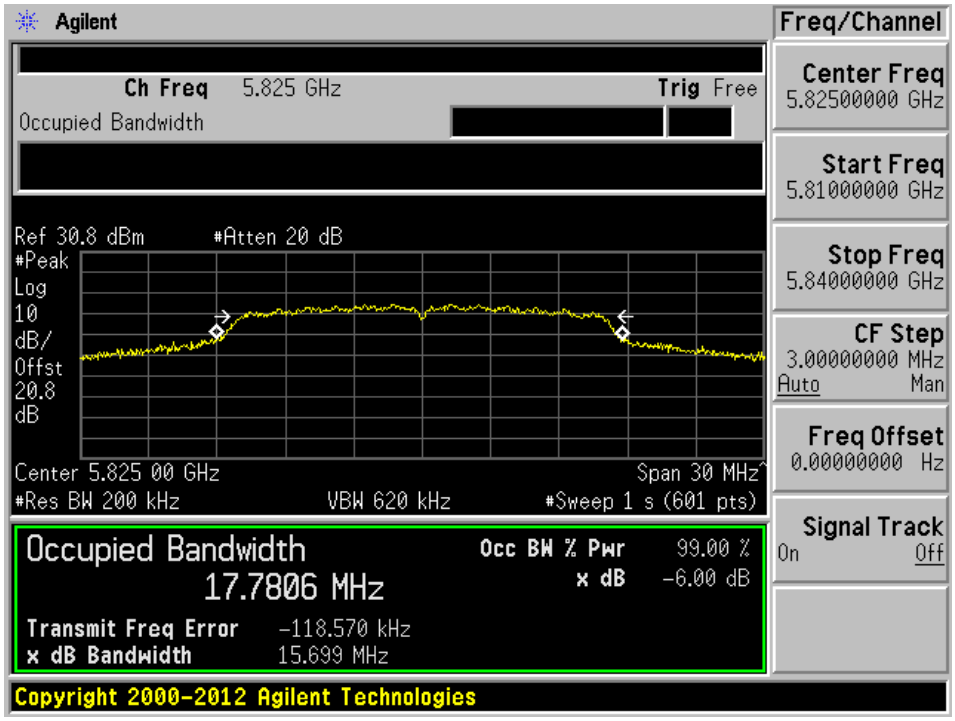
802.11a Mode 5785 MHz Mid Channel 99% OBW



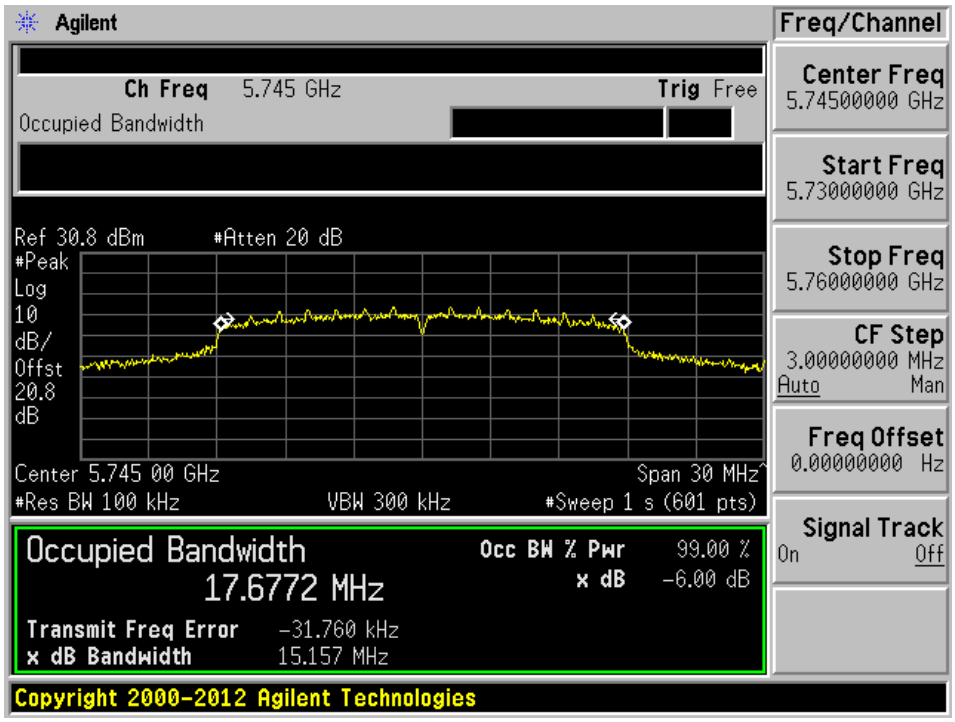
802.11a Mode 5825 MHz High Channel 6 dB BW



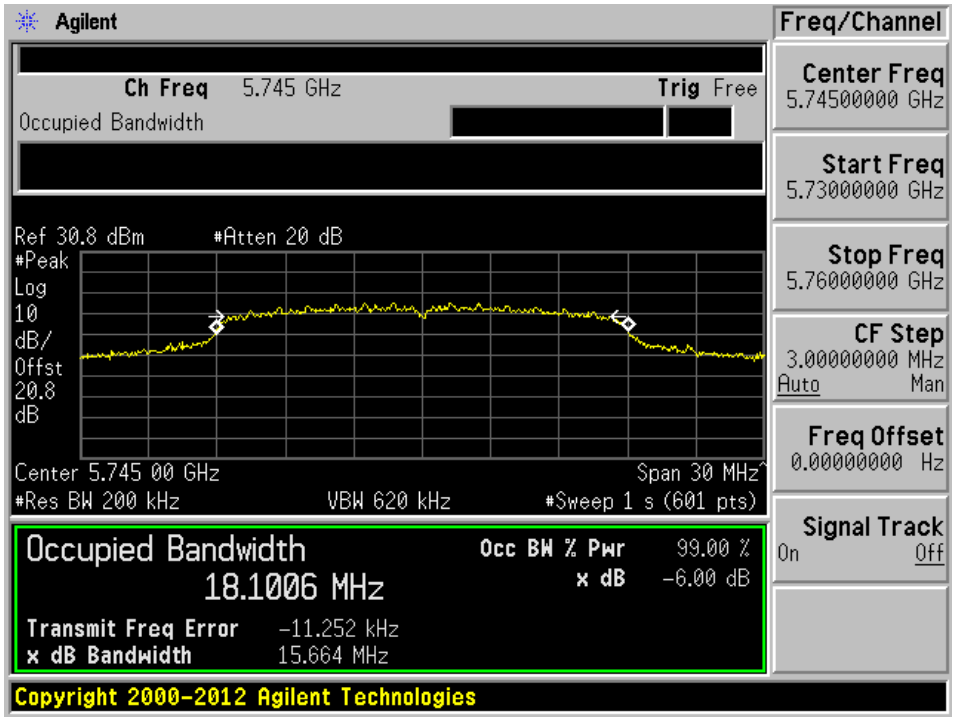
802.11a Mode 5825 MHz High Channel 99% OBW



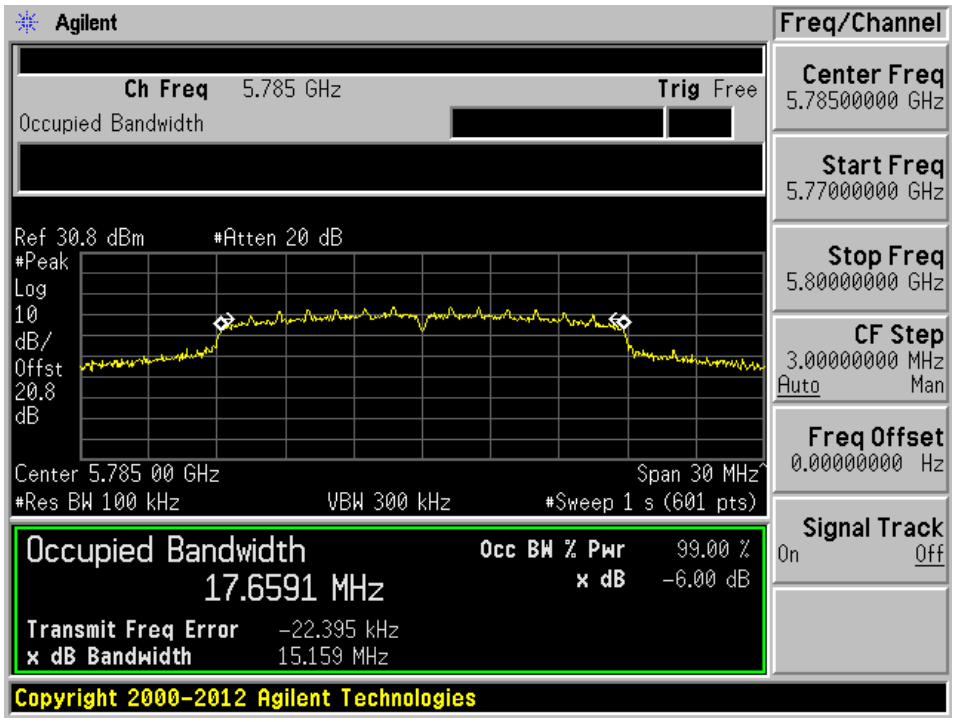
802.11n HT20 Mode 5745 MHz Low Channel 6 dB BW



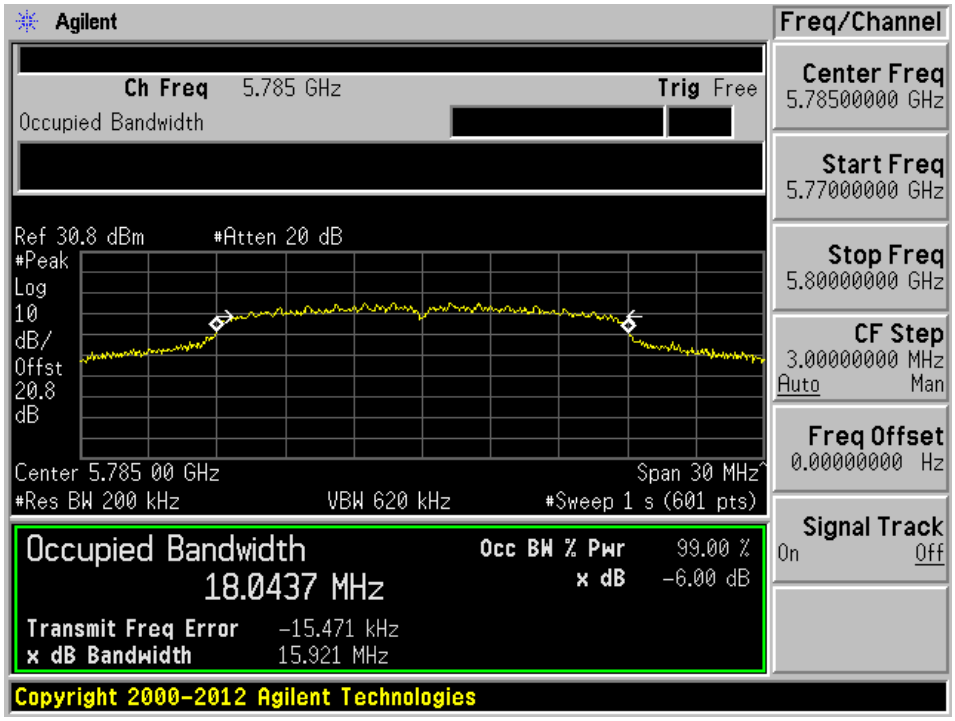
802.11n HT20 Mode 5745 MHz Low Channel 99% OBW



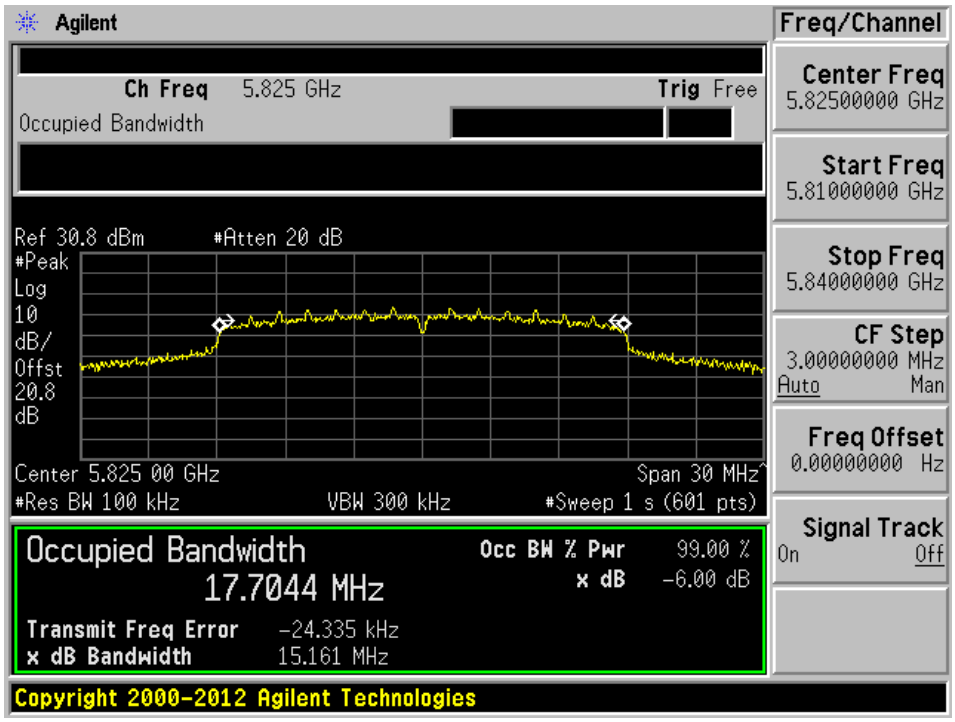
802.11n HT20 Mode 5785 MHz Mid Channel 6 dB BW



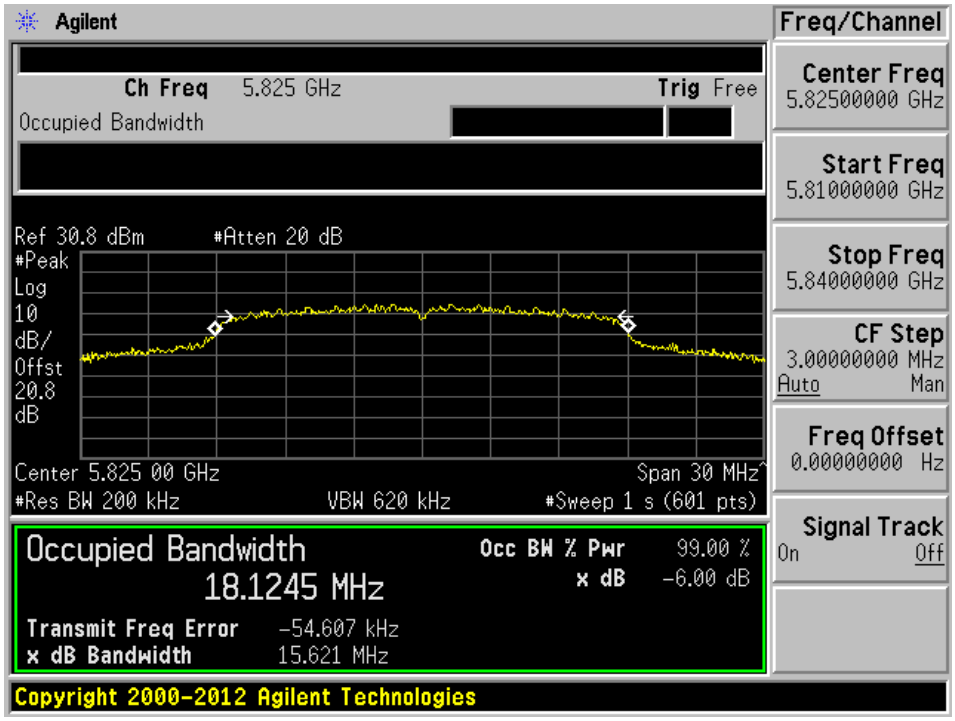
802.11n HT20 Mode 5785 MHz Mid Channel 99% OBW



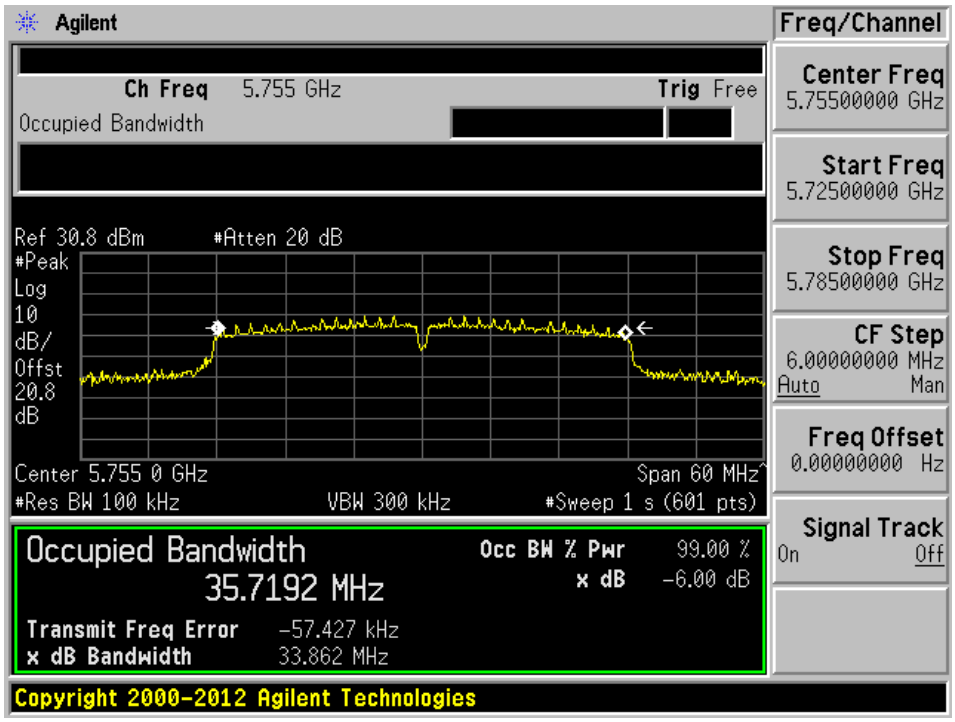
802.11n HT20 Mode 5825 MHz High Channel 6 dB BW



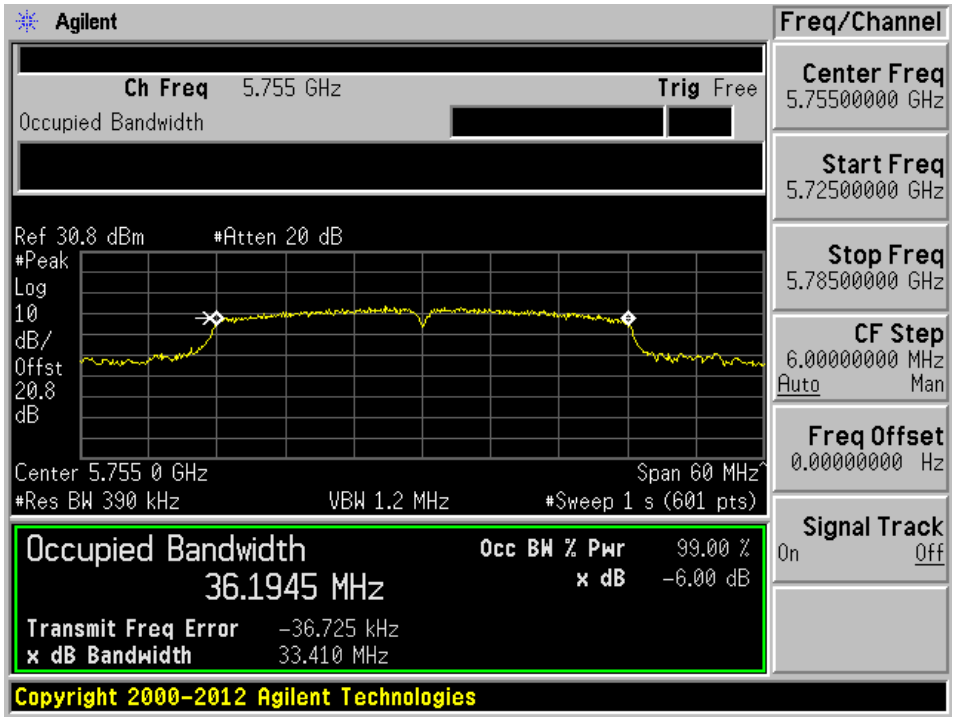
802.11n HT20 Mode 5825 MHz High Channel 99% OBW



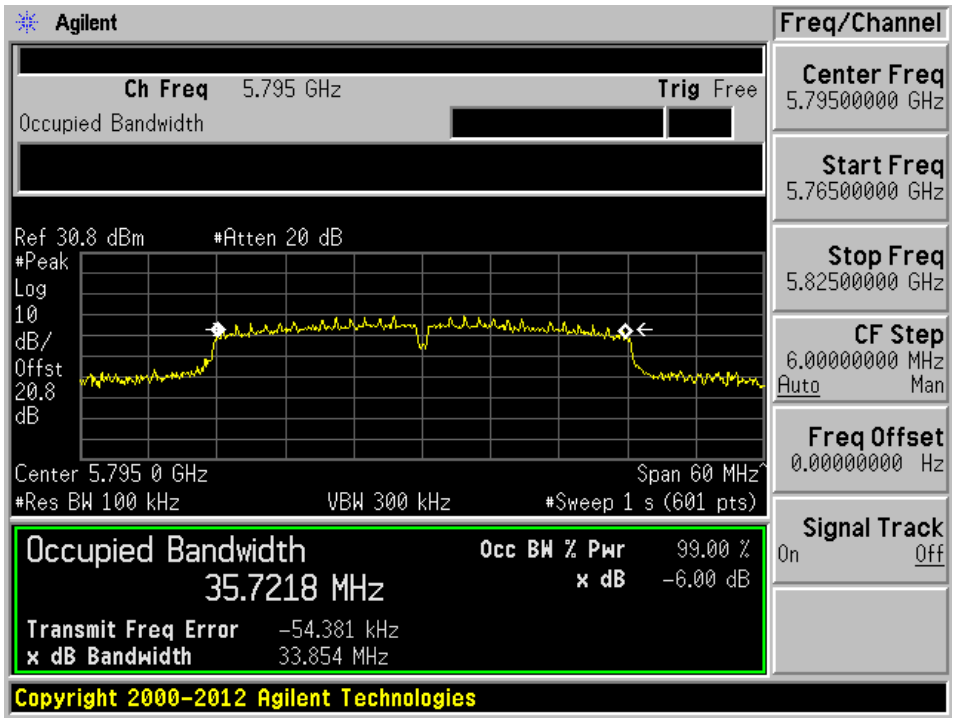
802.11n HT40 Mode 5755 MHz Low Channel 6 dB BW



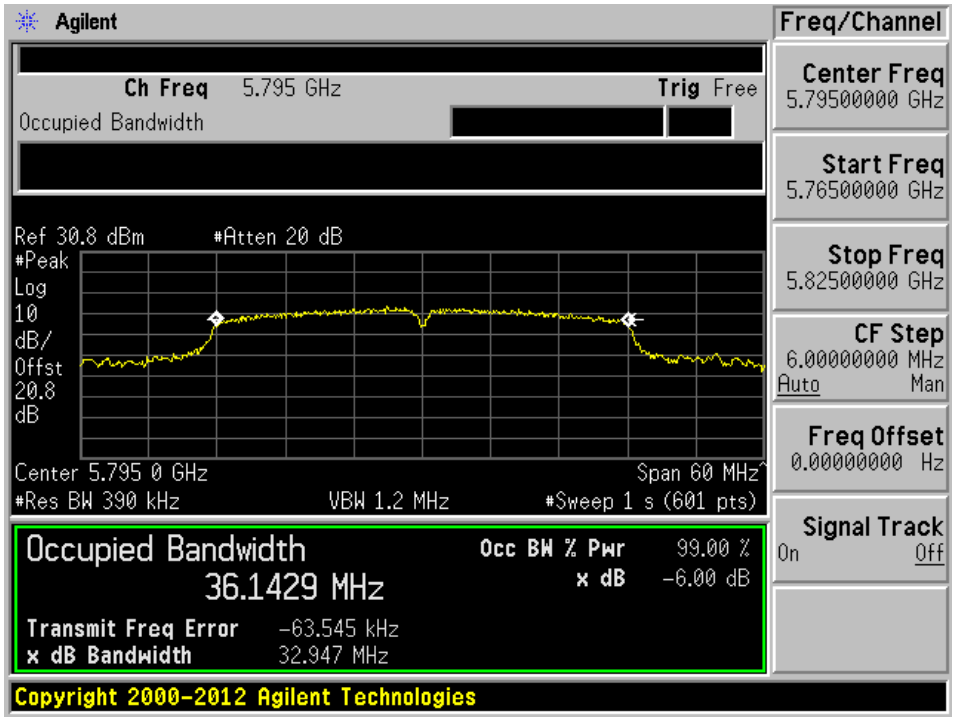
802.11n HT40 Mode 5755 MHz Low Channel 99% OBW



802.11n HT40 Mode 5795 MHz High Channel 6 dB BW

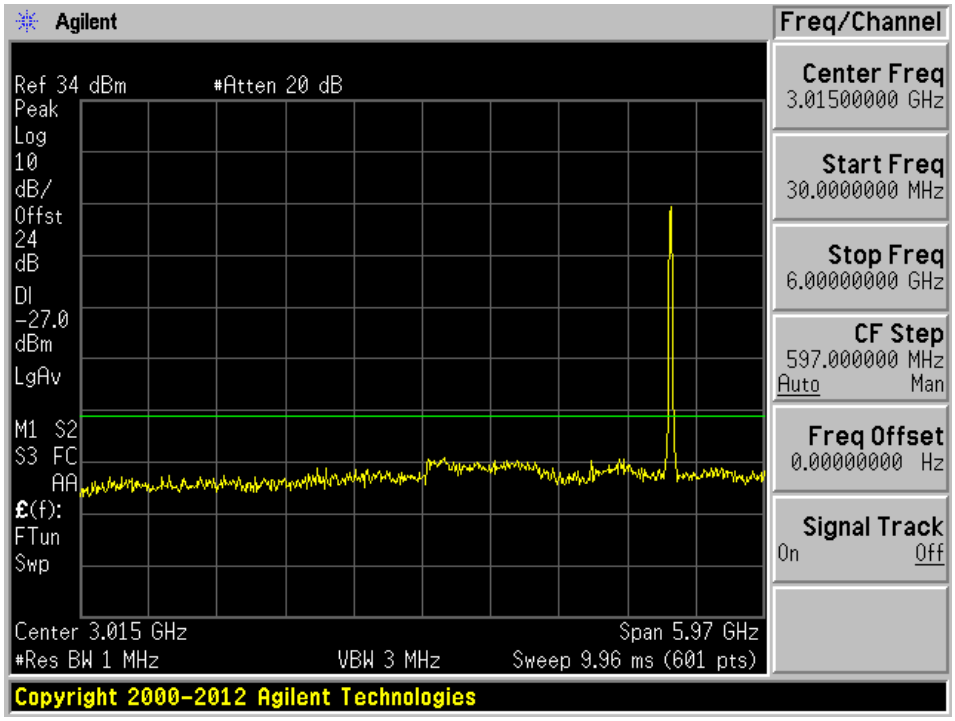


802.11n HT40 Mode 5795 MHz High Channel 99% OBW

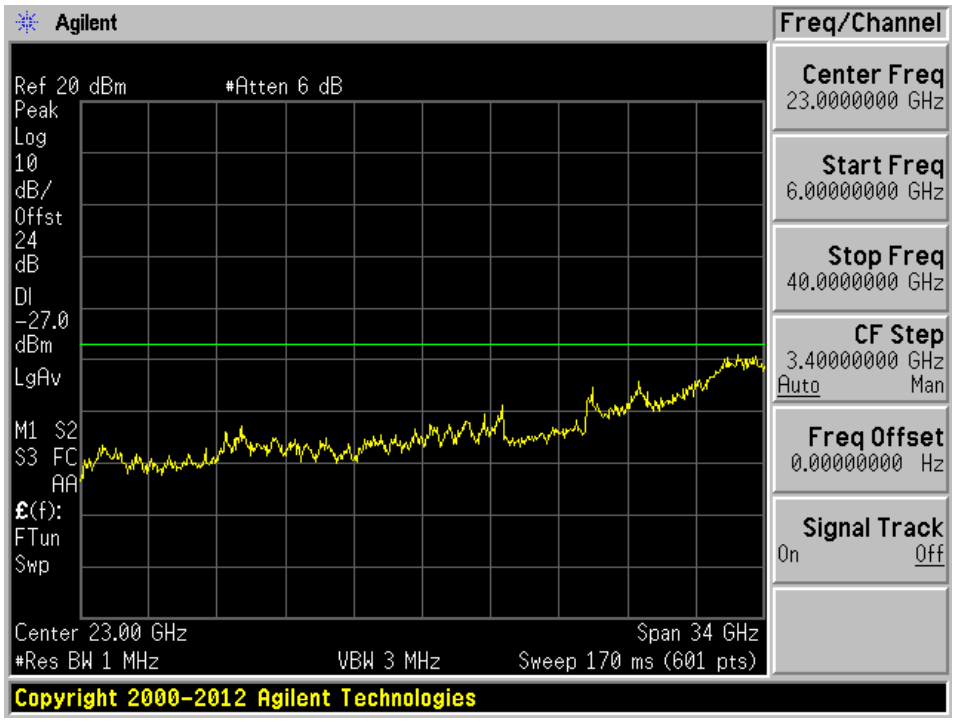


13 Appendix B (Normative) – Plots for Spurious Emission at Antenna Port

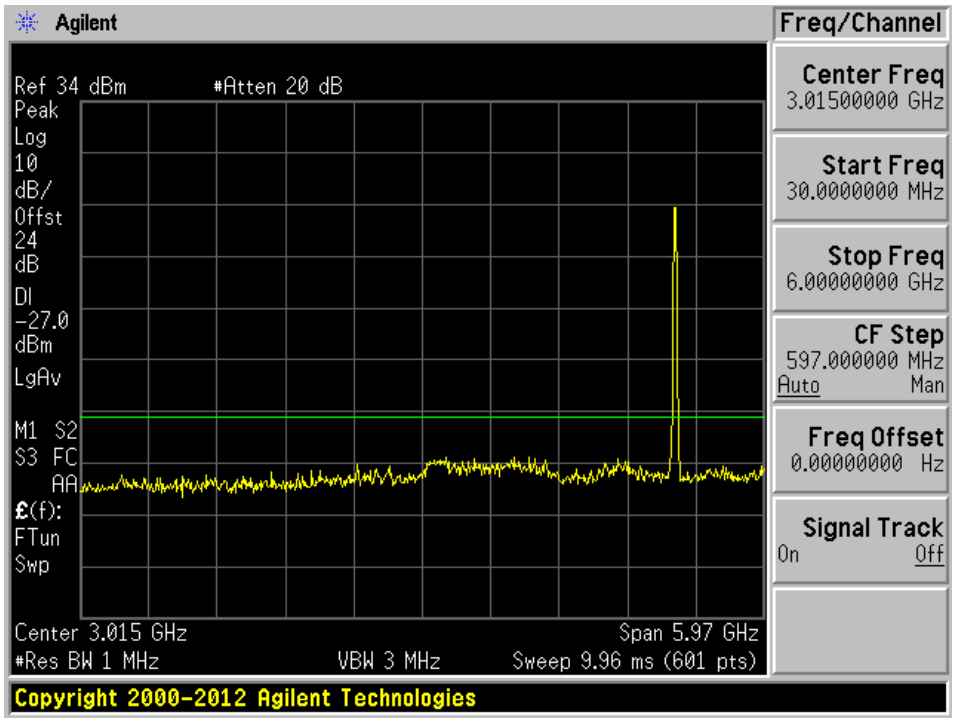
802.11a Mode 5180 MHz Low Channel Spurious Emission_1



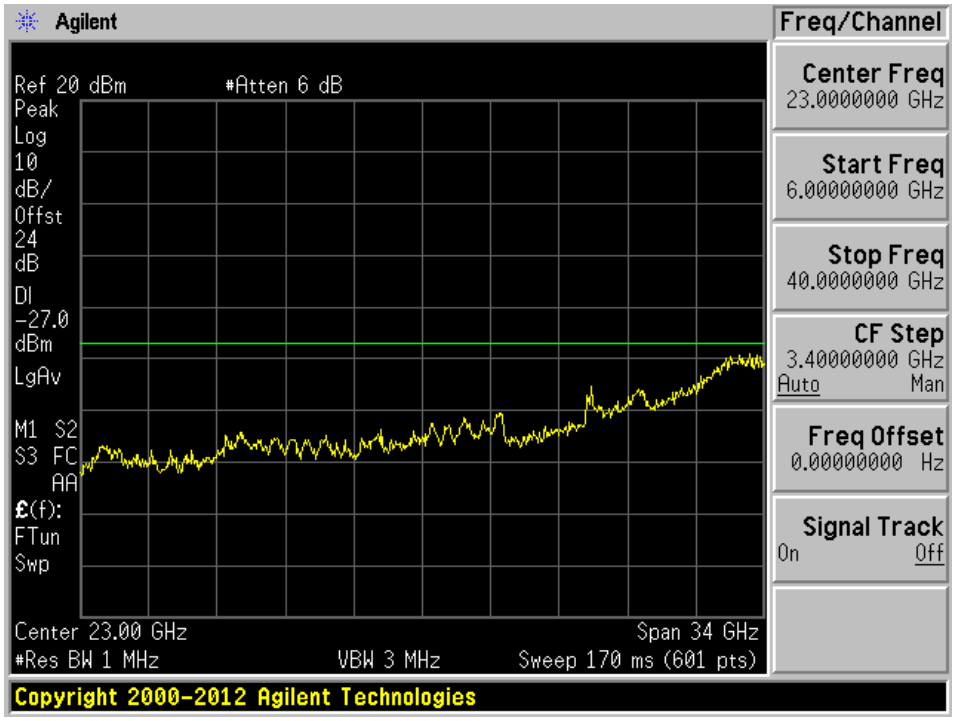
802.11a Mode 5180 MHz Low Channel Spurious Emission_2



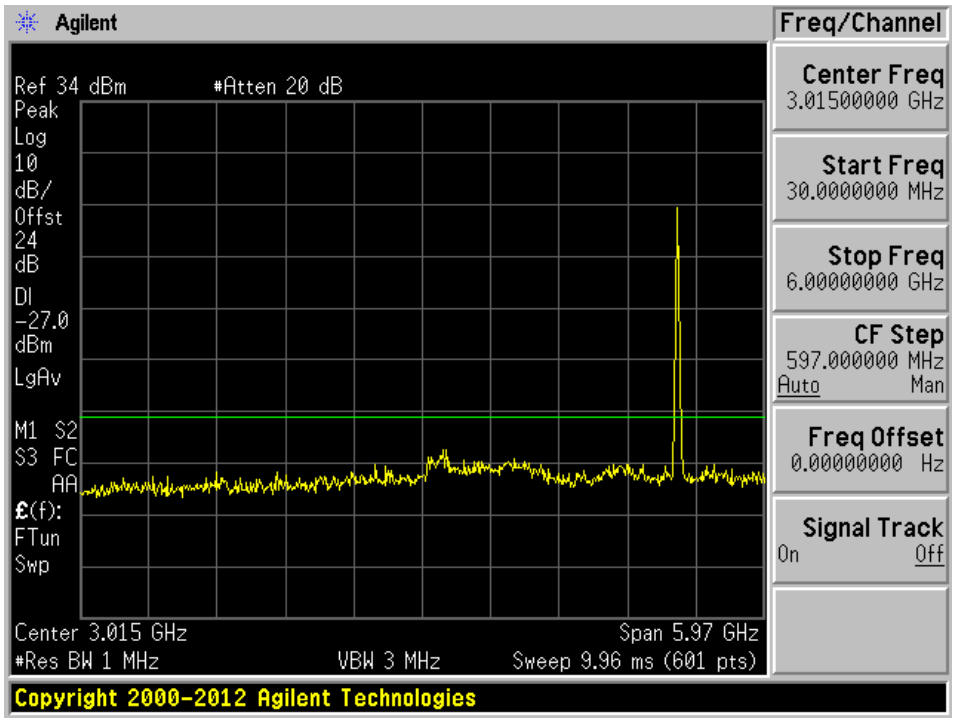
802.11a Mode 5220 MHz Mid Channel Spurious Emission_1



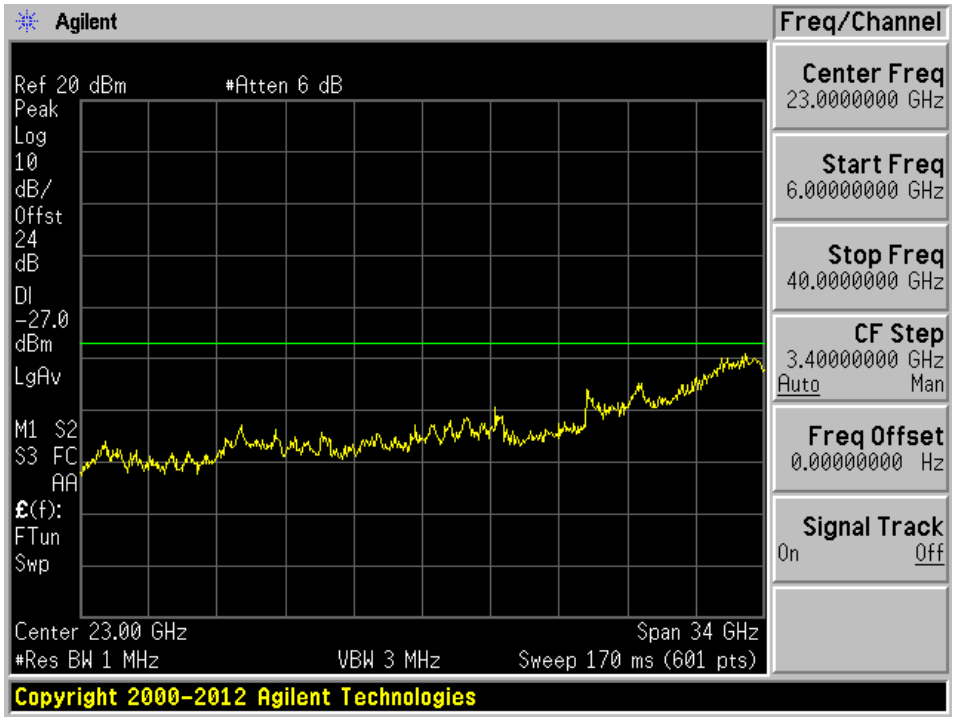
802.11a Mode 5220 MHz Mid Channel Spurious Emission_2



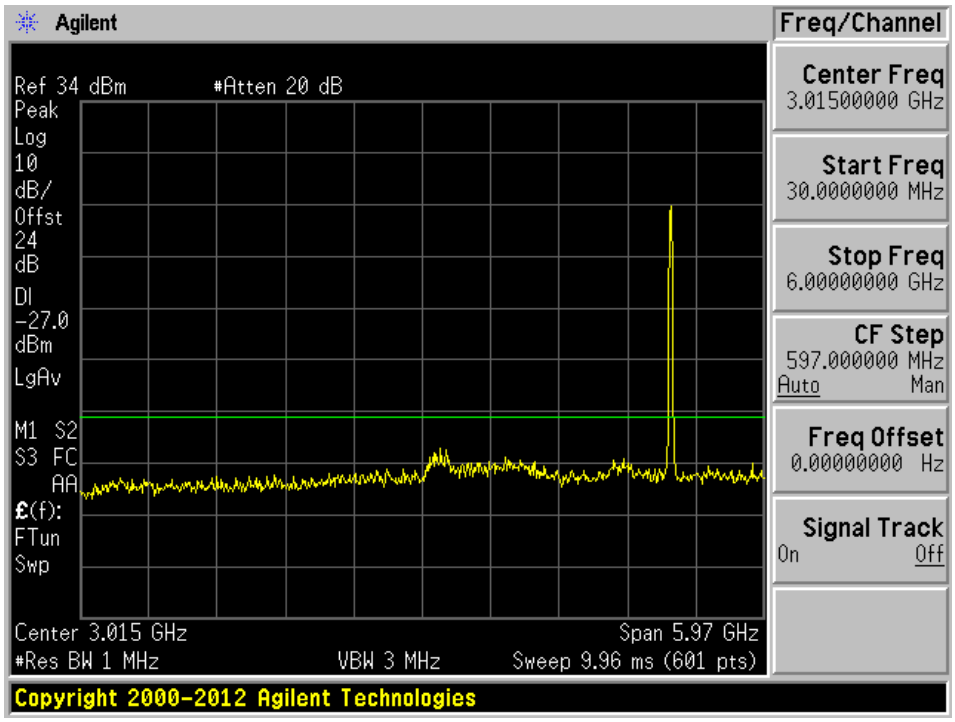
802.11a Mode 5240 MHz High Channel Spurious Emission_1



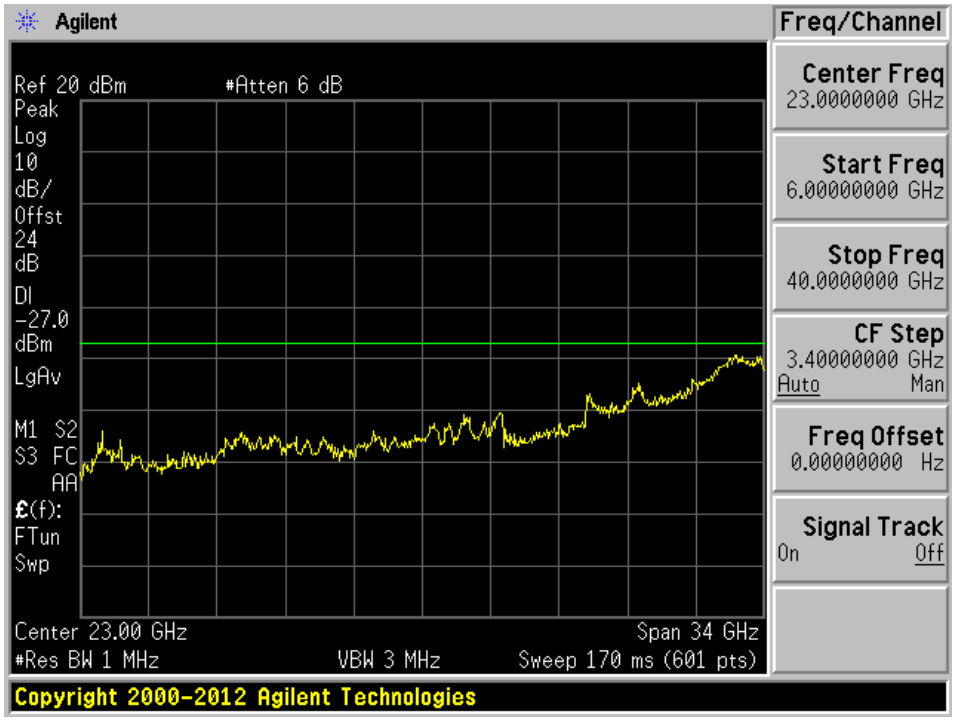
802.11a Mode 5240 MHz High Channel Spurious Emission_2



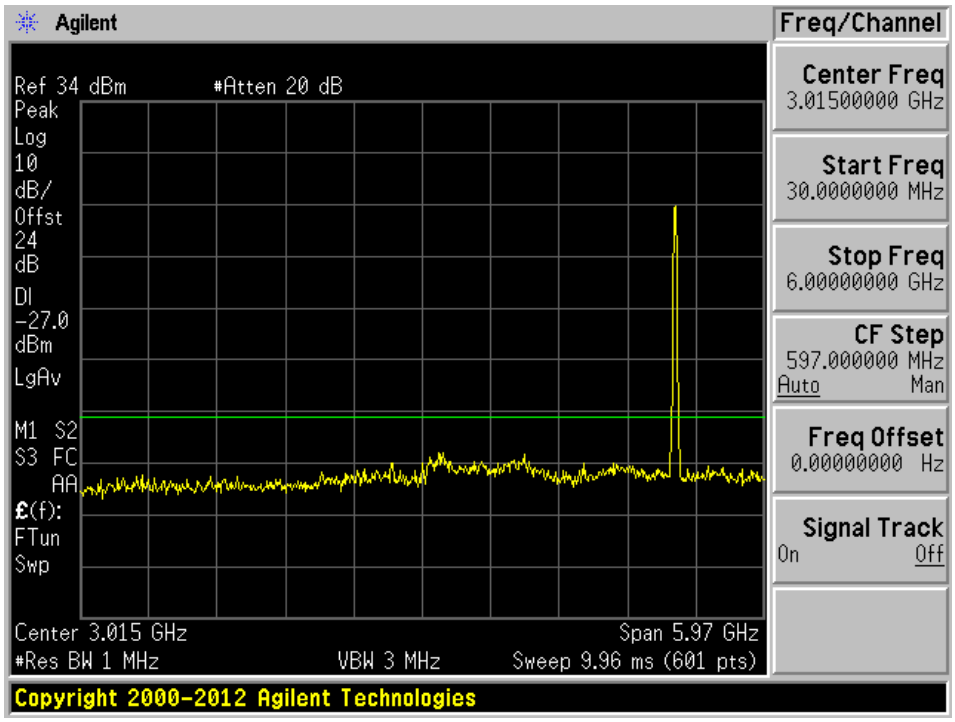
802.11n HT20 Mode 5180 MHz Low Channel Spurious Emission_1



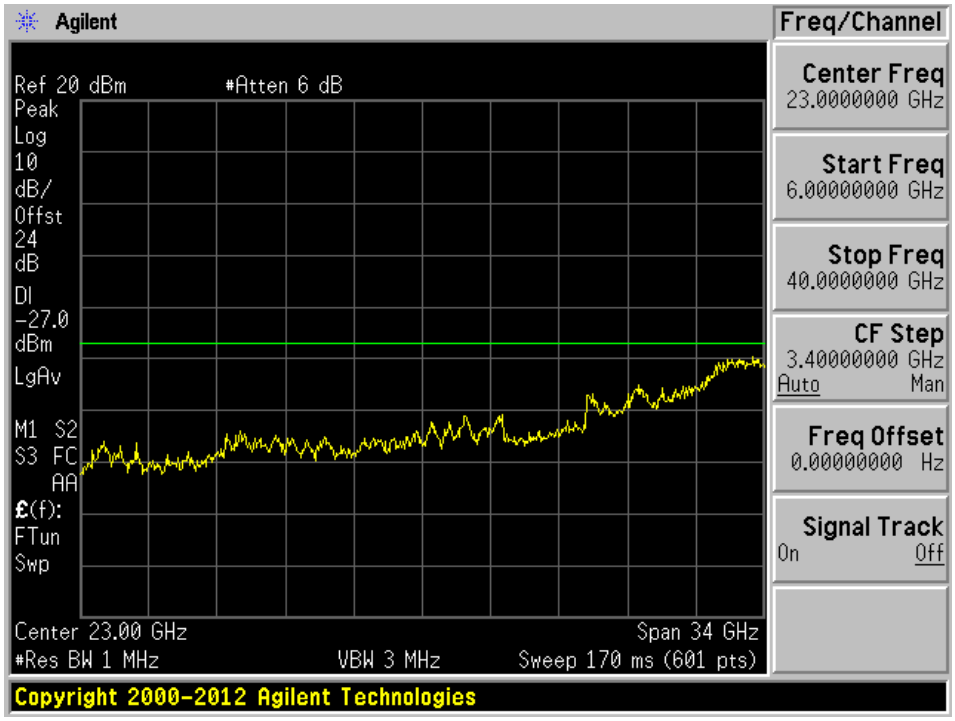
802.11n HT20 Mode 5180 MHz Low Channel Spurious Emission_2



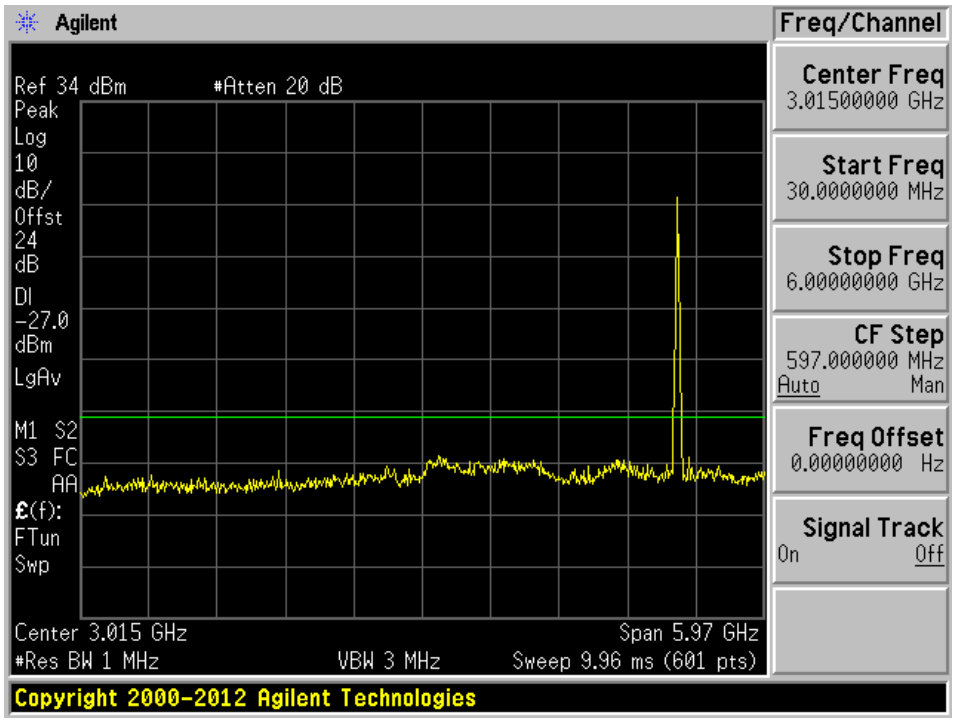
802.11n HT20 Mode 5220 MHz Mid Channel Spurious Emission_1



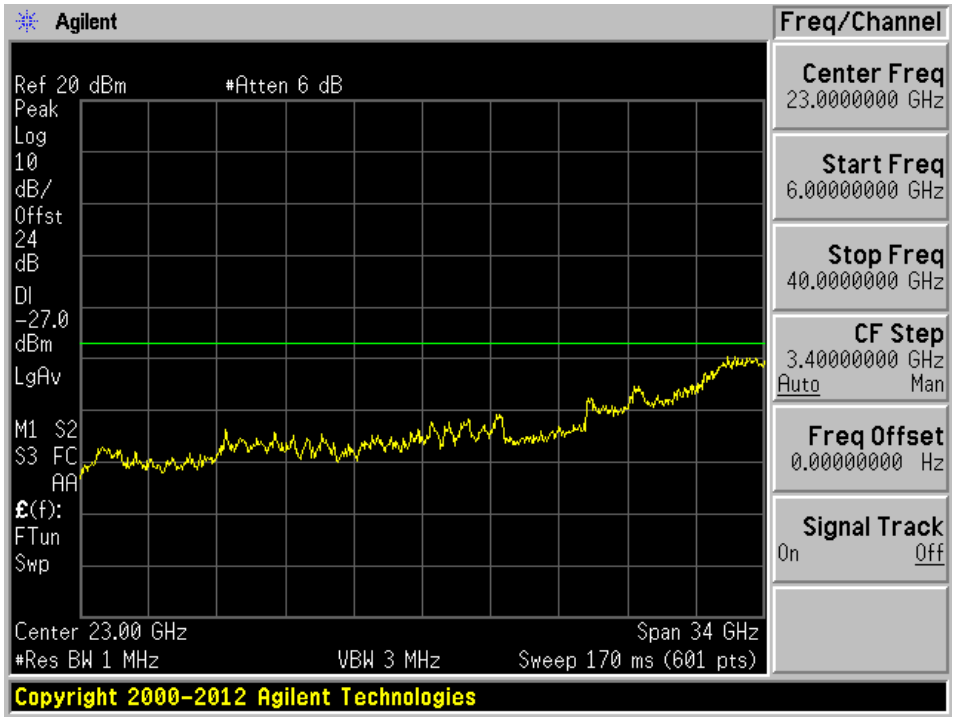
802.11n HT20 Mode 5220 MHz Mid Channel Spurious Emission_2



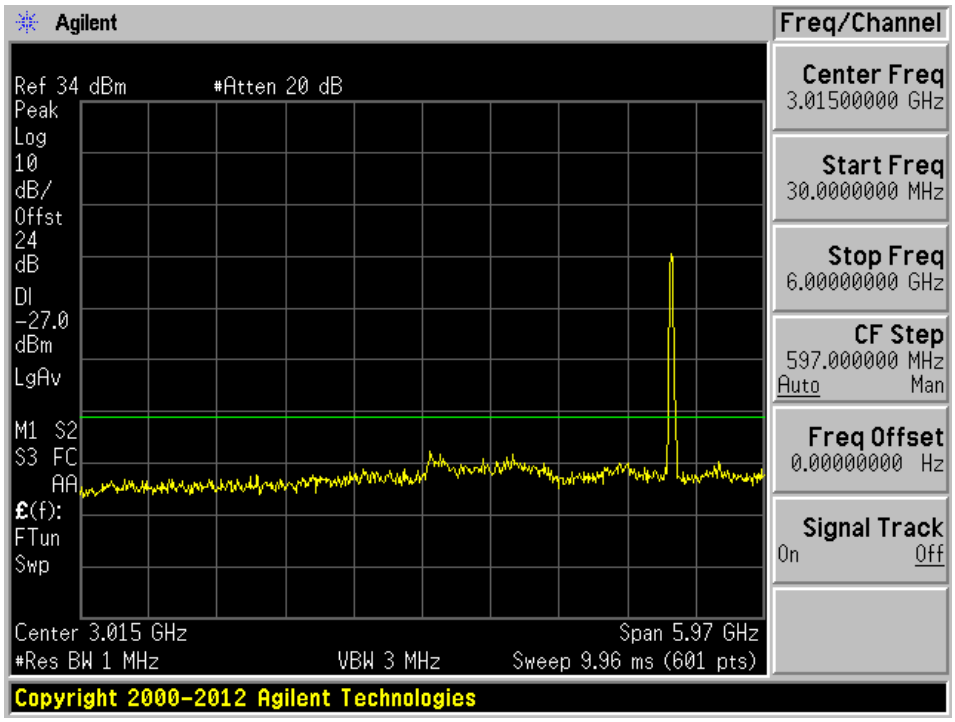
802.11n HT20 Mode 5240 MHz High Channel Spurious Emission_1



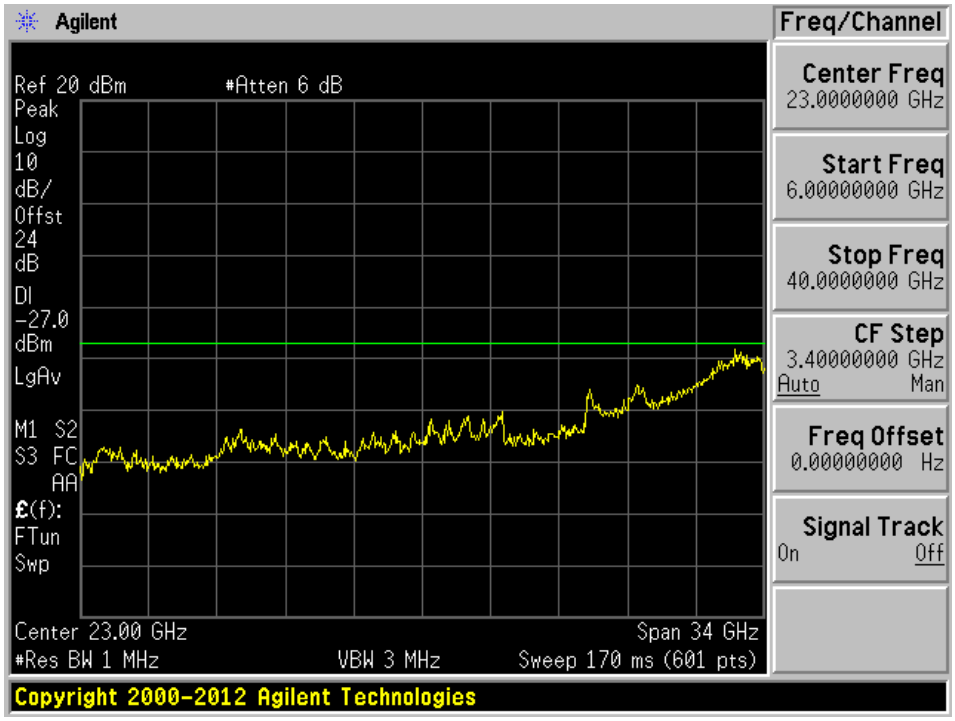
802.11n HT20 Mode 5240 MHz High Channel Spurious Emission_2



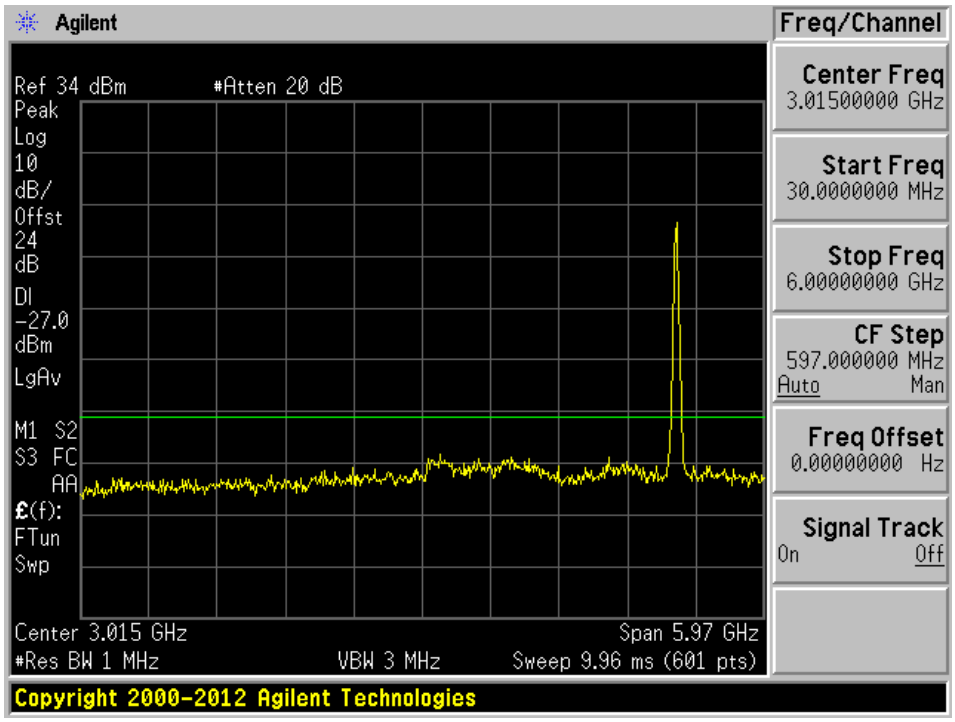
802.11n HT40 Mode 5190 MHz Low Channel Spurious Emission_1



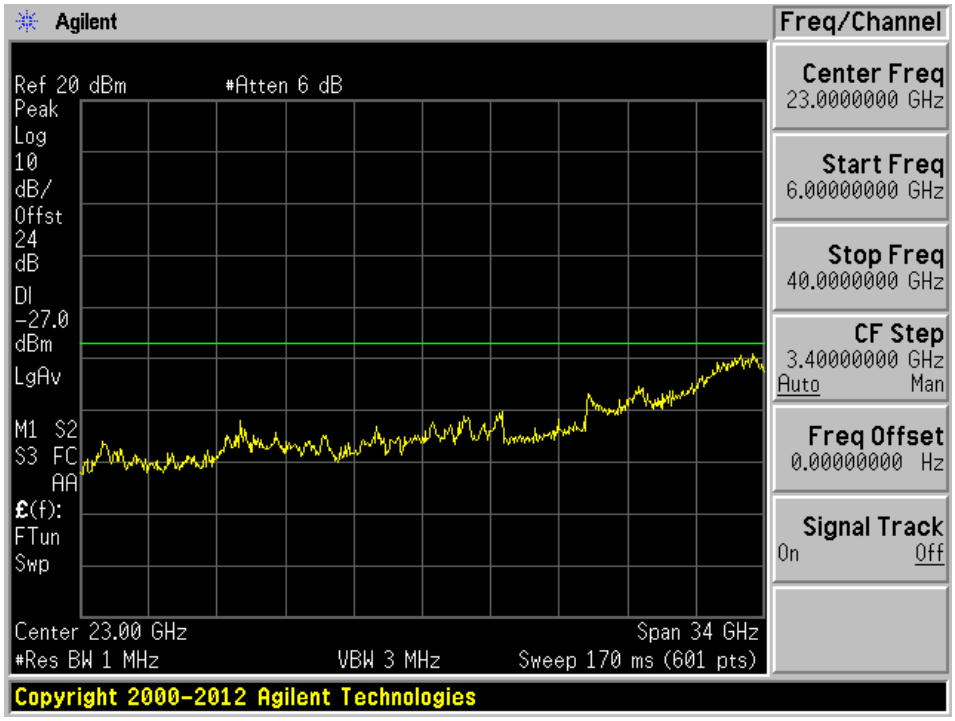
802.11n HT40 Mode 5190 MHz Low Channel Spurious Emission_2



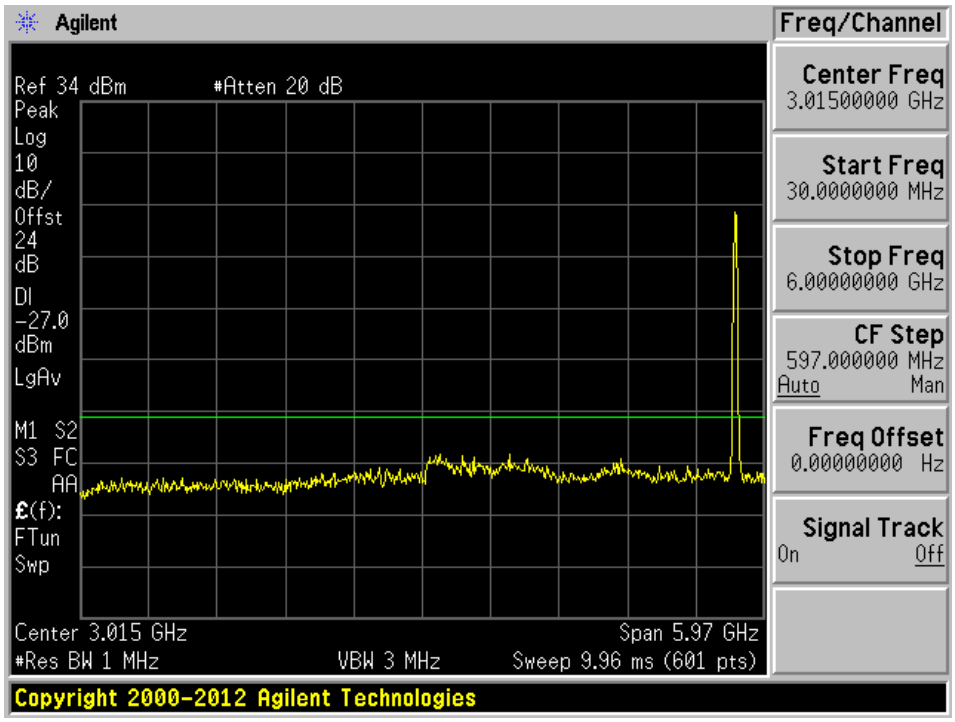
802.11n HT40 Mode 5230 MHz High Channel Spurious Emission_1



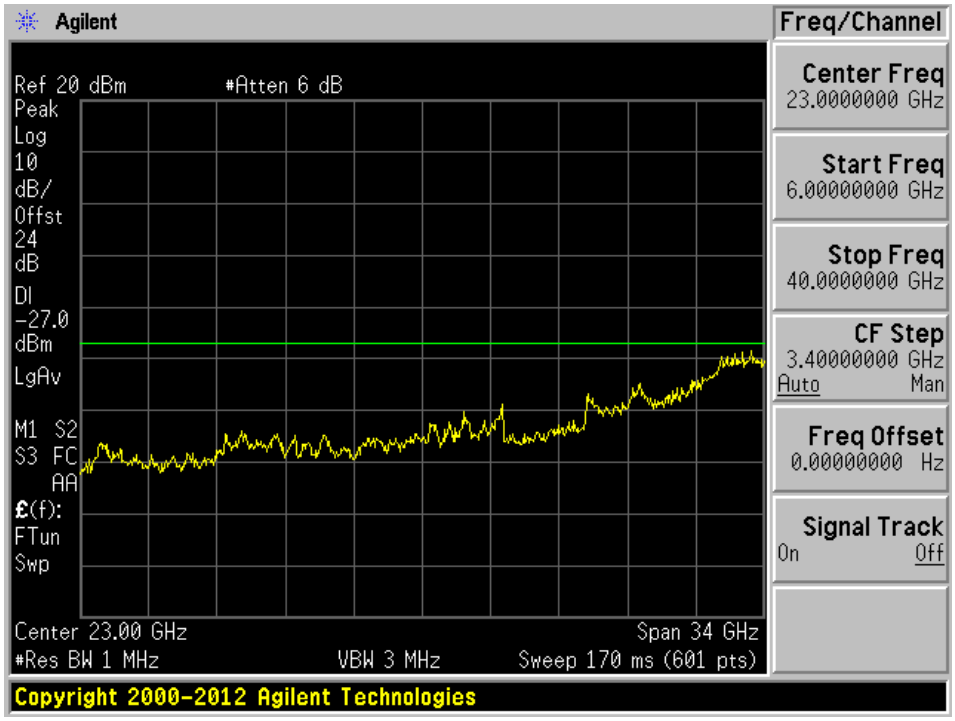
802.11n HT40 Mode 5230 MHz High Channel Spurious Emission_2



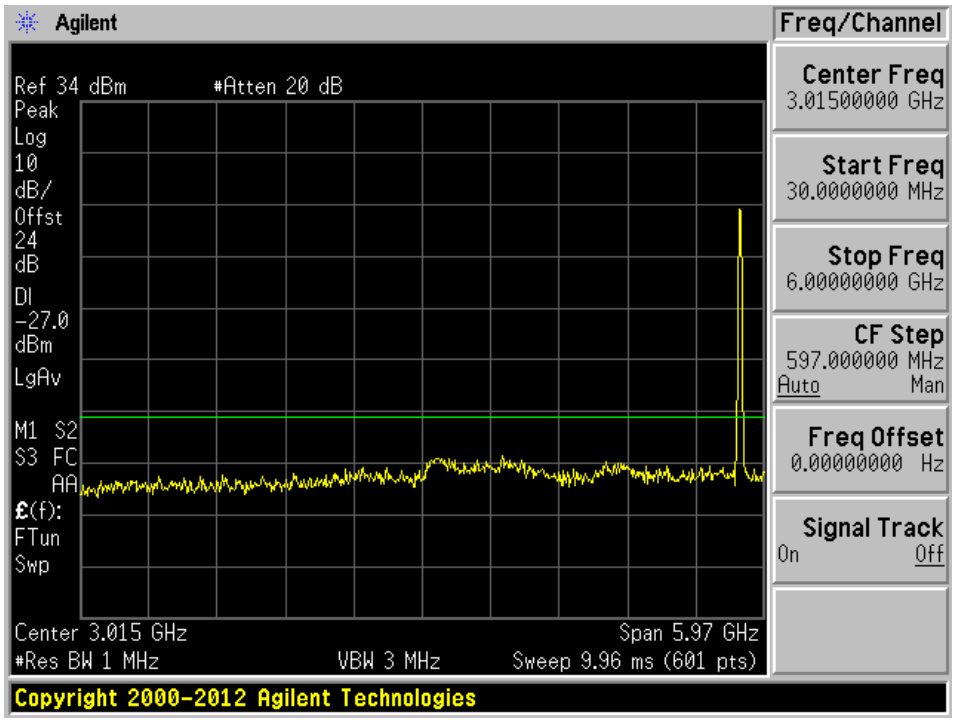
802.11a Mode 5745 MHz Low Channel Spurious Emission_1



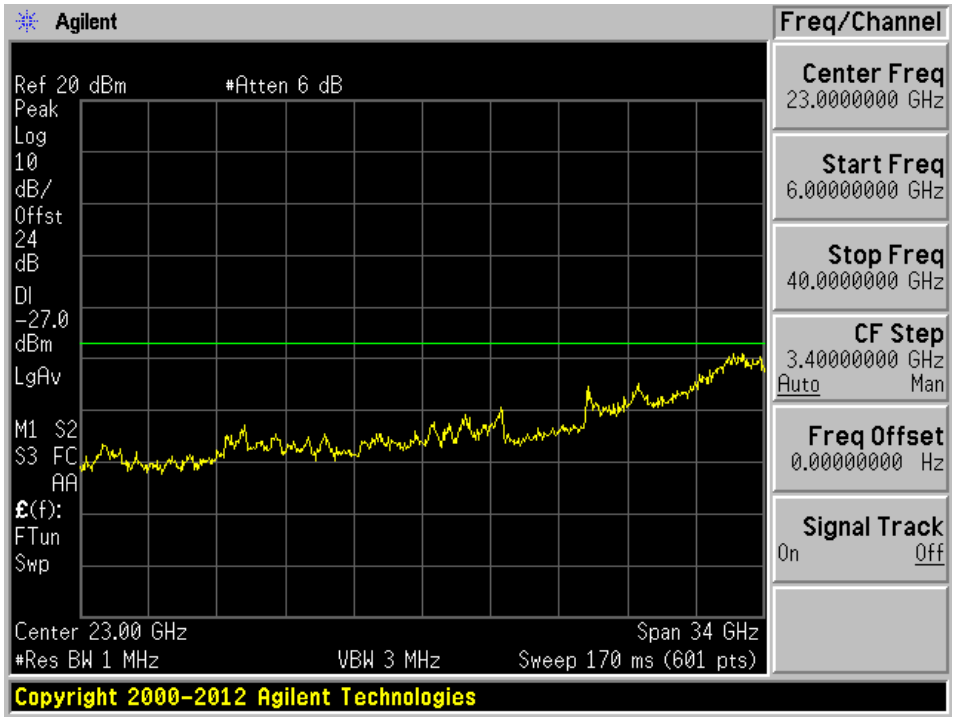
802.11a Mode 5745 MHz Low Channel Spurious Emission_2



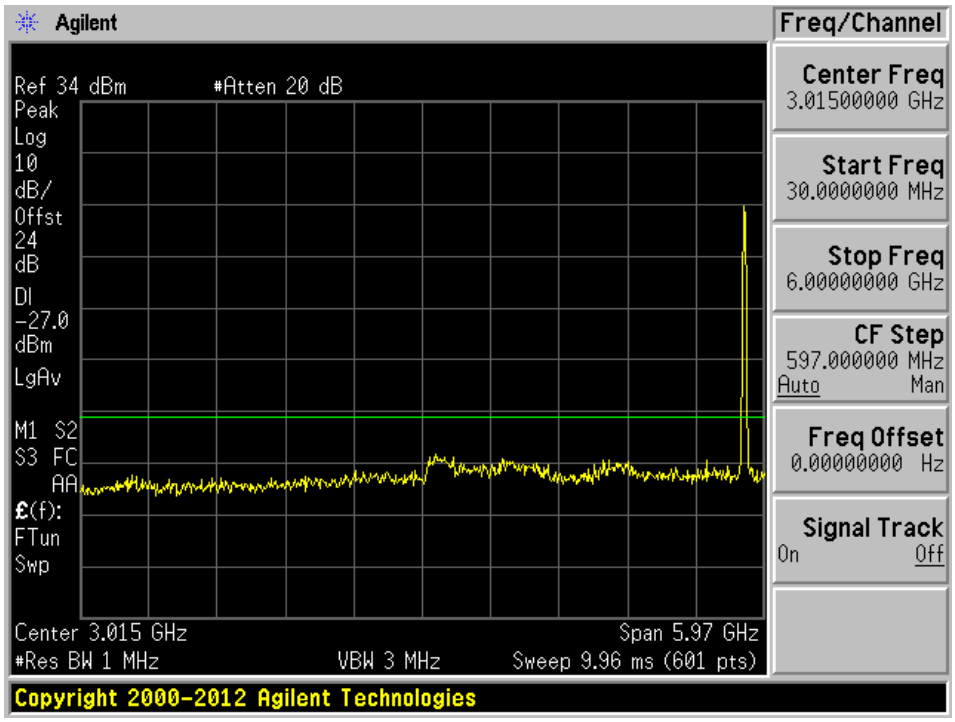
802.11a Mode 5785 MHz Mid Channel Spurious Emission_1



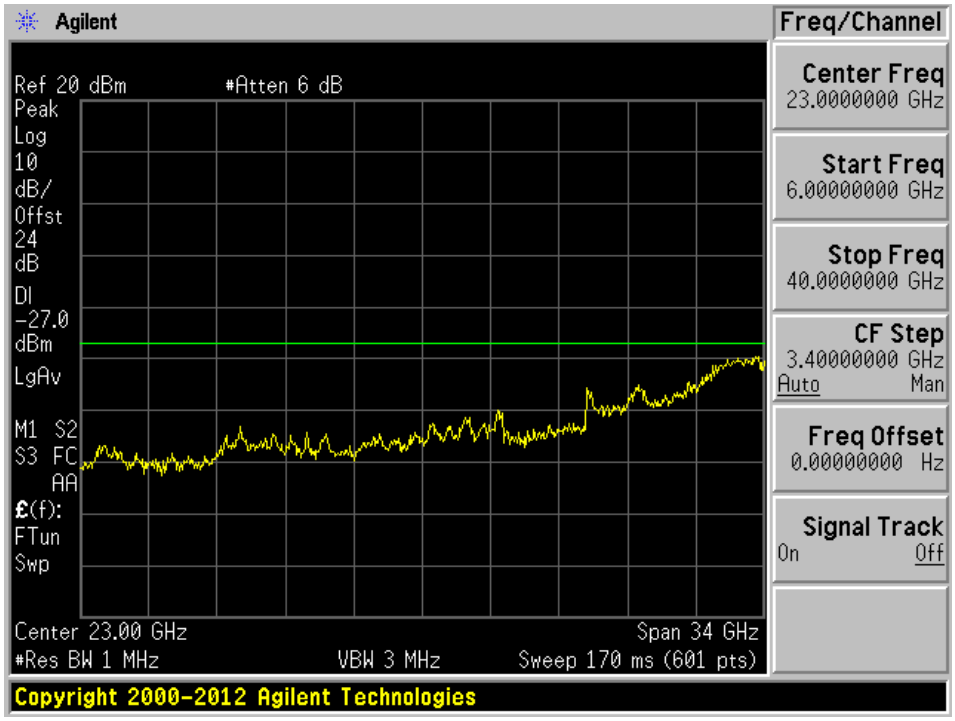
802.11a Mode 5785 MHz Mid Channel Spurious Emission_2



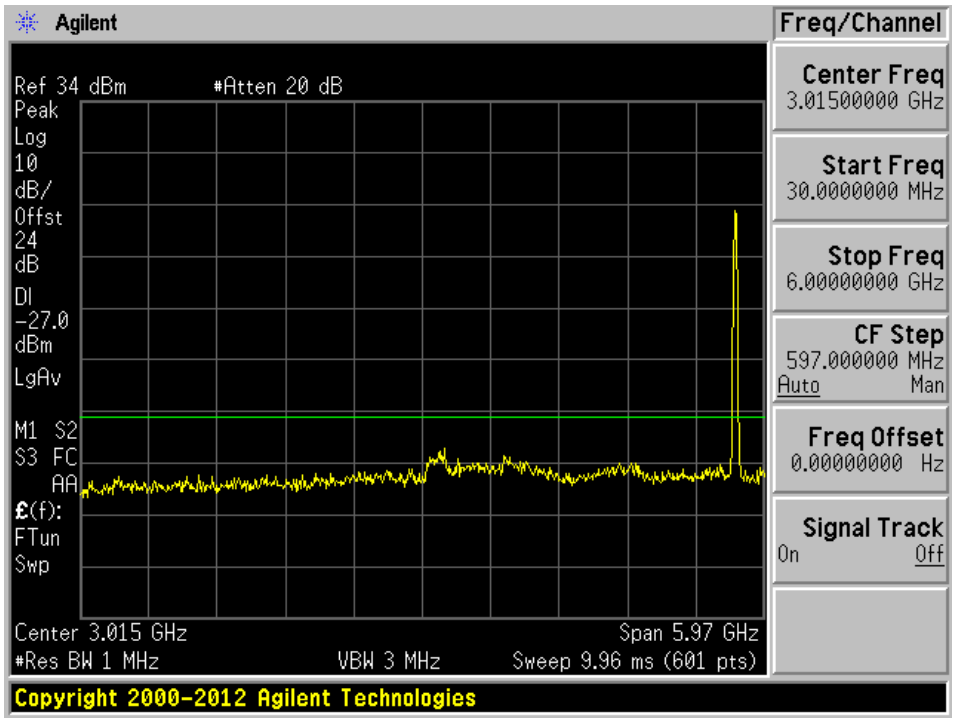
802.11a Mode 5825 MHz High Channel Spurious Emission_1



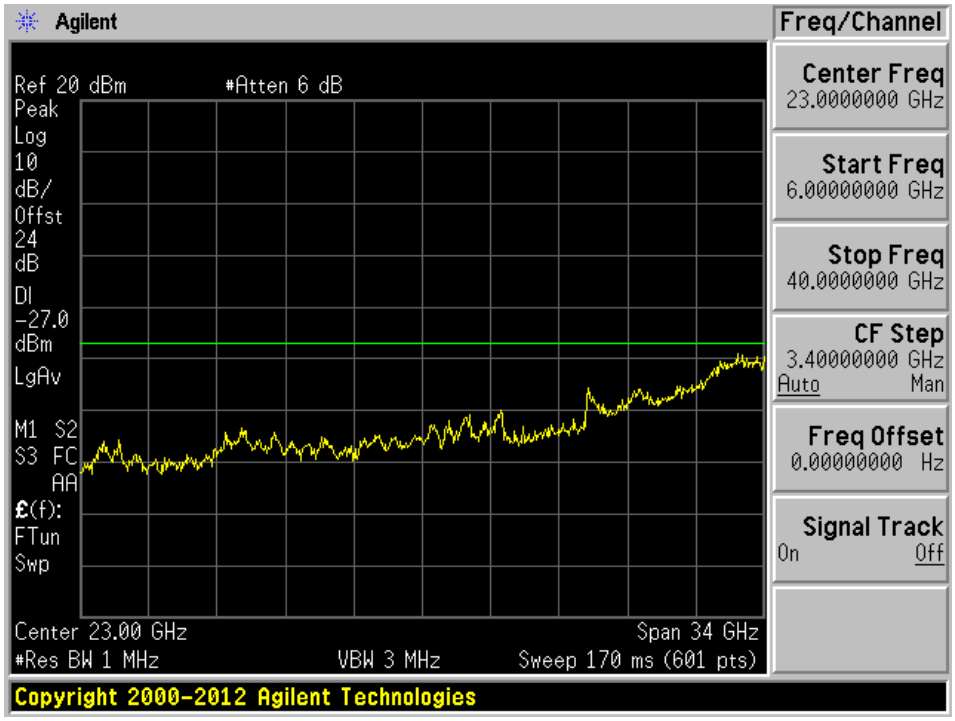
802.11a Mode 5825 MHz High Channel Spurious Emission_2



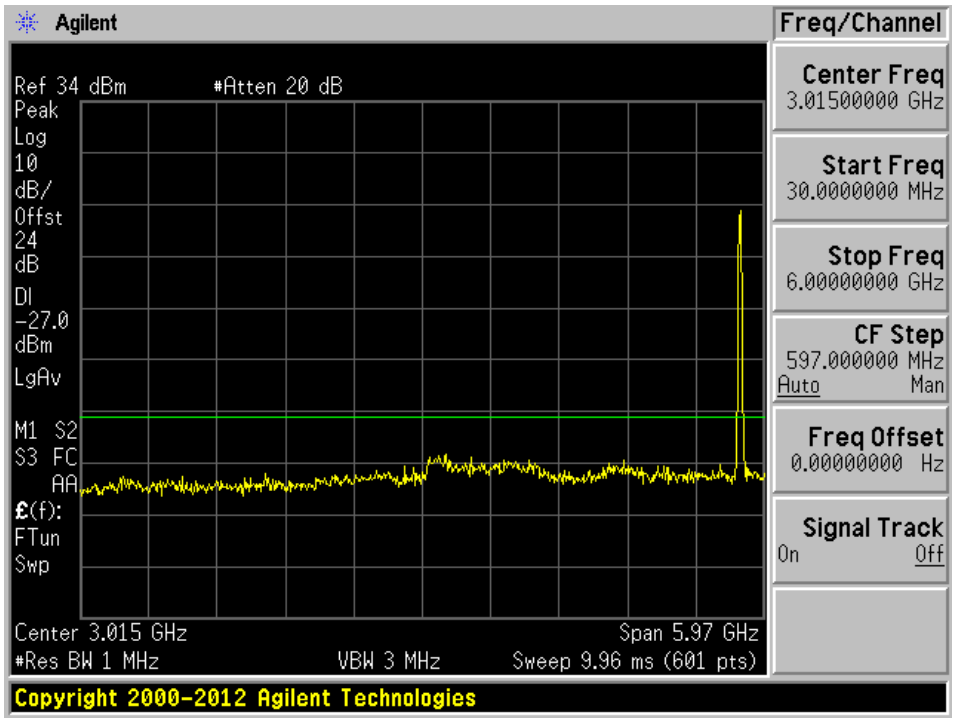
802.11n HT20 Mode 5745 MHz Low Channel Spurious Emission_1



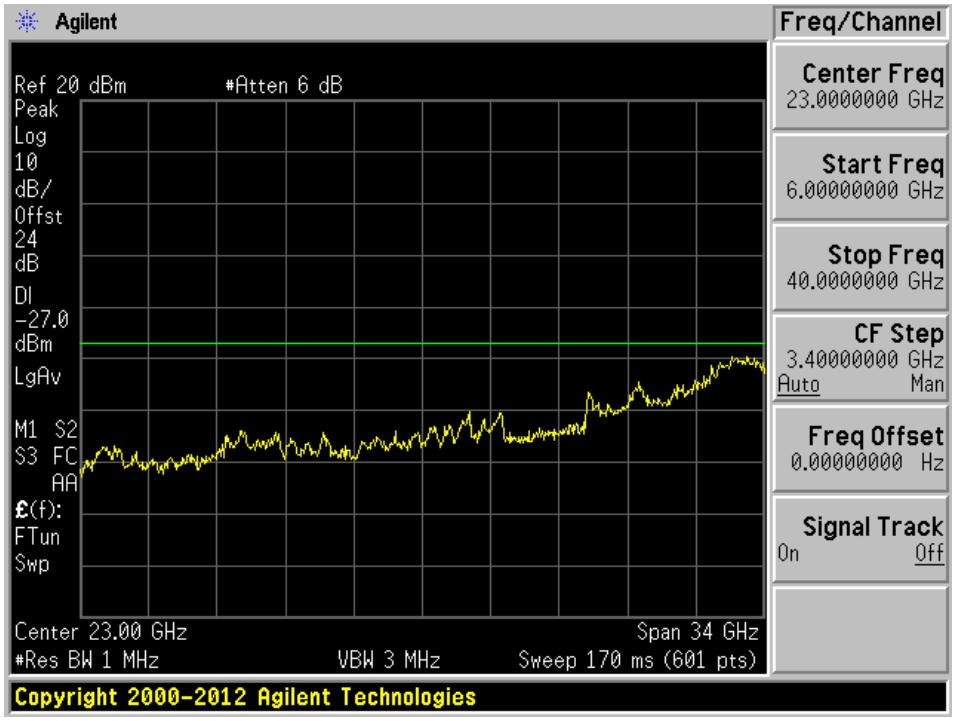
802.11n HT20 Mode 5745 MHz Low Channel Spurious Emission_2



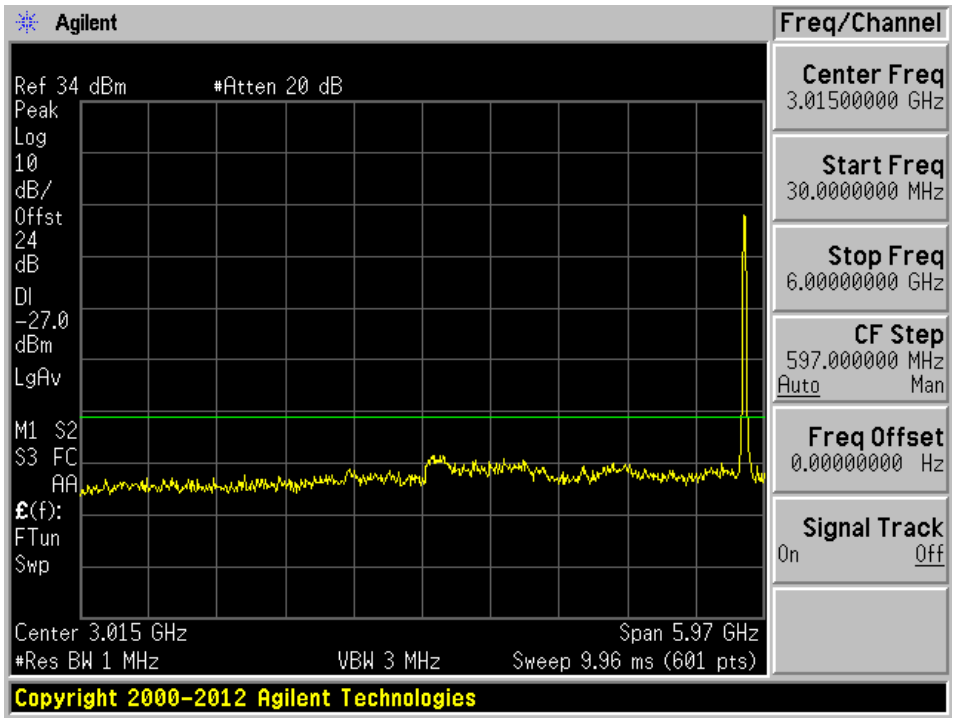
802.11n HT20 Mode 5785 MHz Mid Channel Spurious Emission_1



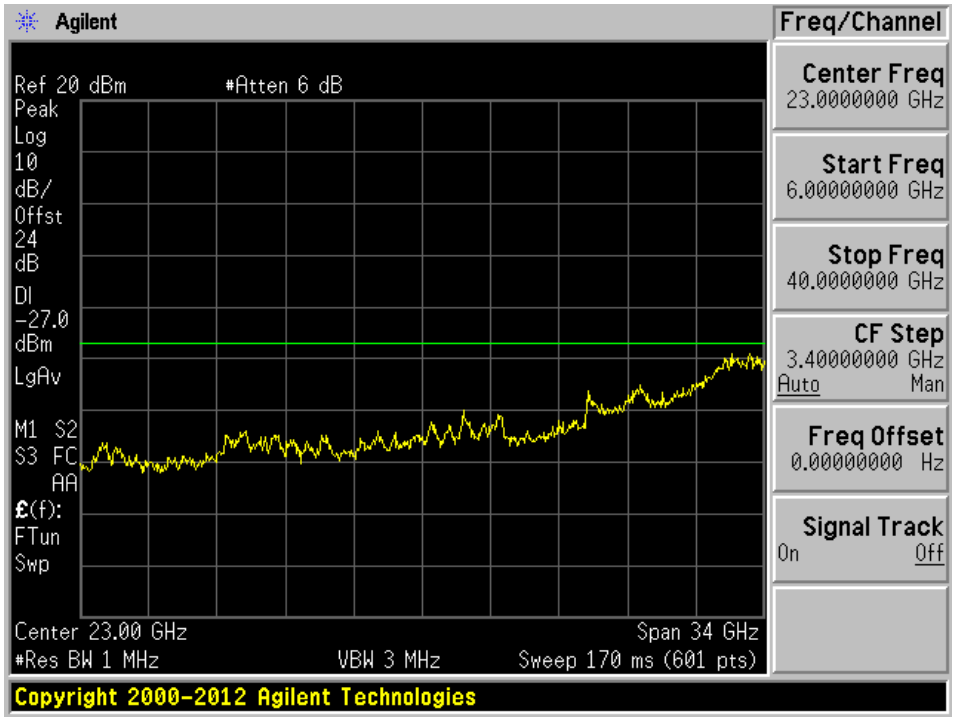
802.11n HT20 Mode 5785 MHz Mid Channel Spurious Emission_2



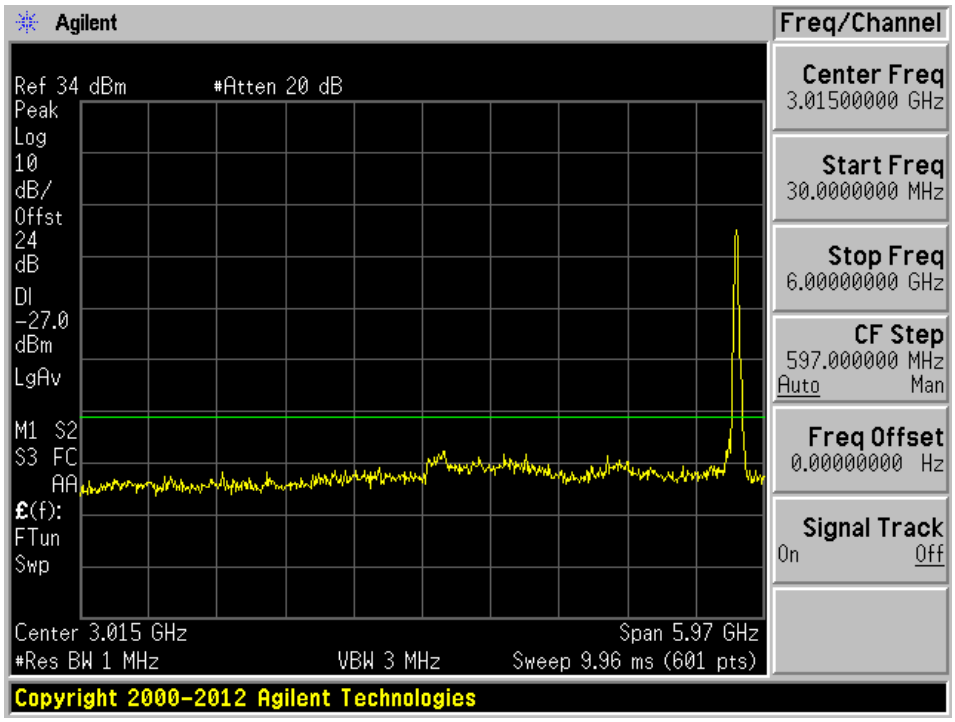
802.11n HT20 Mode 5825 MHz High Channel Spurious Emission_1



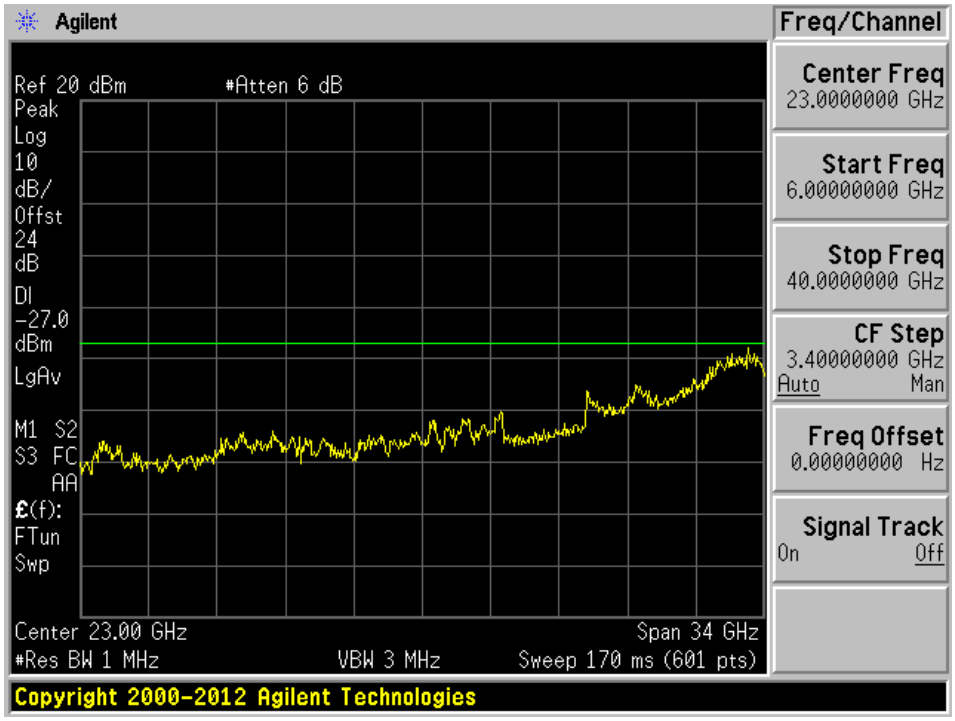
802.11n HT20 Mode 5825 MHz High Channel Spurious Emission_2



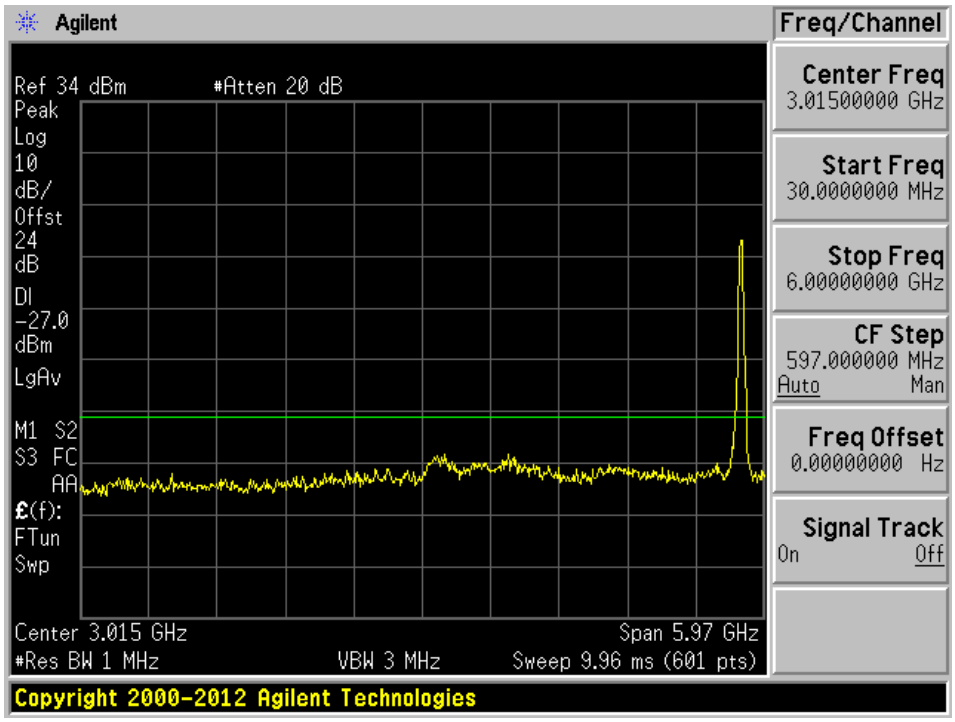
802.11n HT40 Mode 5755 MHz Low Channel Spurious Emission_1



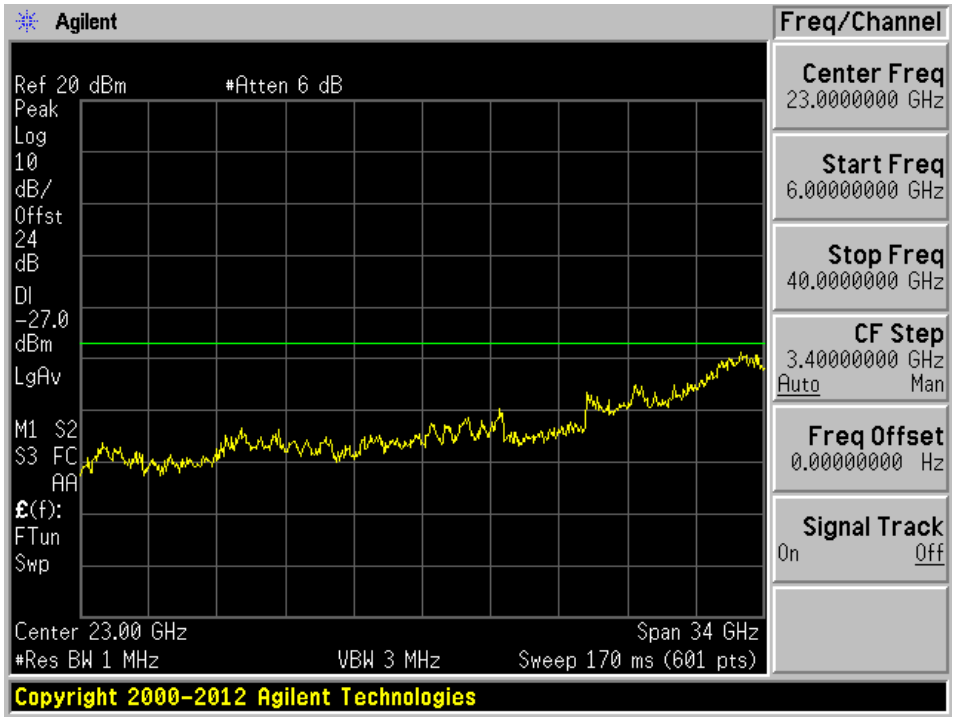
802.11n HT40 Mode 5755 MHz Low Channel Spurious Emission_2



802.11n HT40 Mode 5795 MHz High Channel Spurious Emission_1

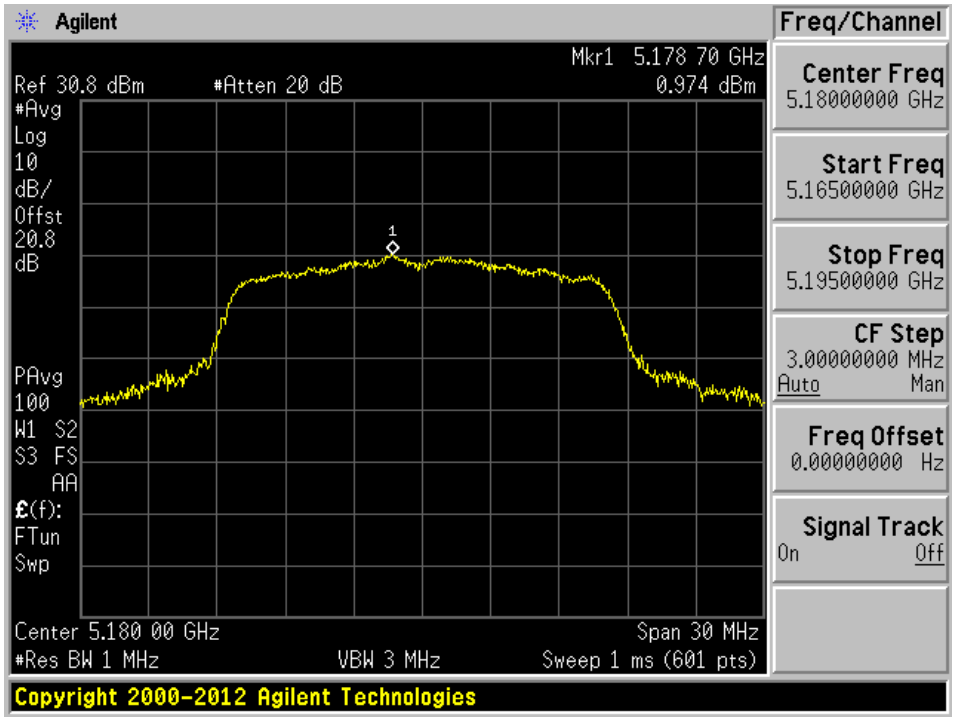


802.11n HT40 Mode 5795 MHz High Channel Spurious Emission_2

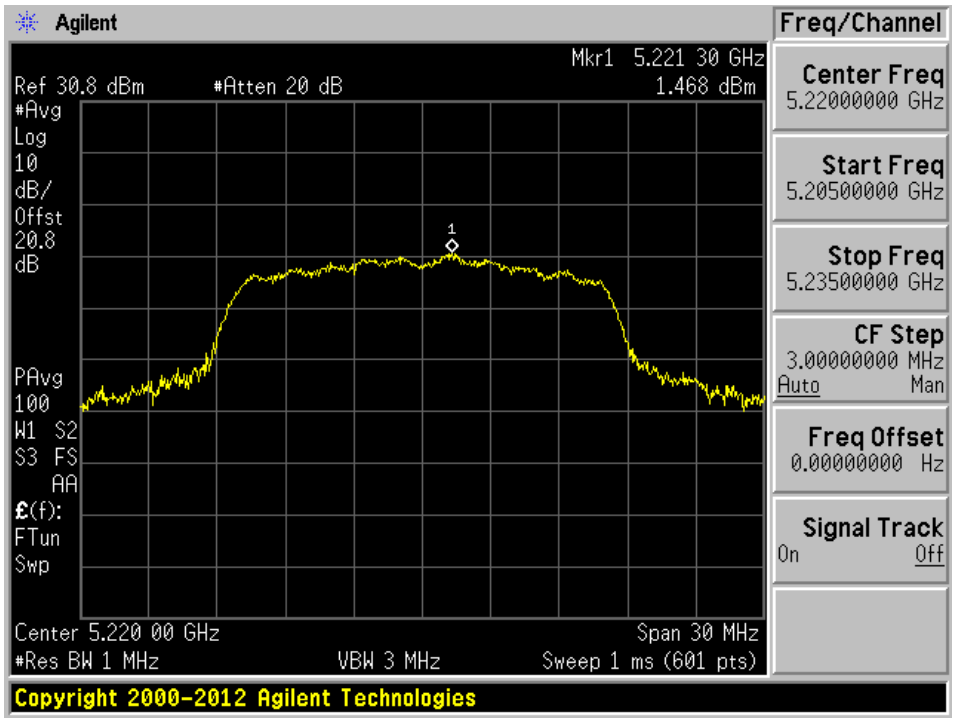


14 Appendix C (Normative) – Plots for Power Spectral Density

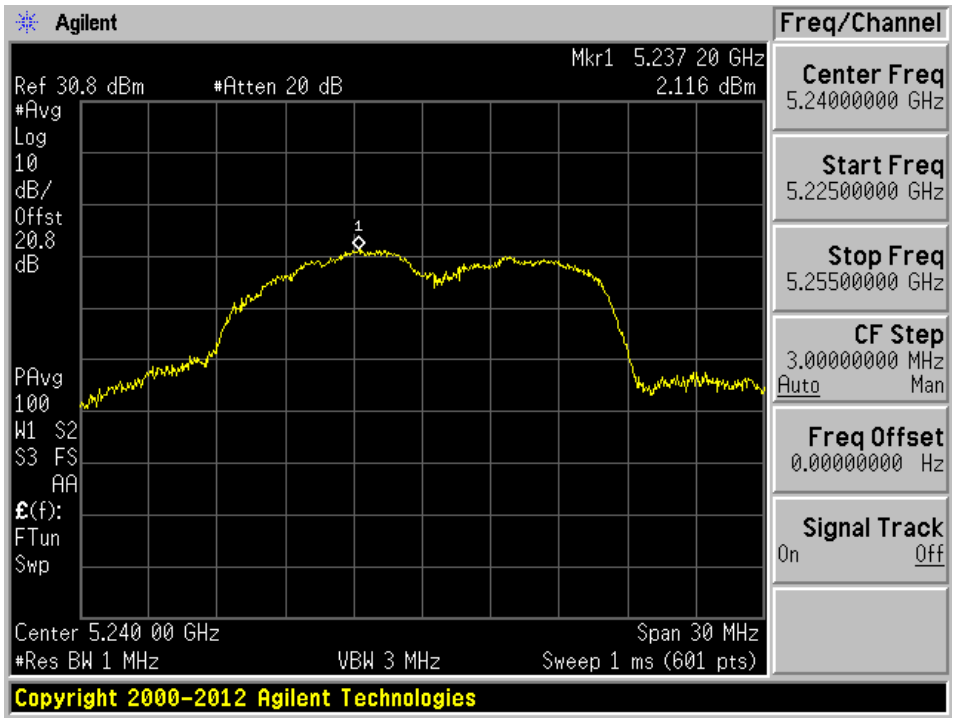
802.11a Mode 5180 MHz Low Channel PSD



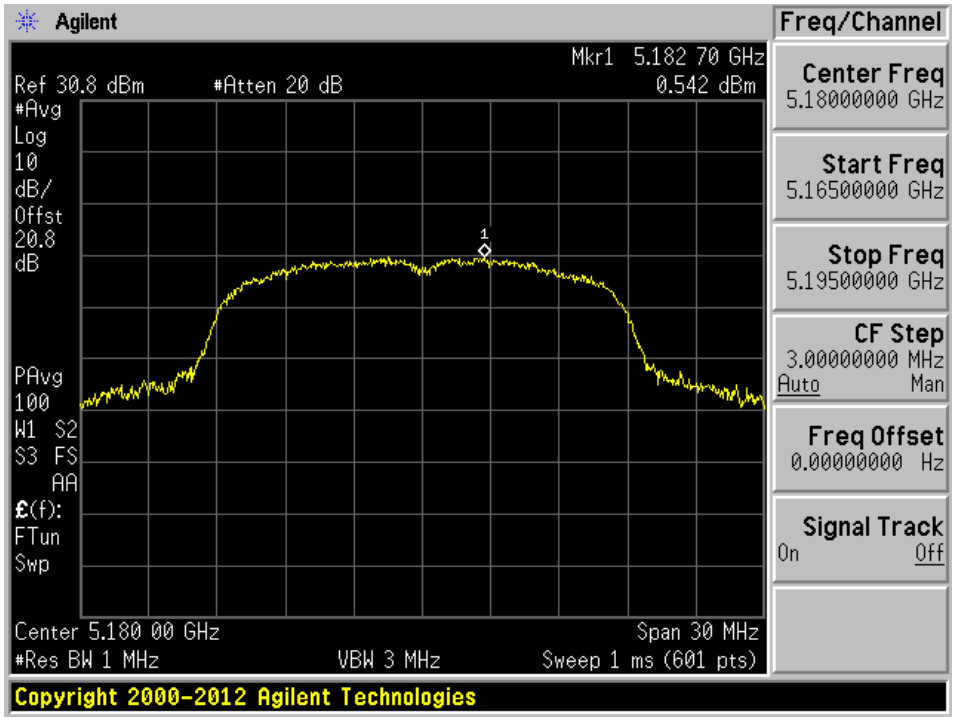
802.11a Mode 5220 MHz Mid Channel PSD



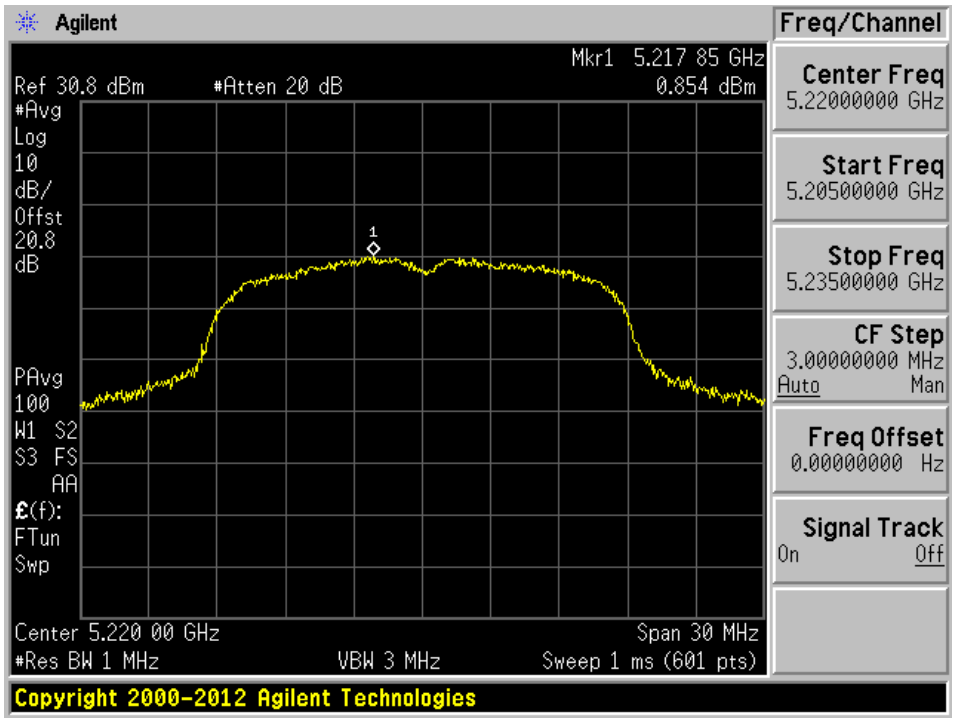
802.11a Mode 5240 MHz High Channel PSD



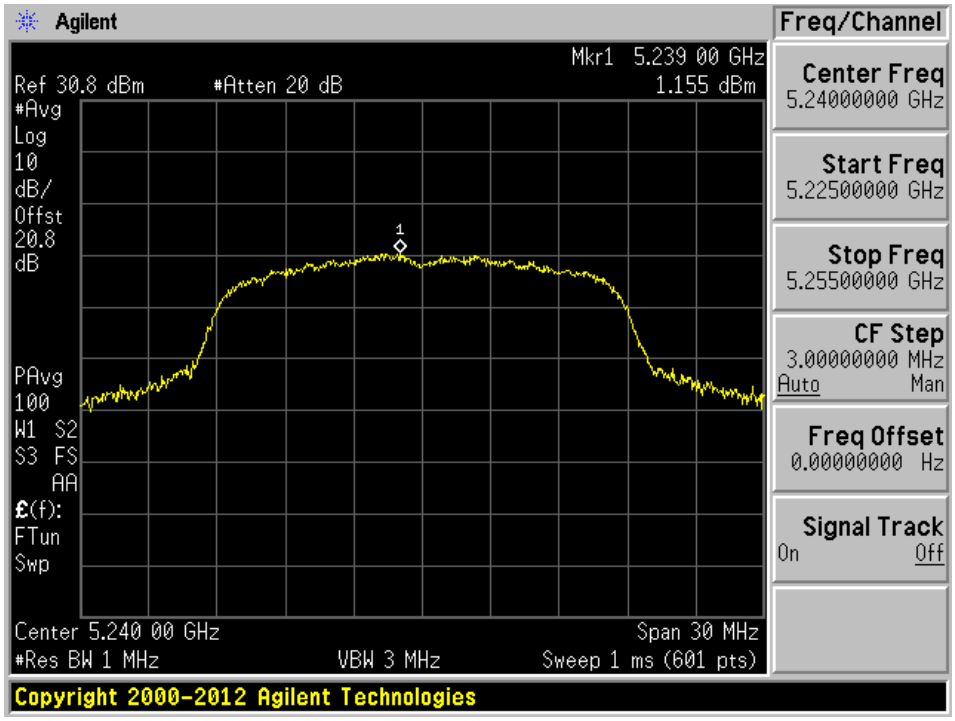
802.11n HT20 Mode 5180 MHz Low Channel PSD



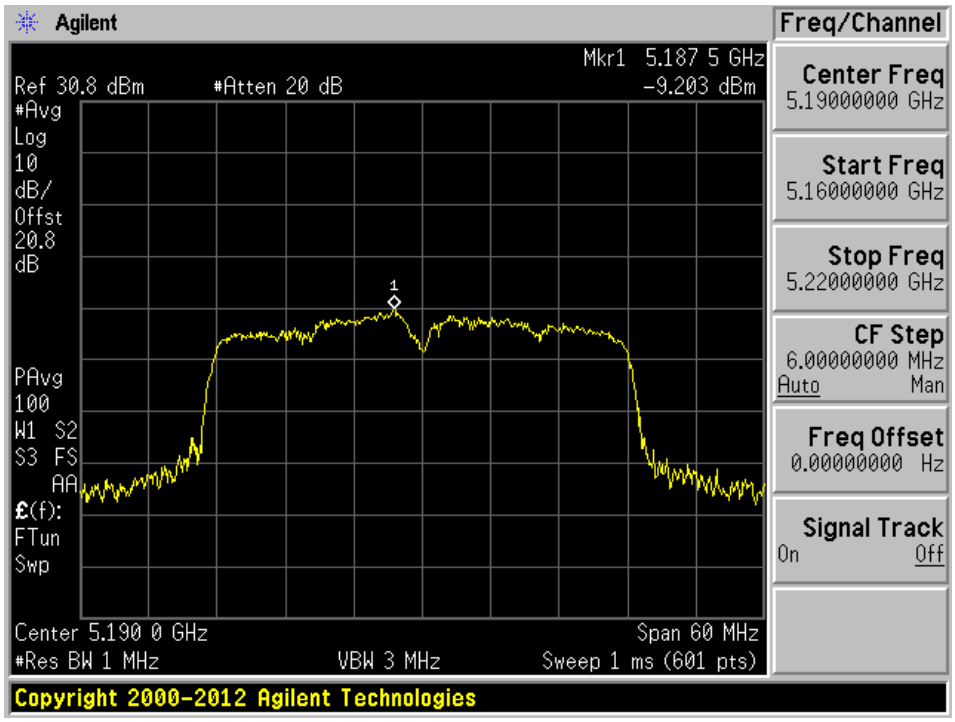
802.11n HT20 Mode 5220 MHz Mid Channel PSD



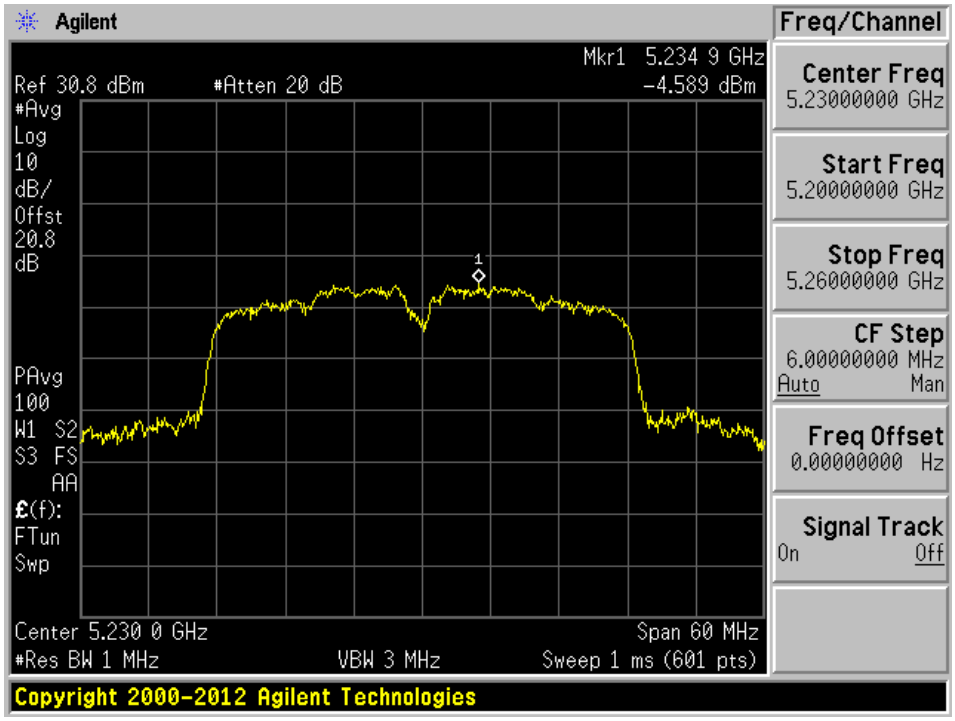
802.11n HT20 Mode 5240 MHz High Channel PSD



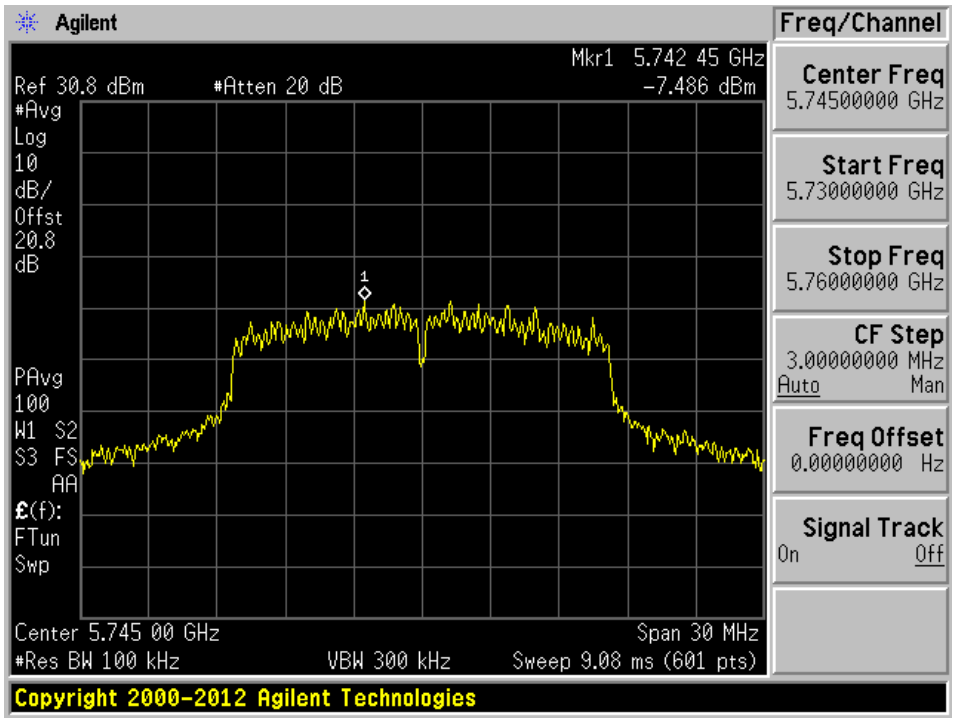
802.11n HT40 Mode 5190 MHz Low Channel PSD



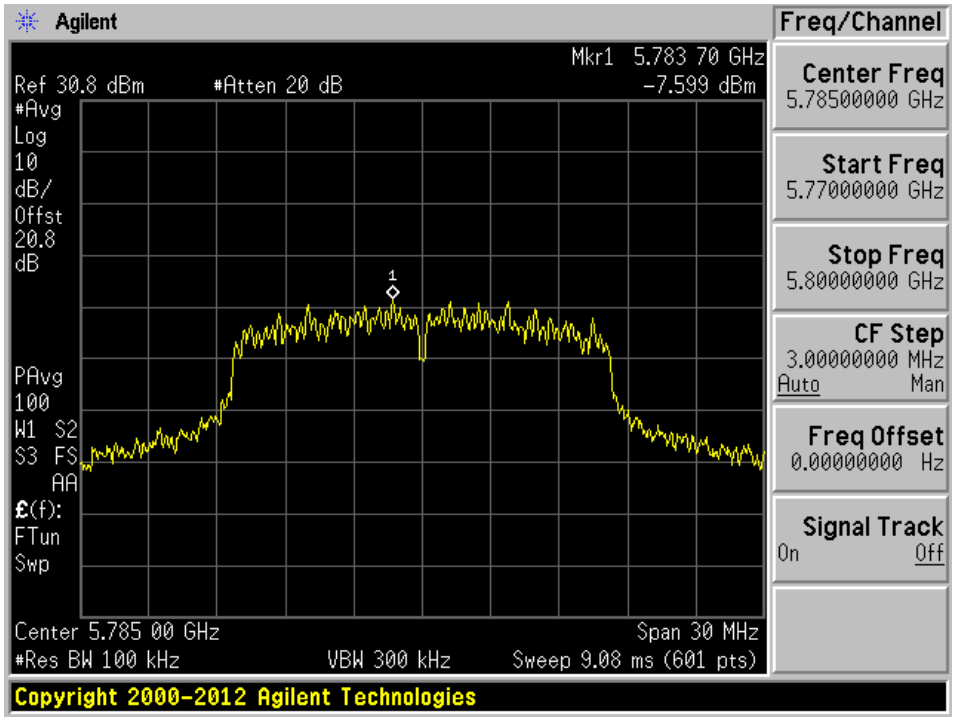
802.11n HT40 Mode 5230 MHz High Channel PSD



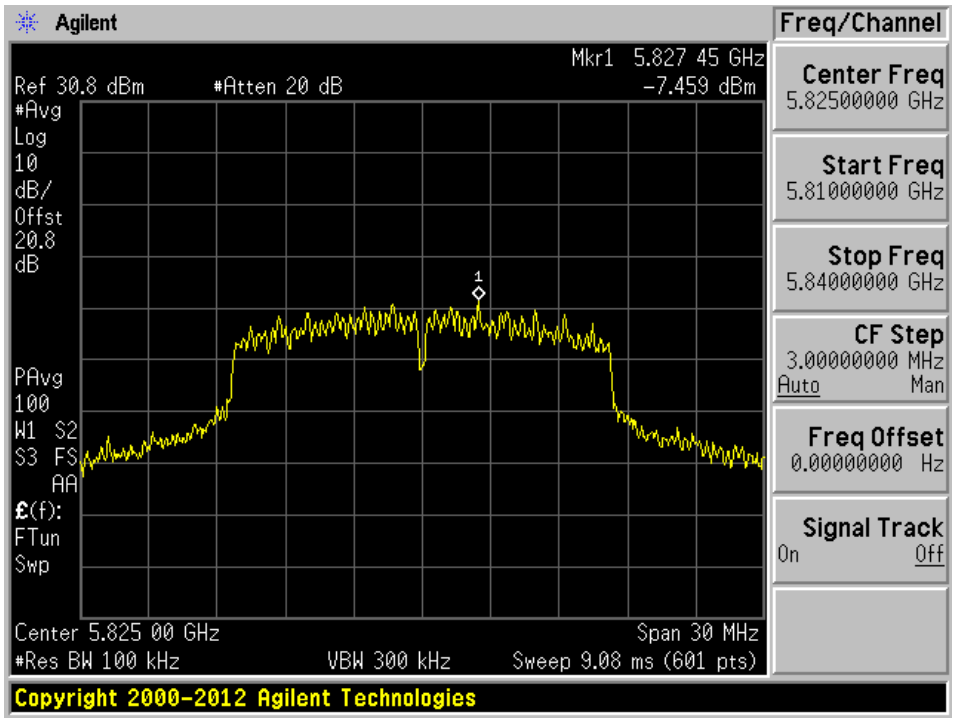
802.11a Mode 5745 MHz Low Channel PSD



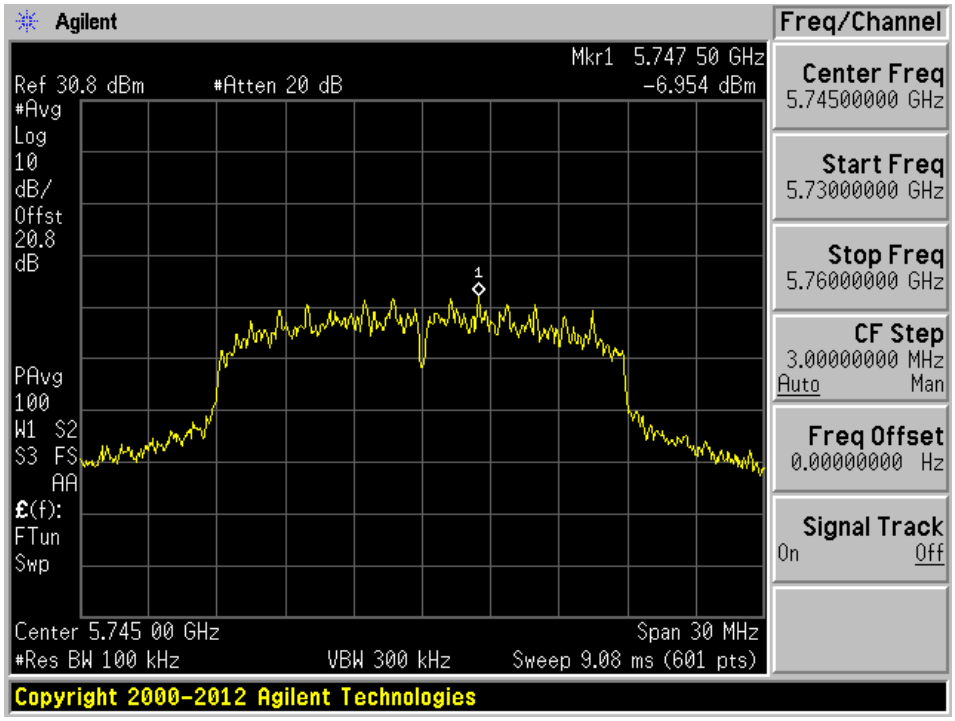
802.11a Mode 5785 MHz Mid Channel PSD



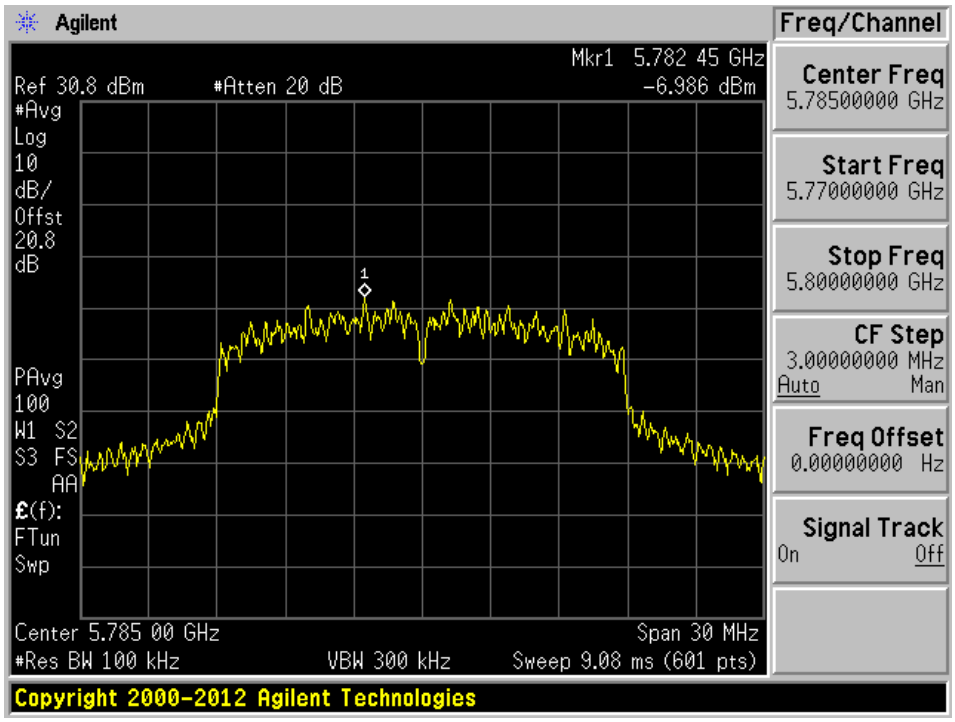
802.11a Mode 5825 MHz High Channel PSD



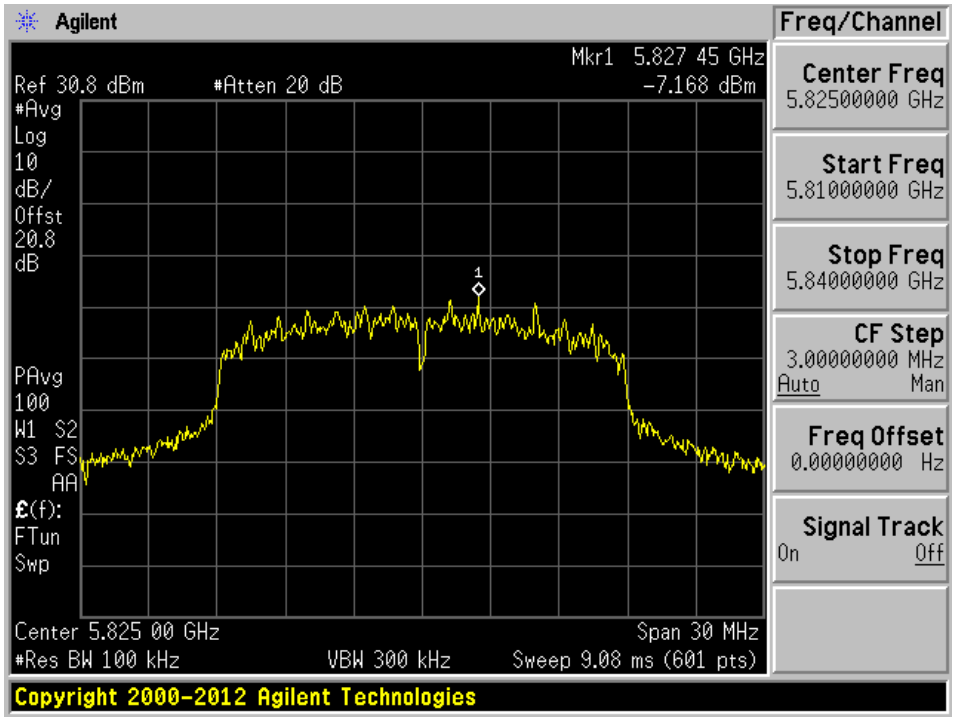
802.11n HT20 Mode 5745 MHz Low Channel PSD



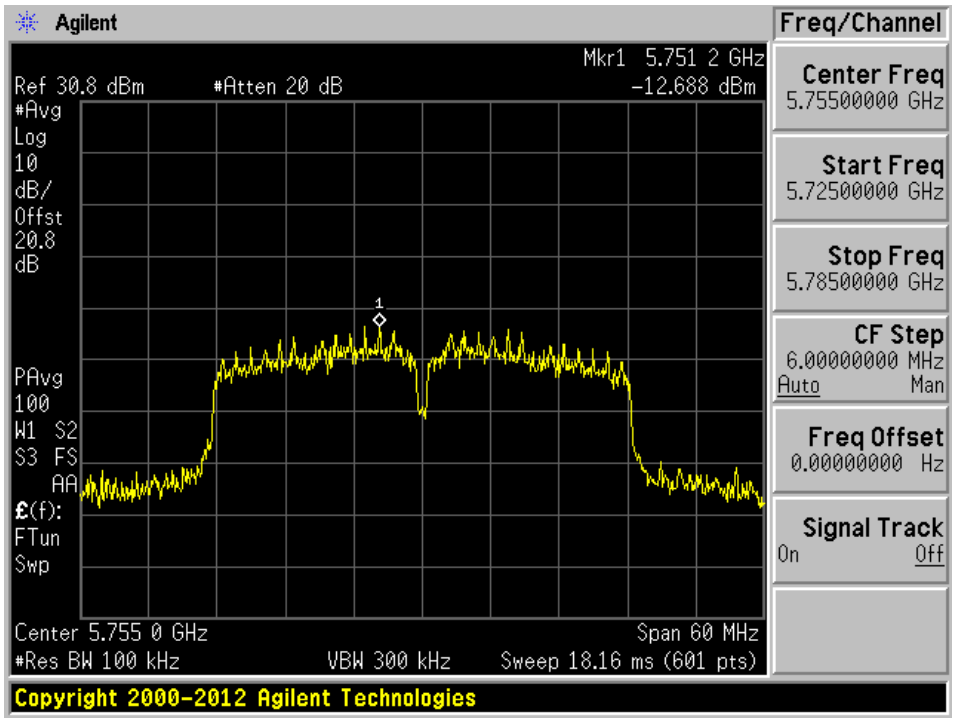
802.11n HT20 Mode 5785 MHz Mid Channel PSD



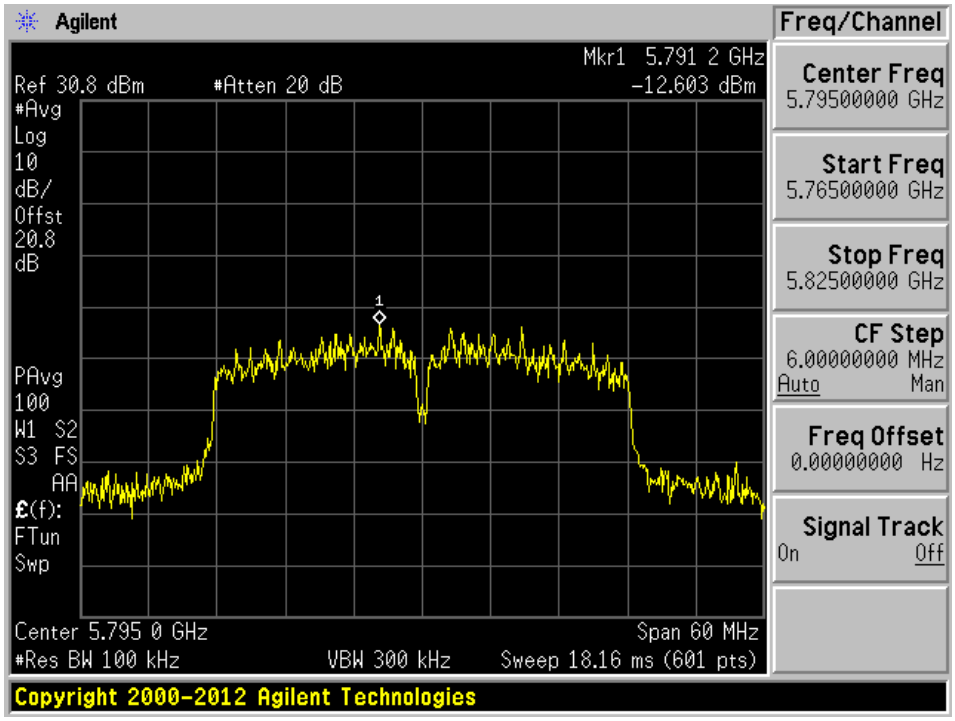
802.11n HT20 Mode 5825 MHz High Channel PSD



802.11n HT40 Mode 5755 MHz Low Channel PSD

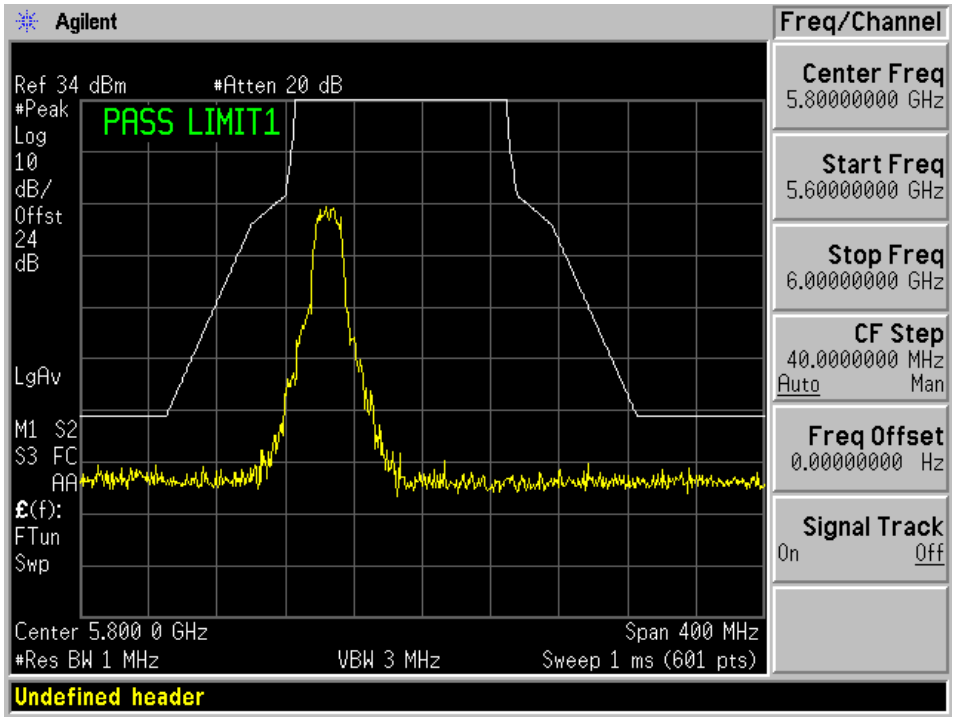


802.11n HT40 Mode 5795 MHz High Channel PSD

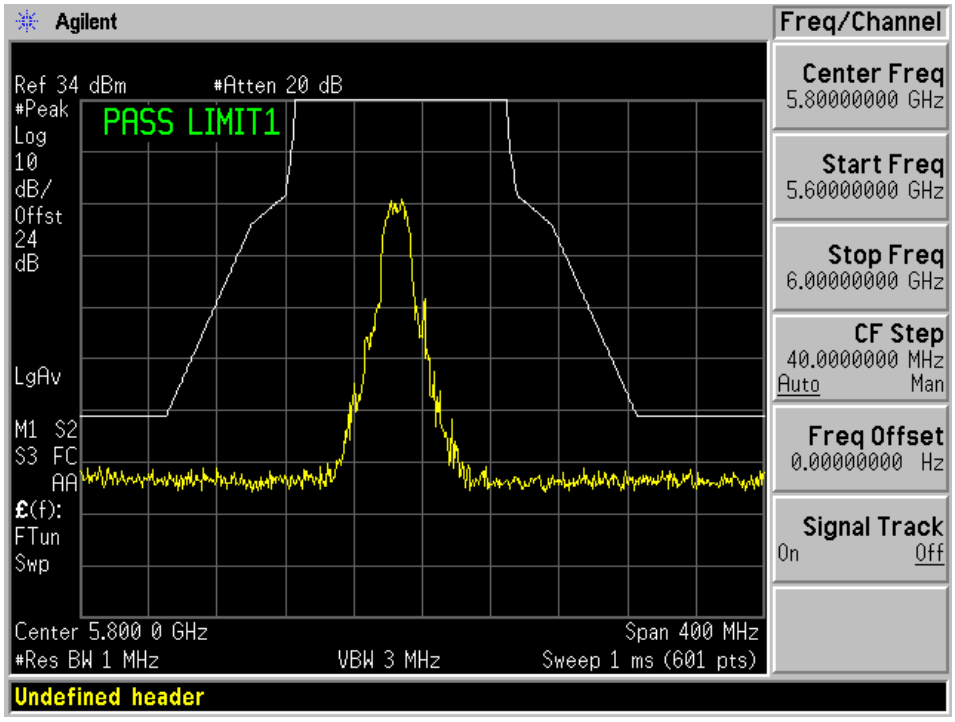


15 Appendix D (Normative) – Plots for Emission Mask

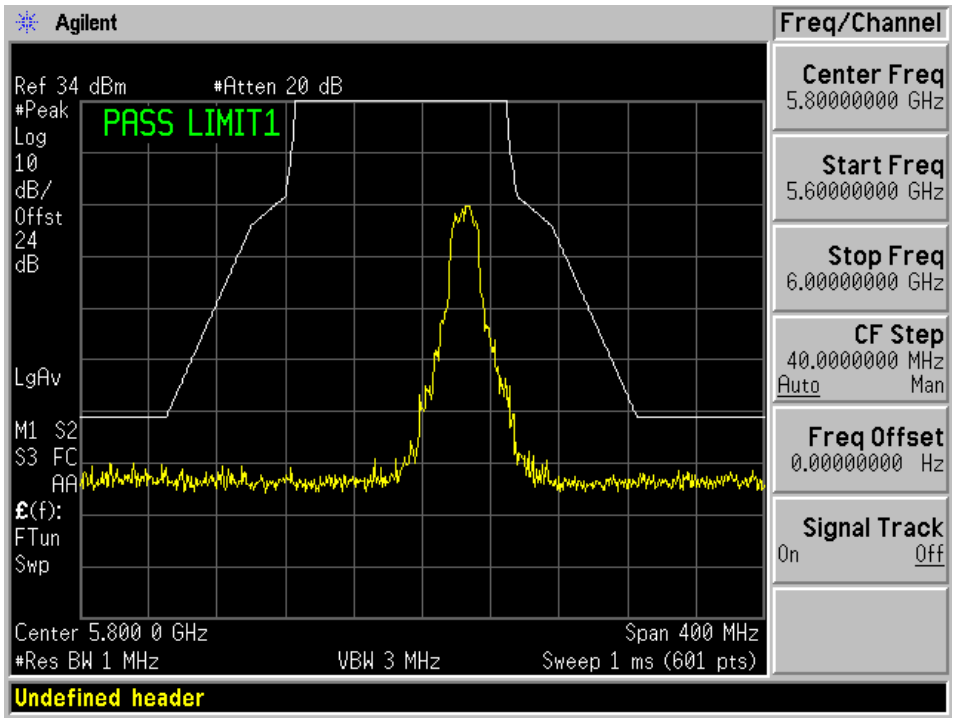
802.11a Mode 5745 MHz Low Channel BE Mask



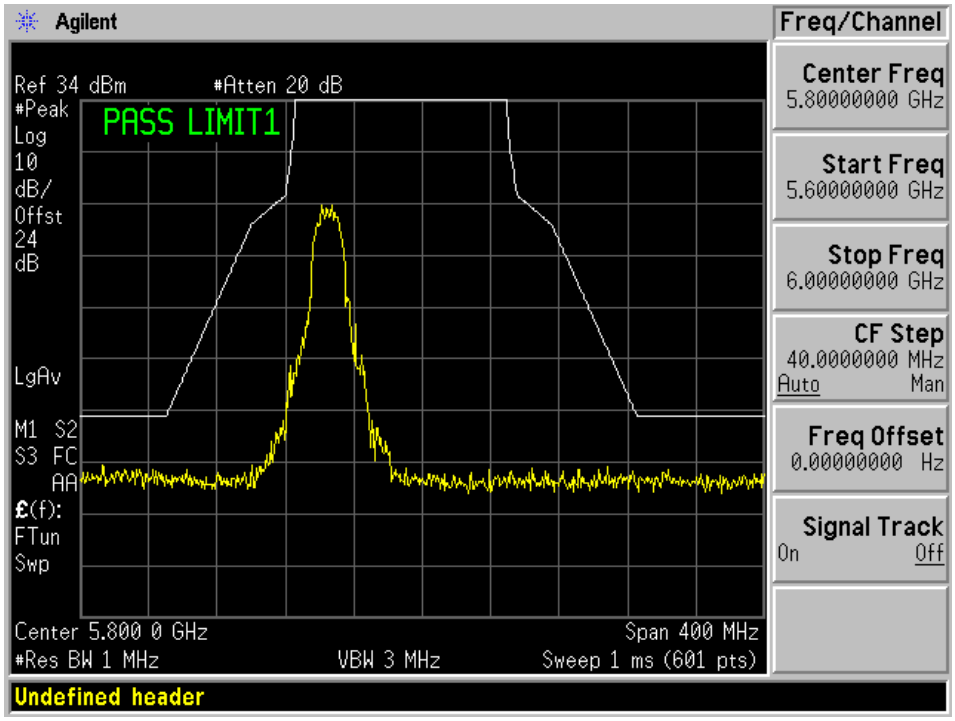
802.11a Mode 5785 MHz Mid Channel BE Mask



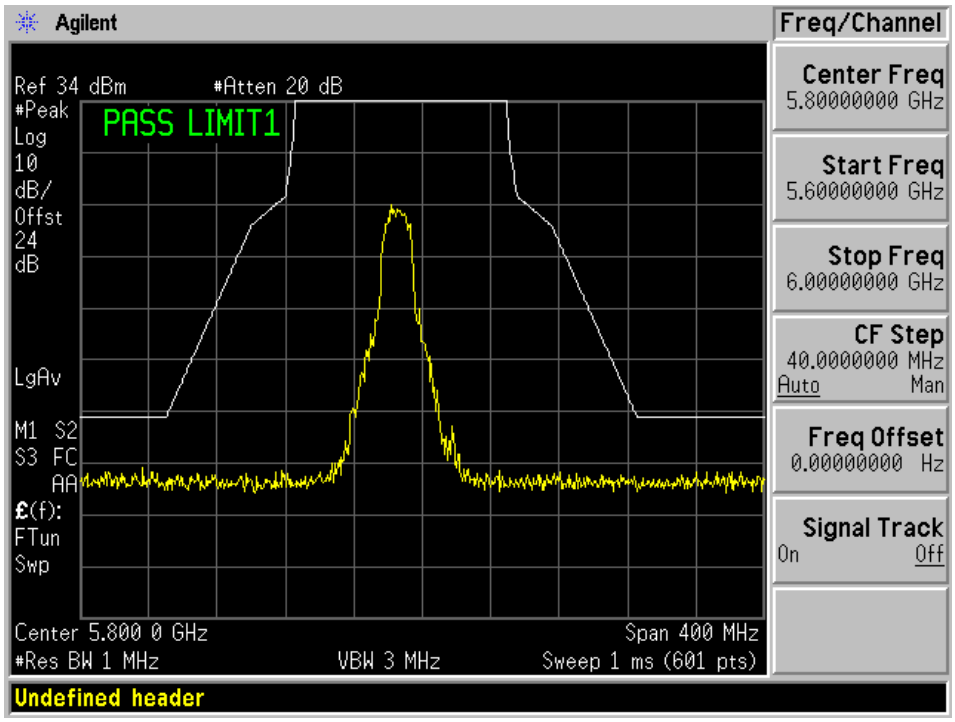
802.11a Mode 5825 MHz High Channel BE Mask



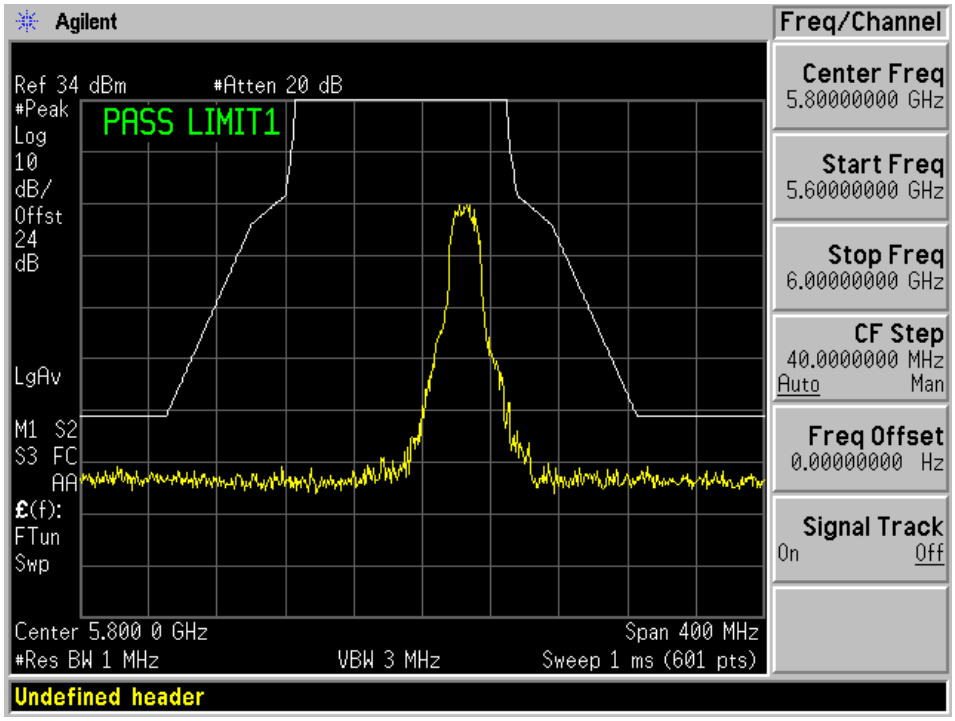
802.11n HT20 Mode 5745 MHz Low Channel BE Mask



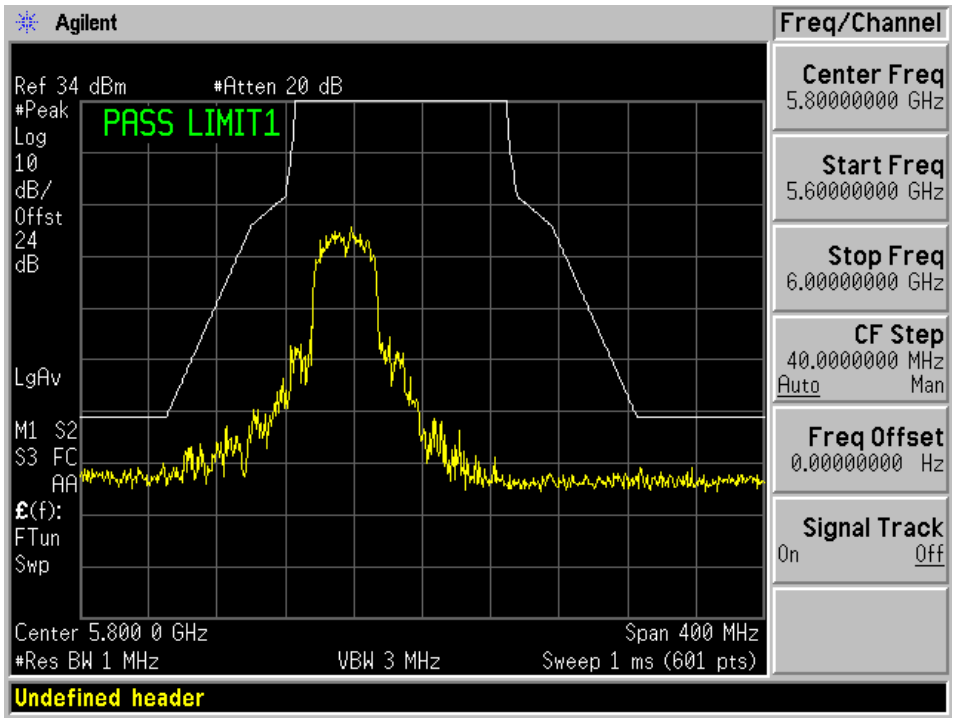
802.11n HT20 Mode 5785 MHz Mid Channel BE Mask



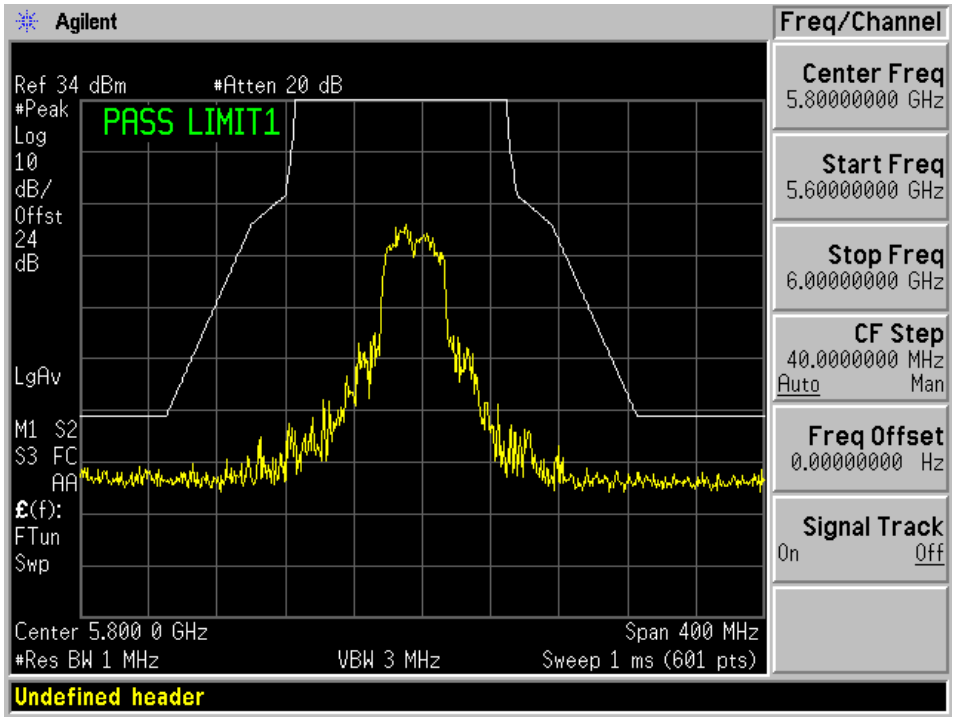
802.11nn HT20 Mode 5825 MHz High Channel BE Mask



802.11n HT40 Mode 5755 MHz Low Channel BE Mask



802.11n HT40 Mode 5795 MHz High Channel BE Mask



16 Appendix E – EUT Test Setup Photographs

Please refer to the attachments EUT Setup Photographs

17 Appendix F – EUT Photographs

Please refer to the attachments EUT Photographs

18 Appendix G (Normative) - A2LA Electrical Testing Certificate

Accredited Laboratory

A2LA has accredited

BAY AREA COMPLIANCE LABORATORIES CORP.

Sunnyvale, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets A2LA R222 - *Specific Requirements EPA ENERGY STAR Accreditation Program*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 2nd day of October 2018.

President and CEO
For the Accreditation Council
Certificate Number 3297.02
Valid to September 30, 2020

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

--- END OF REPORT ---