FCC/IC RF TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR

Portable Tablet Computer

ISSUED TO
LENOVO (SHANGHAI) ELECTRONICS TECHNOLOGY CO LTD

NO 68 BUILDING 199 FENJU RD, CHINA (SHANGHAI) PILOT FREE TRADE ZONE, SHANGHAI, 200131 CHINA

Report No.:	BL-SZ1610062-603
EUT Type:	Portable Tablet Computer
Model Name:	Lenovo TB3-X70F
Brand Name:	Lenovo
Test Standard:	47 CFR Part 15 Subpart E
	IC RSS-Gen (Issue 4, November 2014)
	IC RSS-247 (Issue 1, May 2015)
FCC ID:	O57TB3X70F
IC Number:	10407A-TB3Xp70F
Test conclusion:	Pass
Test Date:	Jan. 7, 2016 ~ Feb. 5, 2016
Date of Issue:	Mar. 8, 2016

Prepared by: _____
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Date Mar. 8, 2016

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Date Mar. 8, 2016

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Revision History

Version	Issue Date	Revisions
Rev. 01	Feb. 2, 2016	Initial Issue
Rev. 02	Feb. 15, 2016	The Second Issue
Rev. 03	Mar. 3, 2016	The Third Issue
Rev. 04	Mar. 8, 2016	Updated chapter 2.7

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1 ADMINISTRATIVE DATA (GENERAL INFORMATION)

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100
Fax Number	+86 755 6182 4271

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1. The laboratory has been listed by US Federal Communications Commission to perform electromagnetic emission measurements. The recognition numbers of test site are 832625. The laboratory has met the requirements of the IAS Accreditation Criteria for Testing Laboratories (AC89), has demonstrated compliance with ISO/IEC Standard 17025:2005. The accreditation certificate number is TL-588. The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Laboratory Condition

Ambient Temperature	20 to 25℃
Ambient Relative Humidity	45% - 55%
Ambient Pressure	100 kPa - 102 kPa

1.4 Announce

(1) The test report reference to the report template version v1.0.

(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

(3) The test report is invalid if there is any evidence and/or falsification.

(4) The results documented in this report apply only to the tested sample, under the conditions and modes of

operation as described herein.

(5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.

(6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

2 PRODUCT INFORMATION

2.1 Applicant

Applicant	LENOVO (SHANGHAI) ELECTRONICS TECHNOLOGY CO LTD
Address	NO 68 BUILDING 199 FENJU RD, CHINA (SHANGHAI) PILOT FREE TRADE ZONE, SHANGHAI, 200131 CHINA

2.2 Manufacturer

Manufacturer	Lenovo PC HK Limited.
Address	23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong

2.3 Factory

Factory1	BYD Precision Manufacture Co., Ltd.
Address1	No.3001, Baohe Road, Baolong Industrial, Longgang, Shenzhen, P.R. China
Factory2	Motorola (Wuhan) Mobility Technologies Communication Co., Ltd
Address2	No.19, Gaoxin 4th Road, Wuhan East Lake High-tech Zone, Wuhan, China
Factory3	Dong Guan Huabel Electronic Technology Co.,Ltd
Address3	No.9 Industrial Northern Road, National High-Tech Industrial Development Zone, SongShan Lake, Dong Guan City, China

2.4 General Description for Equipment under Test (EUT)

EUT Type	Portable Tablet Computer
Model Name Under Test	Lenovo TB3-X70F
Hardware Version	A6604_MB_PCB_V2.0
Software Version	TB3-X70F_160108
Network and Wireless connectivity	Bluetooth 3.0, Bluetooth 4.0 Low Energy (BLE), WIFI 802.11a,802.11b, 802.11g and 802.11n (HT20/40), 802.11ac, GPS, GLONASS, NFC

EUT	Hardware	Manufacturer
Configuration A	LCD display	BOE TECHNOLOGY GROUP CO., LTD.
	Battery	Sunwoda Electronic Co.,Ltd.
Configuration B	LCD display	Innolux corporation
	Battery	SCUD（Fujian）Electronics Co.,Ltd.

Note: The EUT have two sample which Configuration A is OF display with XWD battery and Configuration B is AUO display with ATL battery), the internal structure and circuit electrical parameters are the same; but the LCD display and battery are different. All of them were tested in this report, the Configuration A sample as the main for tested and the Configuration B sample as confirmatory test. In Spurious Emissions test, only the Configuration A + C-P35 (HUNTKEY) and Configuration B + C-P35 (Acbel) were shown in this report.

2.5 Ancillary Equipment

Ancillary Equipment 1	Battery 1	
	Brand Name	Lenovo
	Model No.	L14D2P31
	Serial No.	N/A
	Capacitance	7000 mAh
	Rated Voltage	3.8 V
	Limit Charge Voltage	4.35 V
	Manufacturer	Sunwoda Electronic Co. Ltd
Ancillary Equipment 2	Battery 2	
	Brand Name	Lenovo
	Model No.	L14D2P31
	Serial No.	N/A
	Capacitance	7000 mAh
	Rated Voltage	3.8 V
	Limit Charge Voltage	SCUD (Fujian) Electronics Co., Ltd.
Ancillary Equipment 3	Charger 1	
	Brand Name	Lenovo
	Model Name	C-P35
	Rated Input	100-240 V ~, 50/60 Hz, 0.5 A
	Rated Output	5.2 V ⎓, 2.0 A
	Manufacturer	SHENZHEN HUNTKEY ELECTRIC CO LTD
Ancillary Equipment 4	Charger 2	
	Brand Name	Lenovo
	Model Name	C-P35
	Rated Input	100-240 V ~, 50/60 Hz, 0.3 A
	Rated Output	5.2 V ⎓, 2.0 A
	Manufacturer	Acbel Polytech Inc.
Ancillary Equipment 5	USB Cable 1 Note 1	
	Length(Approx.)	102 cm
	Manufacturer	SHIN AN WIRE&CABLE CO., LTD.
Ancillary Equipment 6	USB Cable 2 Note 1	
	Length(Approx.)	102 cm
	Manufacturer	SAIBO ELECTRON TECHNOLOGY（HK）CO., LTD.

Note 1: There tow USB cable only the manufacturer is different. All the USB cable were tested, but only the USB cable 1 was shown in this report.

2.6 Technical Information

Frequency Range	Band I: 5150 MHz to 5250 MHz, Band II: 5250 MHz to 5350 MHz, Band III: 5470 MHz to 5725 MHz Band IV: 5725 MHz to 5850 MHz
Modulation technology	OFDM

Modulation Type	256QAM, 64QAM, 16QAM, BPSK, QPSK
Product Type	Mobile and portable
Transfer Rate (Mbps)	802.11a: 54/ 48/ 36 / 24 / 18 / 9/ 6 Mbps 802.11n: up to 135 Mbps 802.11ac: up to V9
Channel Bandwidth	802.11a: 20 MHz 802.11n: 20 MHz, 40 MHz 802.11ac: 20 MHz, 40 MHz
Maximum Output Power	Band I: 14.41 dBm Band II: 14.69 dBm Band III: 14.92 dBm Band IV: 14.59 dBm
Antenna Type	PIFA Antenna
Antenna Gain	Band I: 5150 MHz to 5250 MHz: 0.4 dBi Band II: 5250 MHz to 5350 MHz: 1.02 dBi Band III: 5470 MHz to 5725 MHz: -1.72 dBi Band IV: 5725 MHz to 5850 MHz: 0.86 dBi
Antenna System (eg., MIMO, Smart Antenna)	N/A
About the Product	The equipment is Portable Tablet Computer, intended for used with information technology equipment.

2.7 Additional Instructions

EUT Software Settings:

Mode	☒ Special software is used. The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

During testing. Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Band I (5150 - 5250 MHz) Power level setup in software			
Test Software Version	Test software is set by engineering instruction“*#*#3646633#*#*” in engineering mode		
Mode	Channel	Frequency (MHz)	Soft Set
11a	CH36	5180	17
11a	CH44	5220	17
11a	CH48	5240	17
11n (HT20)	CH36	5180	17
11n (HT20)	CH44	5220	17
11n (HT20)	CH48	5240	17
11n (HT40)	CH38	5190	17

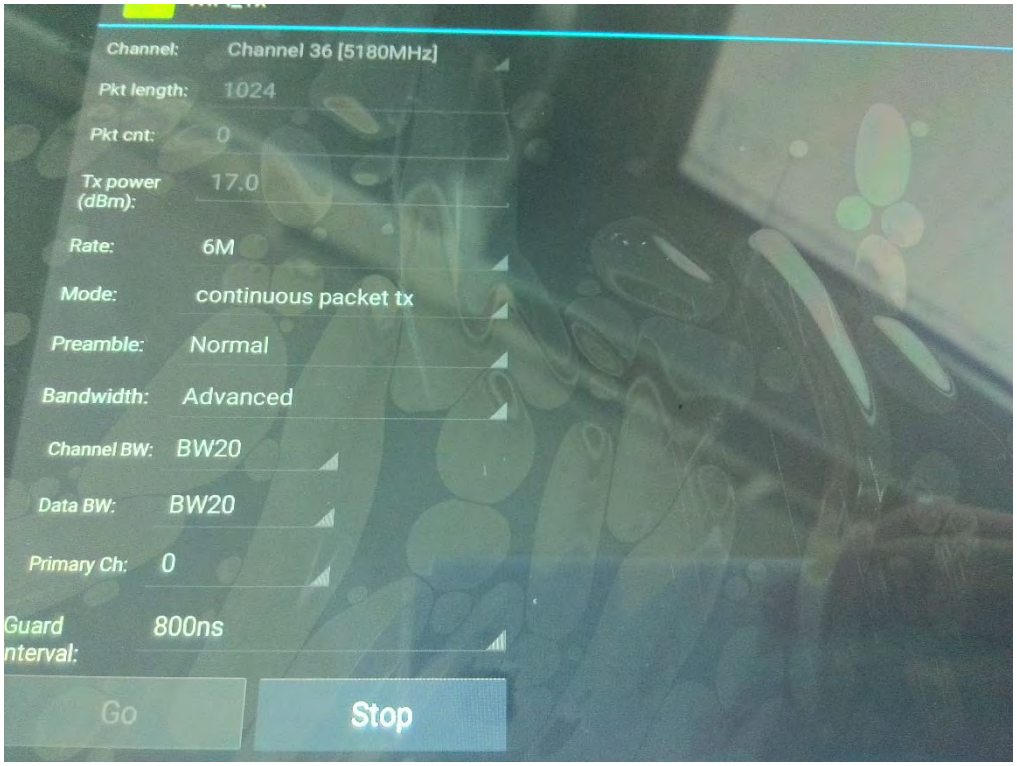
Band I (5150 - 5250 MHz) Power level setup in software			
Test Software Version	Test software is set by engineering instruction“*#*#3646633#*#*” in engineering mode		
Mode	Channel	Frequency (MHz)	Soft Set
11n (HT40)	CH46	5230	17
11ac (HT20)	CH36	5180	17
11ac (HT20)	CH44	5220	17
11ac (HT20)	CH48	5240	17
11ac (HT40)	CH38	5190	17
11ac (HT40)	CH46	5230	17
11ac (HT80)	CH42	5210	17

Band II (5250 - 5350 MHz) Power level setup in software			
Test Software Version	Test software is set by engineering instruction“*#*#3646633#*#*” in engineering mode		
Mode	Channel	Frequency (MHz)	Soft Set
11a	CH52	5260	17
11a	CH60	5300	17
11a	CH64	5320	17
11n (HT20)	CH52	5260	17
11n (HT20)	CH60	5300	17
11n (HT20)	CH64	5320	17
11n (HT40)	CH54	5270	17
11n (HT40)	CH62	5310	17
11ac (HT20)	CH52	5260	17
11ac (HT20)	CH60	5300	17
11ac (HT20)	CH64	5320	17
11ac (HT40)	CH54	5270	17
11ac (HT40)	CH62	5310	17
11ac (HT80)	CH58	5290	17

Band III (5470 - 5725 MHz) Power level setup in software			
Test Software Version	Test software is set by engineering instruction“*#*#3646633#*#*” in engineering mode		
Mode	Channel	Frequency (MHz)	Soft Set
11a	CH100	5500	17
11a	CH116	5580	17
11a	CH140	5700	17
11n (HT20)	CH100	5500	17
11n (HT20)	CH116	5580	17
11n (HT20)	CH140	5700	17
11n (HT40)	CH102	5510	17
11n (HT40)	CH134	5670	17
11ac (HT20)	CH100	5500	17
11ac (HT20)	CH116	5580	17
11ac (HT20)	CH140	5700	17
11ac (HT40)	CH102	5510	17
11ac (HT40)	CH134	5670	17
11ac (HT80)	CH106	5530	17

Band IV (5725 - 5850 MHz) Power level setup in software			
Test Software Version	Test software is set by engineering instruction“*#*#3646633#*#*” in engineering mode		
Mode	Channel	Frequency (MHz)	Soft Set
11a	CH149	5745	17
11a	CH157	5785	17
11a	CH161	5825	17
11n (HT20)	CH149	5745	17
11n (HT20)	CH157	5785	17
11n (HT20)	CH161	5825	17
11n (HT40)	CH151	5755	17
11n (HT40)	CH159	5795	17
11ac (HT20)	CH149	5745	17
11ac (HT20)	CH157	5785	17
11ac (HT20)	CH161	5805	17
11ac (HT40)	CH151	5755	17
11ac (HT40)	CH159	5795	17
11ac (HT80)	CH155	5775	17

Run software:



2.8 Channel List

20 MHz		40 MHz	
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
36	5180	38	5190
40	5200	46	5230
44	5220	54	5270
48	5240	62	5310
52	5260	102	5510
56	5280	110	5550
60	5300	134	5670
64	5320	151	5755
100	5500	159	5790
104	5520		
108	5540		
112	5560		
116	5580		
132	5660		
136	5680		
140	5700		
149	5745		
153	5765		
157	5785		
161	5805		
165	5825		

The Lowest frequency, the middle frequency and the highest frequency of channel were selected to perform the test, and the selected channel see below:

For 802.11a/n (HT20)/ac(HT20)

Band I (5150 - 5250 MHz)			Band II (5250 - 5350 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
36	Low	5180	52	Low	5260
44	Mid	5220	60	Mid	5300
48	High	5240	64	High	5320

Band III (5470 - 5725 MHz)			Band IV (5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
100	Low	5500	149	Low	5745
116	Mid	5580	157	Mid	5785
140	High	5700	161	High	5805

For 802.11n (HT40)/ac (HT40)

Band I (5150 - 5250 MHz)			Band II (5250 - 5350 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
38	Low	5190	54	Low	5270
46	High	5230	62	High	5310

Band III (5150 - 5250 MHz)			Band IV (5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
102	Low	5510	151	Low	5755
134	High	5670	159	High	5795

Note: Preliminary tests were performed in different data rate in above table to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Modulation Technology	Modulation Type	Band I	Band II	Band III	Band IV
					Channel	Channel	Channel	Channel
RF Output Power	11a	6	OFDM	BPSK	48/44/36	64/60/52	140/116/100	161/157/149
	11n(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/60/52	140/116/100	161/157/149
	11n(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
	11ac(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/60/52	140/116/100	161/157/149
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
Emission Bandwidth & 99% Occupied Bandwidth	11a	6	OFDM	BPSK	48/44/36	64/60/52	144/140/116/100	161/157/149/144
	11n(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/60/52	144/140/116/100	161/157/149
	11n(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
	11ac(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/60/52	140/116/100	161/157/149
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
6 dB bandwidth	11a	6	OFDM	BPSK	N/A	N/A	N/A	161/157/149
	11n(20 MHz)	6.5	OFDM	BPSK	N/A	N/A	N/A	161/157/149
	11n(40	13.5	OFDM	BPSK	N/A	N/A	N/A	159/151

	MHz)							
	11ac(20 MHz)	6.5	OFDM	BPSK	N/A	N/A	N/A	161/157/149 /144
	11ac(40 MHz)	13.5	OFDM	BPSK	N/A	N/A	N/A	159/151
Power Spectral Density	11a	6	OFDM	BPSK	48/44/36	64/60/52	140/116/100	161/157/149
	11n(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/60/52	140/116/100	161/157/149
	11n(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
	11ac(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/60/52	140/116/100	161/157/149
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
Conducted Spurious Emissions	11a	6	OFDM	BPSK	48/44/36	64/60/52	140/116/100	161/157/149
	11n(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/60/52	140/116/100	161/157/149
	11n(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
	11ac(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/60/52	140/116/100	161/157/149
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
Radiated Spurious Emissions	11a	6	OFDM	BPSK	48/44/36	64/60/52	140/116/100	161/157/149
	11n(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/60/52	140/116/100	161/157/149
	11n(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
	11ac(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/60/52	140/116/100	161/157/149
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
Frequency Stability	11a	6	OFDM	BPSK	44	60	116	157
	11n(20 MHz)	6.5	OFDM	BPSK	44	60	116/100	157
	11n(40 MHz)	13.5	OFDM	BPSK	38	54	102	151
	11ac(20 MHz)	6.5	OFDM	BPSK	44	60	116	157
	11ac(40 MHz)	13.5	OFDM	BPSK	38	54	102	151
Band	11a	6	OFDM	BPSK	36	--	64	100

Edge	11n(20 MHz)	6.5	OFDM	BPSK	36	--	64	100
	11n(40 MHz)	13.5	OFDM	BPSK	38	--	62	102
	11ac(20 MHz)	6.5	OFDM	BPSK	36	--	64	100
	11ac(40 MHz)	13.5	OFDM	BPSK	38	--	62	102

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15 Subpart E	Unlicensed National Information Infrastructure Devices
2	KDB Publication 789033 D02v01	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E
3	IC RSS-Gen (Issue 4, Nov. 2014)	General Requirements for Compliance of Radio Apparatus
4	IC RSS-247 (Issue 1, May 2015)	Digital Transmission Systems (DTSs), Frequency Hopping Systems(FHSs) and Licence-Exemp Local Area Network (LE-LAN) Devices
5	ANSI C63.4-2014	American National Standard for 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
6	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

3.2 Verdict

No.	Description	FCC Part No.	IC Part No.	Test Result	Verdict
1	Antenna Requirement	15.203	RSS-247, 6.2	--	Pass Note 1
2	RF Output Power	15.407(a)	RSS-247, 6.2	ANNEX A.1	Pass
3	Emission Bandwidth & 99% Occupied Bandwidth	15.407(a)	RSS-247, 6.2	ANNEX A.2	Pass
4	6 dB bandwidth	15.407(e)	RSS-247, 6.2	ANNEX A.3	Pass
5	Power Spectral Density	15.407(a)	RSS-247, 6.2	ANNEX A.4	Pass
6	Conducted Emission	15.207	RSS-GEN, 8.8	ANNEX A.5	Pass
7	Conducted Spurious Emissions	15.407(b) 15.209	RSS-247, 6.2	ANNEX A.6	Pass
8	Radiated Spurious Emissions and Band Edge	15.407(b)	RSS-247, 6.2	ANNEX A.7	Pass
9	Frequency Stability	2.1055 90.213	--	ANNEX A.8	Pass
10	Receiver Spurious Emissions	--	RSS-Gen, 7.1.2	ANNEX A.9	Pass
Note 1: The EUT has a permanently and irreplaceable attached antenna, which complies with the requirement FCC 15.203.					

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

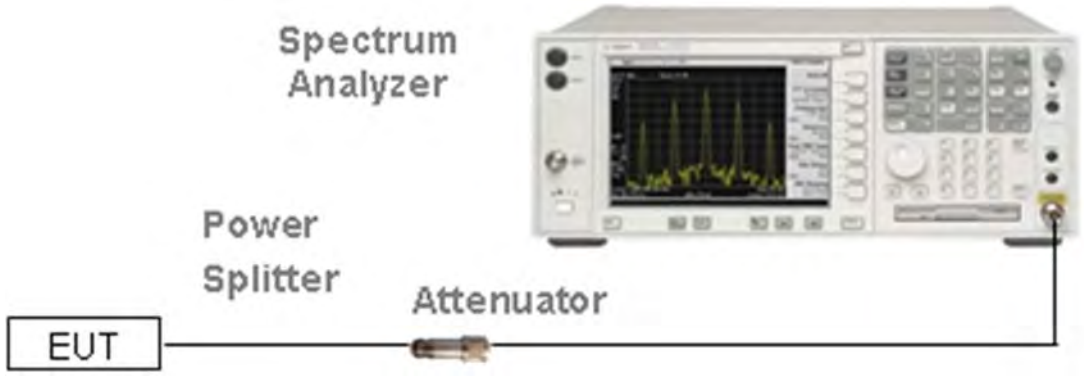
Relative Humidity	45% - 55%	
Atmospheric Pressure	100 kPa - 102 kPa	
Temperature	NT (Normal Temperature)	+22℃ to +25℃
	LT (Low Temperature)	-10℃
	HT (High Temperature)	+45℃
Working Voltage of the EUT	NV (Normal Voltage)	3.8 V
	LV (Low Voltage)	3.5 V
	HV (High Voltage)	4.2 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-30	103118	2015.07.16	2016.07.15
Vector Signal Generator	ROHDE&SCHWARZ	SMBV100A	177746	2015.07.16	2016.07.15
Signal Generator	ROHDE&SCHWARZ	SMB100A	260592	2015.07.16	2016.07.15
Switch Unit with OSP-B157	ROHDE&SCHWARZ	OSP120	101270	2015.07.16	2016.07.15
Spectrum Analyzer	AGILENT	E4440A	MY45304434	2015.10.15	2016.10.14
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-40	101008	2015.10.18	2016.10.17
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2015.07.14	2016.07.13
LISN	SCHWARZBECK	NSLK 8127	8127-687	2015.07.14	2016.07.13
Bluetooth Tester	ROHDE&SCHWARZ	CBT	101005	2015.07.16	2016.07.15
Power Splitter	KMW	DCPD-LDC	1305003215	2015.07.01	2016.06.30
Power Sensor	ROHDE&SCHWARZ	NRP-Z21	103971	2015.07.21	2016.07.20
Attenuator (20 dB)	KMW	ZA-S1-201	110617091	--	--
Attenuator (6 dB)	KMW	ZA-S1-61	1305003189	--	--
DC Power Supply	ROHDE&SCHWARZ	HMP2020	018141664	2015.07.17	2016.07.16
Temperature Chamber	ANGELANTIONI SCIENCE	NTH64-40A	1310	2015.08.07	2016.08.06
Test Antenna-Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2015.07.22	2017.07.21
Test Antenna-Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2015.07.22	2017.07.21
Test Antenna-Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	9120D-1148	2015.07.22	2017.07.21
Test Antenna-Horn(18-40 GHz)	SCHWARZBECK	BBHA 9170	9170-1025	2015.07.22	2017.07.21
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2015.02.28	2016.02.27
Shielded Enclosure	ChangNing	CN-130701	130703	--	--

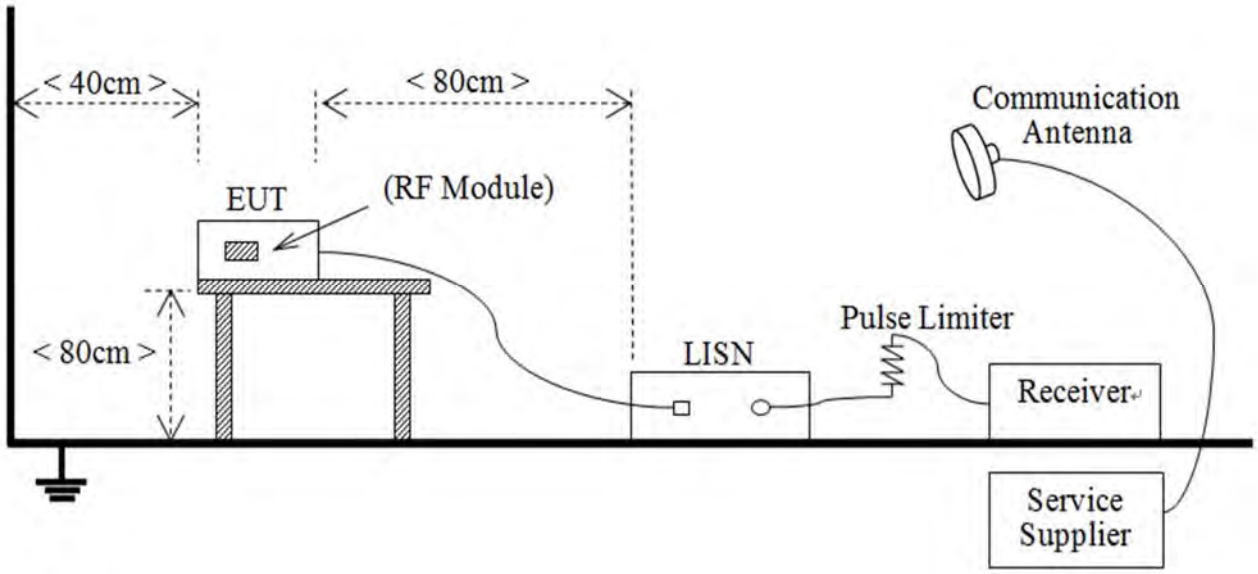
4.3 Description of Test Setup

4.3.1 For Antenna Port Test



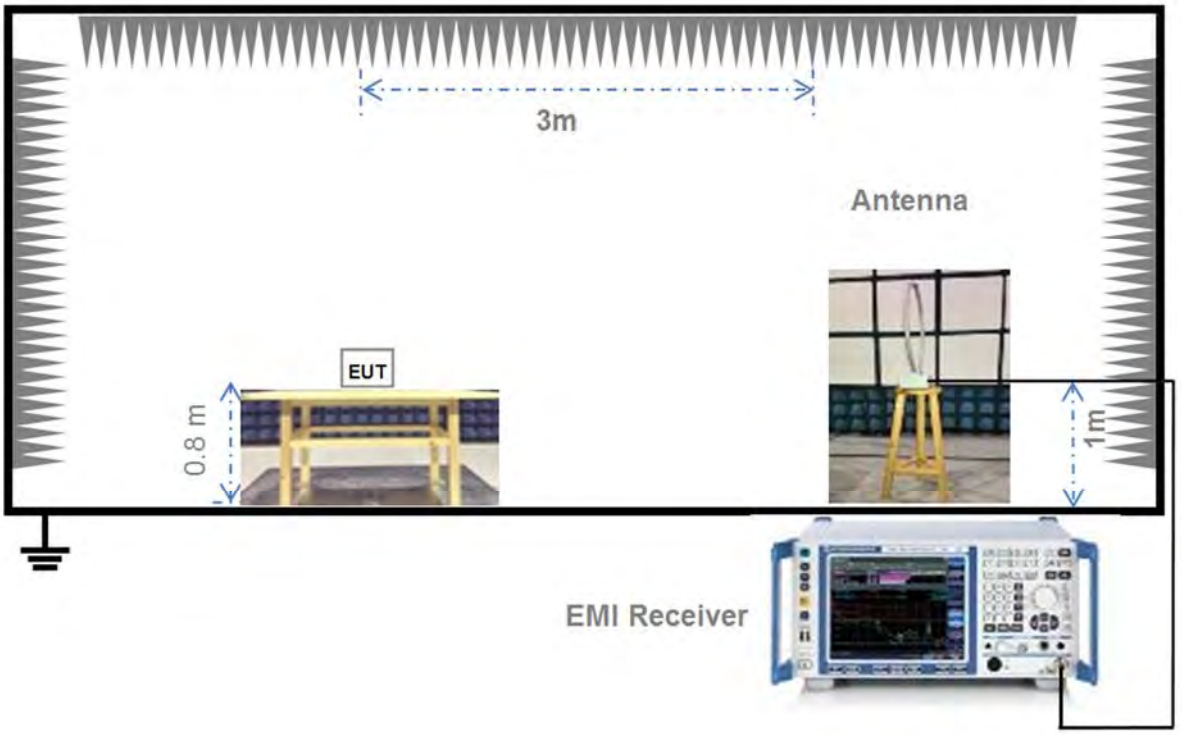
(Diagram 1)

4.3.2 For AC Power Supply Port Test



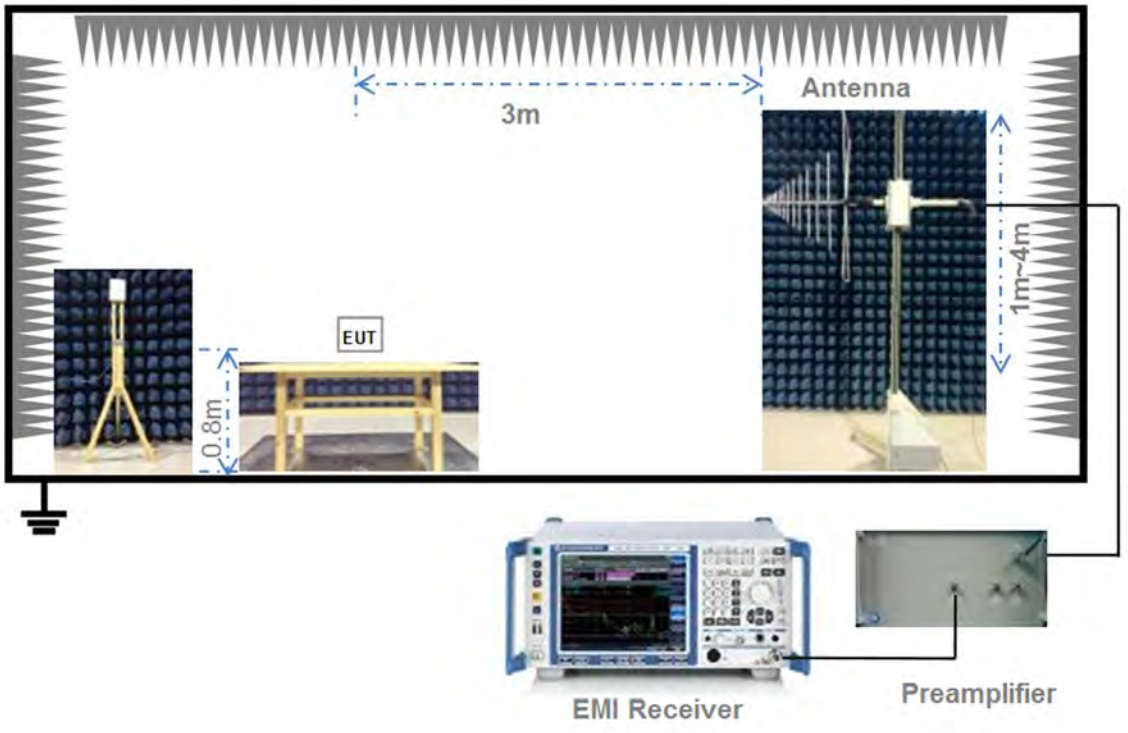
(Diagram 2)

4.3.3 For Radiated Test (Below 30 MHz)



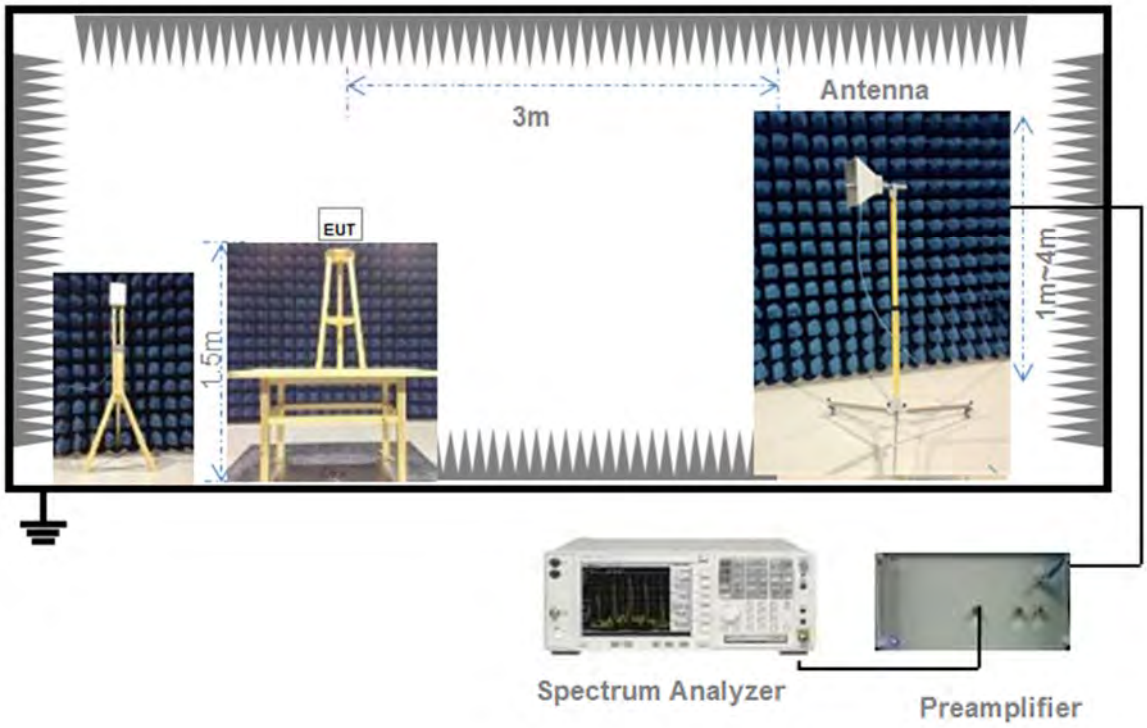
(Diagram 3)

4.3.4 For Radiated Test (30 MHz-1 GHz)



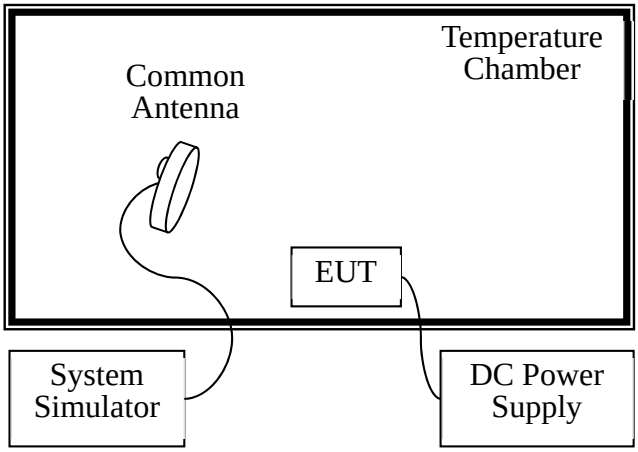
(Diagram 4)

4.3.5 For Radiated Test (Above 1 GHz)



(Diagram 5)

4.3.6 For Frequency Stability Test



(Diagram 6)

5 TEST ITEMS

5.1 RF Output Power

5.1.1 Test Limit

FCC §15.407(a)

The maximum conducted output power should not exceed:

Frequency Band (MHz)	Limit
5150-5250	250 mW
5250-5350	250 mW or 11 dBm + 10log B, whichever is less.
5470-5725	250 mW or 11 dBm + 10log B, whichever is less.
5725-5850	1 W
Note: Where “B” is the 26 dB emissions bandwidth in MHz.	

RSS-247, 6.2

The maximum conducted output power shall not exceed:

Frequency Band (MHz)	Limit
5150-5250	N/A
5250-5350	250 mW or 11 dBm + 10log B, whichever is less.
5470-5725	250 mW or 11 dBm + 10log B, whichever is less.
5725-5850	1 W
Note: Where “B” is the 99% emissions bandwidth in MHz.	

The maximum e.i.r.p. shall not exceed:

Frequency Band (MHz)	Limit
5150-5250	200 mW or 10 dBm + 10log B, whichever is less.
5250-5350	1W or 17 dBm + 10log B, whichever is less.
5470-5725	1W or 17 dBm + 10log B, whichever is less.
5725-5850	N/A
Note: Where “B” is the 99% emissions bandwidth in MHz.	

5.1.2 Test Setup

The section 4.3.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.3 Test Procedure

The maximum peak conducted output power may be measured using a broadband Average RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the emission bandwidth and utilize a fast-responding diode detector. e.i.r.p Result= Conducted Power Result + Antenna Gain

5.1.4 Test Result

Please refer to ANNEX A.1.

5.2 Emission Bandwidth and 6 dB Bandwidth

5.2.1 Limit

FCC §15.407(a), RSS-247, 6.2

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

5.2.2 Test Setup

The test setup photo please refer to 4.3.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.2.3 Test Procedure

Emission bandwidth

1. Set RBW = approximately 1% of the emission bandwidth.

2. Set VBW ≥ 3*RBW,

3. Detector = Peak.

4. Trace mode = Max hold.

5. Measure the maximum width of the emission that is 26 dB down from the peak of the emission.

Occupied Bandwidth

1. Set Span = 1.5 times to 5.0 times the OBW

2. Set RBW = 1% to 5% of the OBW.

3. Set VBW ≥ 3*RBW, Detector = Peak.

4. Trace mode = Max hold.

5. Use the 99% power bandwidth function of the instrument.

6 dB bandwidth

1. Set RBW = 100 kHz, VBW = 300 kHz.

2. Detector = Peak.Trace mode = Max hold.

3. Allow the trace to stabilize.

4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

5.2.4 Test Result

Please refer to ANNEX A.2 and ANNEX A.3.

5.3 Power Spectral density (PSD)

5.3.1 Limit

FCC §15.407(a)

The maximum power spectral density should not exceed:

Frequency Band (MHz)	Limit
5150-5250	11 dBm/MHz
5250-5350	11 dBm/MHz
5470-5725	11 dBm/MHz
5725-5850	30 dBm/500kHz

RSS-247, 6.2

The maximum power spectral density should not exceed:

Frequency Band (MHz)	Limit
5150-5250	N/A
5250-5350	11 dBm/MHz
5470-5725	11 dBm/MHz
5725-5850	30 dBm/500kHz

The e.i.r.p. spectral density should not exceed:

Frequency Band (MHz)	Limit
5150-5250	10 dBm/MHz
5250-5350	N/A
5470-5725	N/A
5725-5850	N/A

5.3.2 Test Setup

The section 4.3.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.3.3 Test Procedure

1. Set Span = 1.5 times to 5.0 times the OBW

2. Set RBW = 1 MHz (for band 1, band 2, band3), RBW = 500 kHz (for band 4)

3. Set VBW = 8 MHz (for band 1, band 2, band3), RBW = 3 MHz (for band 4)

4. Detector = RMS.

5. Trace mode = Max hold.

6. Use the peak marker function to determine the maximum amplitude level.

7. e.i.r.p spectral density = Conducted power spectral density Result + Antenna Gain

5.3.4 Test Result

Please refer to ANNEX A.4.

5.4 Conducted Emission

5.4.1 Limit

FCC §15.207, 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 within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

5.4.2 Test Setup

The section 4.4.2 (Diagram 2) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.4.3 Test Procedure

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

5.4.4 Test Result

Please refer to ANNEX A.5.

5.5 Conducted Spurious Emission and Band Edge (Authorized-band)

5.5.1 Limit

FCC §15.407(b)

Un-restricted band emissions	
Frequency Band (MHz)	Limit
5150 - 5250	Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm
5250 - 5350	Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm
5470 - 5725	Outside of the 5.47-5.725 GHz band: e.i.r.p. -27 dBm
5725 - 5850	5715 -5725 MHz: e.i.r.p. -17 dBm 5850 -5860 MHz: e.i.r.p. -17 dBm Other un-restricted band: e.i.r.p .-27 dBm

RSS-247, 6.2

Un-restricted band emissions	
Frequency Band (MHz)	Limit
5150 - 5250	Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm, 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.
5250 - 5350	Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm. And any emissions within the band 5150-5250 MHz shall meet the power spectral density limits of 10 dBm/MHz, The device shall be labelled “for indoor use only.”
5470 - 5725	Outside of the 5.47-5.725 GHz band: e.i.r.p. -27 dBm
5725 - 5850	5715 -5725 MHz: e.i.r.p. -17 dBm 5850 -5860 MHz: e.i.r.p. -17 dBm Other un-restricted band: e.i.r.p .-27 dBm

5.5.2 Test Setup

See section 4.4.2 (Diagram 2) for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.5.3 Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize

5.5.4 Test Result

Please refer to ANNEX A.6.

5.6 Transmitter Radiated and Band Edge (Restricted-band)

5.6.1 Limit

FCC §15.209 & 15.407(b), RSS-247, 6.2

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
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	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note 1: The Limit for radiated test was performed according to FCC Part 15C
Note 2: The tighter limit applies at the band edge.

Un-restricted band emissions	
Out Operating Band (MHz）	Limit
5150 - 5250	e.i.r.p. -27 dBm (68.2 dBuV/m@3m)
5250 - 5350	e.i.r.p. -27 dBm (68.2 dBuV/m@3m)
5470 - 5725	e.i.r.p. -27 dBm (68.2 dBuV/m@3m)
5725 - 5850	5715 -5725 MHz: e.i.r.p. -17 dBm (78.2 dBuV/m@3m) 5850 -5860 MHz: e.i.r.p. -17 dBm (78.2 dBuV/m@3m) Other un-restricted band: e.i.r.p.(68.2 dBuV/m@3m)

Note: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength.

5.6.2 Test Setup

The section 4.3 (Diagram 3 - Diagram 5) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.6.3 Test Procedure

Since the emission limits are specified in terms of radiated field strength levels, measurements performed to demonstrate compliance have traditionally relied on a radiated test configuration. Radiated measurements remain the principal method for demonstrating compliance to the specified limits; however antenna-port conducted measurements are also now acceptable to demonstrate compliance (see below for details). When radiated measurements are utilized, test site requirements and procedures for maximizing and measuring radiated emissions that are described in ANSI C63.10 shall be followed.

Antenna-port conducted measurements may also be used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case spurious emissions is required.

General Procedure for conducted measurements in restricted bands

a) Measure the conducted output power (in dBm) using the detector specified (see guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).

b) Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see guidance on determining the applicable antenna gain)

c) Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).

d) For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).

e) Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

E = EIRP – 20log D + 104.8

where:

E = electric field strength in dBμV/m,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

f) Compare the resultant electric field strength level to the applicable limit.

g) Perform radiated spurious emission test.

Quasi-Peak measurement procedure

The specifications for measurements using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Frequency Interference (CISPR) of the International Electrotechnical Commission.

As an alternative to CISPR quasi-peak measurement, compliance can be demonstrated to the applicable emission limits using a peak detector.

Peak power measurement procedure

Peak emission levels are measured by setting the instrument as follows:

a) RBW = as specified in Table 1.

b) VBW ≥ 3 x RBW.

c) Detector = Peak.

d) Sweep time = auto.

e) Trace mode = max hold.

f) Allow sweeps to continue until the trace stabilizes. (Note that the required measurement time may be longer for low duty cycle applications).

Table 1—RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

Trace averaging across on and off times of the EUT transmissions followed by duty cycle correction

If continuous transmission of the EUT (i.e., duty cycle ≥ 98 percent) cannot be achieved and the duty cycle is constant (i.e., duty cycle variations are less than ± 2 percent), then the following procedure shall be used:

a) The EUT shall be configured to operate at the maximum achievable duty cycle.

b) Measure the duty cycle, x, of the transmitter output signal as described in section 6.0.

c) RBW = 1 MHz (unless otherwise specified).

d) VBW ≥ 3 x RBW.

e) Detector = RMS, if span/(# of points in sweep) ≤ (RBW/2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.

f) Averaging type = power (i.e., RMS).

1) As an alternative, the detector and averaging type may be set for linear voltage averaging.

2) Some instruments require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used.

g) Sweep time = auto.

h) Perform a trace average of at least 100 traces.

i) A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:

1) If power averaging (RMS) mode was used in step f), then the applicable correction factor is 10 log(1/x), where x is the duty cycle.

2) If linear voltage averaging mode was used in step f), then the applicable correction factor is 20 log(1/x), where x is the duty cycle.

3) If a specific emission is demonstrated to be continuous (≥ 98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

NOTE: Reduction of the measured emission amplitude levels to account for operational duty factor is not permitted. Compliance is based on emission levels occurring during transmission - not on an average across on and off times of the transmitter.

Determining the applicable transmit antenna gain

A conducted power measurement will determine the maximum output power associated with a restricted band emission; however, in order to determine the associated EIRP level, the gain of the transmitting antenna (in dBi) must be added to the measured output power (in dBm).

Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.

See KDB 662911 for guidance on calculating the additional array gain term when determining the effective antenna gain for a EUT with multiple outputs occupying the same or overlapping frequency ranges in the same band.

Radiated spurious emission test

An additional consideration when performing conducted measurements of restricted band emissions is that unwanted emissions radiating from the EUT cabinet, control circuits, power leads, or intermediate circuit elements will likely go undetected in a conducted measurement configuration. To address this concern, a radiated test shall be performed to ensure that emissions emanating from the EUT cabinet (rather than the antenna port) also comply with the applicable limits.

For these cabinet radiated spurious emission measurements the EUT transmit antenna may be replaced with a termination matching the nominal impedance of the antenna. Procedures for performing radiated measurements are specified in ANSI C63.10. All detected emissions shall comply with the applicable limits.

The measurement frequency range is from 30 MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

5.6.4 Test Result

Please refer to ANNEX A.7 and Please refer to ANNEX A.9

5.7 Frequency Stability

5.7.1 Limit

FCC §15.407(g)

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

5.7.2 Test Setup

The section 4.3.1 (Diagram 6) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.7.3 Test Procedure

The EUT is installed in an environment test chamber with external power source.
Set the chamber to operate at 50 centigrade and external power source to output at nominal voltage of EUT.
A sufficient stabilization period at each temperatures is used prior to each frequency measurement.
When temperature is stabled, measure the frequency stability.
The test shall be performed under -30 to 50 centigrade and 85 to 115 percent of the nominal voltage.
Change setting of chamber and external power source to complete all conditions.

5.7.4 Test Result

Please refer to ANNEX A.8.

5.8 Receiver Spurious Emissions

5.8.1 Limit

IC RSS-Gen, 7.1.2

Radiated spurious emission measurements shall be performed with the receiver antenna connected to the receiver antenna terminals. Spurious emissions from receivers shall not exceed the radiated limits shown in the table below:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

1. Field Strength (dBμV/m) = 20*log[Field Strength (μV/m)].
2. In the emission tables above, the tighter limit applies at the band edges.
3. For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
4. For above 1000 MHz, limit field strength of harmonics: 54 dBuV/m@3m (AV) and 74 dBuV/m@3m (PK).

5.8.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.8.3 Test Procedure

The measurement frequency range is from 30 MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

Test Plots for the Whole Measurement Frequency Range:

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

5.8.4 Test Result

Please refer to ANNEX A.9.

ANNEX A TEST RESULT

A.1 RF Output Power

Note 1: For FCC standard, if transmitting antennas of directional gain greater than 6 dBi are used, all band maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note 2: For IC standard, the band IV (5725 - 5850 MHz) maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Data

Conducted Power

Band I (5150 - 5250 MHz)							
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (mW)	FCC Limit (mW)	IC Limit (mW)	Verdict
11a	CH36	5180	13.26	21.18	250	N/A	Pass
11a	CH44	5220	14.29	26.85	250	N/A	Pass
11a	CH48	5240	14.28	26.79	250	N/A	Pass
11n (HT20)	CH36	5180	13.14	20.61	250	N/A	Pass
11n (HT20)	CH44	5220	14.07	25.53	250	N/A	Pass
11n (HT20)	CH48	5240	14.04	25.35	250	N/A	Pass
11n (HT40)	CH38	5190	13.48	22.28	250	N/A	Pass
11n (HT40)	CH46	5230	14.30	26.92	250	N/A	Pass
11ac (HT20)	CH36	5180	13.21	20.94	250	N/A	Pass
11ac (HT20)	CH44	5220	14.25	26.61	250	N/A	Pass
11ac (HT20)	CH48	5240	14.04	25.35	250	N/A	Pass
11ac (HT40)	CH38	5190	13.45	22.13	250	N/A	Pass
11ac (HT40)	CH46	5230	14.41	27.61	250	N/A	Pass

Band II (5250 - 5350 MHz)									
Note: The limit is 250 mW or 11 dBm + 10log B, whichever is less. In IC Standard, Where “B” is the 99% emissions bandwidth in MHz. In FCC Standard, Where “B” is the 26dB emissions bandwidth in MHz. (Please refer to the section A.2).									
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (mW)	FCC: 11 dBm + 10log B (mW)	IC: 11 dBm + 10log B (mW)	FCC Limit (mW)	IC Limit (mW)	Verdict
11a	CH52	5260	14.44	27.80	255	207	250	207	Pass
11a	CH60	5280	14.46	27.93	252	208	250	208	Pass
11a	CH64	5320	13.20	20.89	253	208	250	208	Pass
11n (HT20)	CH52	5260	14.18	26.18	259	221	250	221	Pass
11n (HT20)	CH60	5300	14.22	26.42	254	221	250	221	Pass
11n (HT20)	CH64	5320	13.02	20.04	254	221	250	221	Pass
11n (HT40)	CH54	5270	14.58	28.71	509	452	250	250	Pass
11n (HT40)	CH62	5310	14.30	26.92	506	452	250	250	Pass
11ac (HT20)	CH52	5260	14.25	26.61	250	221	250	221	Pass
11ac (HT20)	CH60	5280	14.29	26.85	260	208	250	208	Pass
11ac (HT20)	CH64	5320	13.12	20.51	253	221	250	221	Pass
11ac (HT40)	CH54	5270	14.69	29.44	509	452	250	250	Pass
11ac (HT40)	CH62	5310	14.38	27.42	506	452	250	250	Pass

Band III (5470 - 5725 MHz)									
Note: The limit is 250 mW or 11 dBm + 10log B, whichever is less. In IC Standard, Where “B” is the 99% emissions bandwidth in MHz. In FCC Standard, Where “B” is the 26dB emissions bandwidth in MHz. (Please refer to the section A.2).									
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (mW)	FCC: 11 dBm + 10log B (mW)	IC: 11 dBm + 10log B (mW)	FCC Limit (mW)	IC Limit (mW)	Verdict
11a	CH100	5500	13.02	20.04	252	208	250	208	Pass
11a	CH116	5580	14.13	25.88	249	208	249	208	Pass
11a	CH140	5700	14.78	30.06	257	209	250	209	Pass
11n (HT20)	CH100	5500	12.77	18.92	254	221	250	221	Pass
11n (HT20)	CH116	5580	13.88	24.43	261	221	250	221	Pass
11n (HT20)	CH140	5700	14.61	28.91	262	221	250	221	Pass
11n (HT40)	CH102	5510	14.05	25.41	507	451	250	250	Pass
11n (HT40)	CH134	5670	14.92	31.05	507	452	250	250	Pass
11ac (HT20)	CH100	5500	12.81	19.10	252	221	250	221	Pass
11ac (HT20)	CH116	5580	13.97	24.95	256	221	250	221	Pass
11ac (HT20)	CH140	5700	14.65	29.17	256	221	250	221	Pass
11ac (HT40)	CH102	5510	14.16	26.06	506	451	250	250	Pass
11ac (HT40)	CH134	5670	14.89	30.83	508	452	250	250	Pass

Band IV (5725 - 5850 MHz)						
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (mW)	FCC/IC Limit (W)	Verdict
11a	CH149	5745	14.37	27.35	1.00	Pass
11a	CH157	5785	14.32	27.04	1.00	Pass
11a	CH161	5825	14.30	26.92	1.00	Pass
11n (HT20)	CH149	5745	14.18	26.18	1.00	Pass
11n (HT20)	CH157	5785	14.13	25.88	1.00	Pass
11n (HT20)	CH161	5825	14.20	26.30	1.00	Pass
11n (HT40)	CH151	5755	14.43	27.73	1.00	Pass
11n (HT40)	CH159	5795	13.36	21.68	1.00	Pass
11ac (HT20)	CH149	5745	14.15	26.00	1.00	Pass
11ac (HT20)	CH157	5785	14.27	26.73	1.00	Pass
11ac (HT20)	CH161	5805	14.22	26.42	1.00	Pass
11ac (HT40)	CH151	5755	14.59	28.77	1.00	Pass
11ac (HT40)	CH159	5795	13.32	21.48	1.00	Pass

EIRP Power

Band I (5150 - 5250 MHz)							
Note: The limit is 200 mW or 10 dBm + 10log B, whichever is less. Where “B” is the 99% emissions bandwidth in MHz (Please refer to the section A.2).							
Mode	Channel	Frequency (MHz)	EIRP Power (dBm)	EIRP Power (mW)	10 dBm + 10log B (mW)	IC Limit (mW)	Verdict
11a	CH36	5180	13.66	23.23	166	166	Pass
11a	CH44	5220	14.69	29.44	165	165	Pass
11a	CH48	5240	14.68	29.38	165	165	Pass
11n (HT20)	CH36	5180	13.54	22.59	175	175	Pass
11n (HT20)	CH44	5220	14.47	27.99	175	175	Pass
11n (HT20)	CH48	5240	14.44	27.80	176	176	Pass
11n (HT40)	CH38	5190	13.88	24.43	359	200	Pass
11n (HT40)	CH46	5230	14.7	29.51	359	200	Pass
11ac (HT20)	CH36	5180	13.61	22.96	175	175	Pass
11ac (HT20)	CH44	5220	14.65	29.17	176	176	Pass
11ac (HT20)	CH48	5240	14.44	27.80	176	176	Pass
11ac (HT40)	CH38	5190	13.85	24.27	358	200	Pass
11ac (HT40)	CH46	5230	14.81	30.27	359	200	Pass

Band II (5250 - 5350 MHz)							
Note: The limit is 1W or 17 dBm + 10log B, whichever is less. Where “B” is the 99% emissions bandwidth in MHz (Please refer to the section A.2).							
Mode	Channel	Frequency (MHz)	EIRP Power (dBm)	EIRP Power (mW)	17 dBm + 10log B (W)	IC Limit (W)	Verdict
11a	CH52	5260	15.46	35.16	0.823	0.823	Pass
11a	CH56	5280	15.48	35.32	0.830	0.830	Pass
11a	CH64	5320	14.22	26.42	0.830	0.830	Pass
11n (HT20)	CH52	5260	15.20	33.11	0.882	0.882	Pass
11n (HT20)	CH60	5300	15.24	33.42	0.880	0.880	Pass
11n (HT20)	CH64	5320	14.04	25.35	0.879	0.879	Pass
11n (HT40)	CH54	5270	15.60	36.31	1.800	1.00	Pass
11n (HT40)	CH62	5310	15.32	34.04	1.800	1.00	Pass
11ac (HT20)	CH52	5260	15.27	33.65	0.878	0.878	Pass
11ac (HT20)	CH56	5280	15.31	33.96	0.828	0.828	Pass
11ac (HT20)	CH64	5320	14.14	25.94	0.879	0.879	Pass
11ac (HT40)	CH54	5270	15.71	37.24	1.800	1.00	Pass
11ac (HT40)	CH62	5310	15.40	34.67	1.800	1.00	Pass

Band III (5470 - 5725 MHz)							
Note: The limit is 1W or 17 dBm + 10log B, whichever is less. Where “B” is the 99% emissions bandwidth in MHz (Please refer to the section A.2)							
Mode	Channel	Frequency (MHz)	EIRP Power (dBm)	EIRP Power (mW)	17 dBm + 10log B (W)	IC Limit (W)	Verdict
11a	CH100	5500	11.30	13.49	0.827	0.827	Pass
11a	CH116	5580	12.41	17.42	0.829	0.829	Pass
11a	CH140	5700	13.06	20.23	0.830	0.830	Pass
11n (HT20)	CH100	5500	11.05	12.74	0.880	0.880	Pass
11n (HT20)	CH116	5580	12.16	16.44	0.879	0.879	Pass
11n (HT20)	CH140	5700	12.89	19.45	0.880	0.880	Pass
11n (HT40)	CH102	5510	12.33	17.10	1.79587	1.00	Pass
11n (HT40)	CH134	5670	13.20	20.89	1.79779	1.00	Pass
11ac (HT20)	CH100	5500	11.09	12.85	0.880	0.880	Pass
11ac (HT20)	CH116	5580	12.25	16.79	0.880	0.880	Pass
11ac (HT20)	CH140	5700	12.93	19.63	0.880	0.880	Pass
11ac (HT40)	CH102	5510	12.44	17.54	1.79593	1.00	Pass
11ac (HT40)	CH134	5670	13.17	20.75	1.79855	1.00	Pass

A.2 Emission Bandwidth & 99% Bandwidth

Test Data

Band I (5150 - 5250 MHz)				
Mode	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11a	CH36	5180	20.301	16.6449
11a	CH44	5220	20.150	16.5095
11a	CH48	5240	20.181	16.5336
11n (HT20)	CH36	5180	20.204	17.5401
11n (HT20)	CH44	5220	20.117	17.5498
11n (HT20)	CH48	5240	19.967	17.5527
11n (HT40)	CH38	5190	40.118	35.8693
11n (HT40)	CH46	5230	40.042	35.8767
11ac (HT20)	CH36	5180	20.167	17.5477
11ac (HT20)	CH44	5220	19.876	17.5629
11ac (HT20)	CH48	5240	20.164	17.555
11ac (HT40)	CH38	5190	40.167	35.8459
11ac (HT40)	CH46	5230	40.485	35.8973

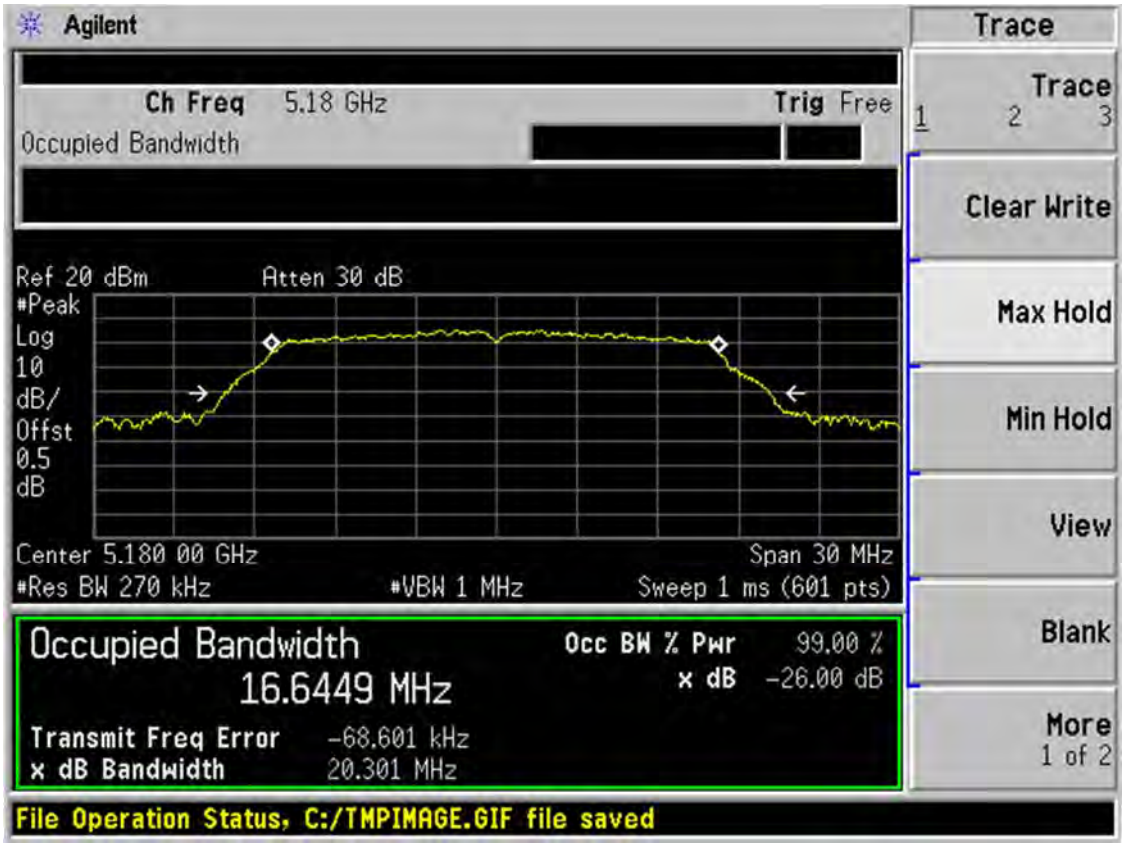
Band II (5250 - 5350 MHz)				
Mode	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11a	CH52	5260	20.240	16.4226
11a	CH60	5300	20.048	16.5533
11a	CH64	5320	20.065	16.5588
11n (HT20)	CH52	5260	20.546	17.5927
11n (HT20)	CH60	5300	20.200	17.5629
11n (HT20)	CH64	5320	20.215	17.5381
11n (HT40)	CH54	5270	40.419	35.9054
11n (HT40)	CH62	5310	40.215	35.9058
11ac (HT20)	CH52	5260	19.894	17.5263
11ac (HT20)	CH60	5300	20.678	16.5273
11ac (HT20)	CH64	5320	20.090	17.5291
11ac (HT40)	CH54	5270	40.419	35.9054
11ac (HT40)	CH62	5310	40.215	35.9058

Band III (5470 - 5725 MHz)				
Mode	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11a	CH100	5500	19.986	16.5094
11a	CH116	5580	19.774	16.5436
11a	CH140	5700	20.434	16.5700
11n (HT20)	CH100	5500	20.209	17.5531
11n (HT20)	CH116	5580	20.756	17.5464
11n (HT20)	CH140	5700	20.811	17.5530
11n (HT40)	CH102	5510	40.301	35.8323
11n (HT40)	CH134	5670	40.308	35.8706
11ac (HT20)	CH100	5500	20.034	17.5586
11ac (HT20)	CH116	5580	20.308	17.5624
11ac (HT20)	CH140	5700	20.303	17.5495
11ac (HT40)	CH102	5510	40.168	35.8335
11ac (HT40)	CH134	5670	40.380	35.8857

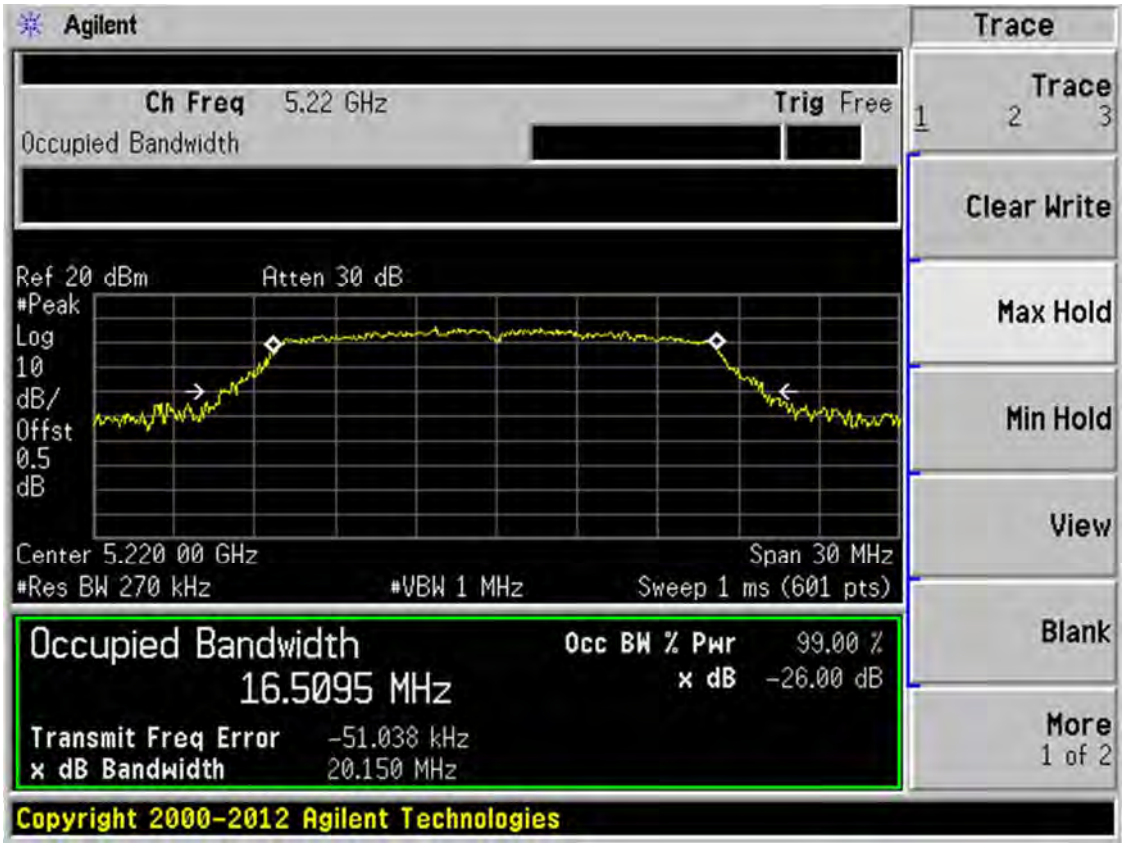
Band IV (5725 - 5850 MHz)				
Mode	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11a	CH149	5745	19.830	16.4610
11a	CH157	5785	20.272	16.4688
11a	CH161	5825	20.272	16.4863
11n (HT20)	CH149	5745	20.242	17.5645
11n (HT20)	CH157	5785	20.052	17.5649
11n (HT20)	CH161	5825	22.758	17.5868
11n (HT40)	CH151	5755	40.086	35.8943
11n (HT40)	CH159	5795	40.058	35.8753
11ac (HT20)	CH149	5745	20.009	17.5742
11ac (HT20)	CH157	5785	20.016	17.5578
11ac (HT20)	CH161	5805	20.053	17.5371
11ac (HT40)	CH151	5755	40.086	35.8943
11ac (HT40)	CH159	5795	40.058	35.8753

Test Plots

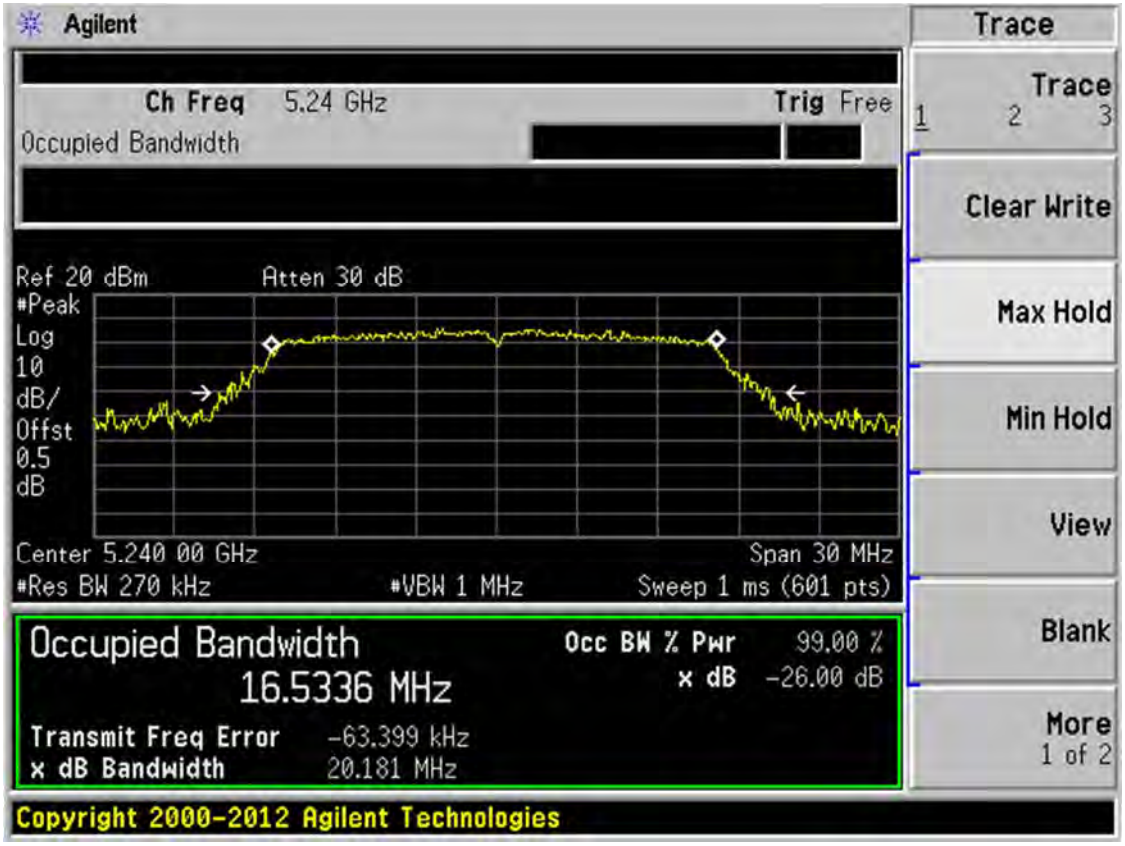
Band I 11a CH36



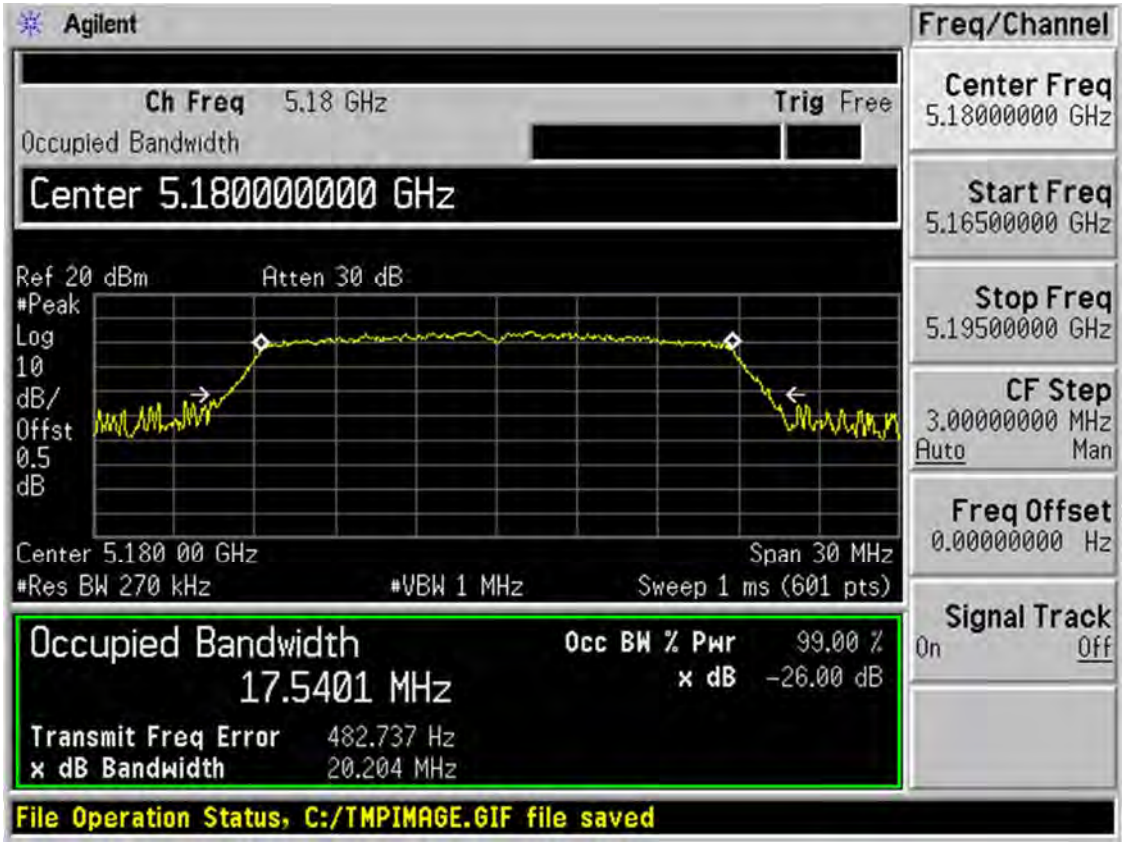
Band I 11a CH44



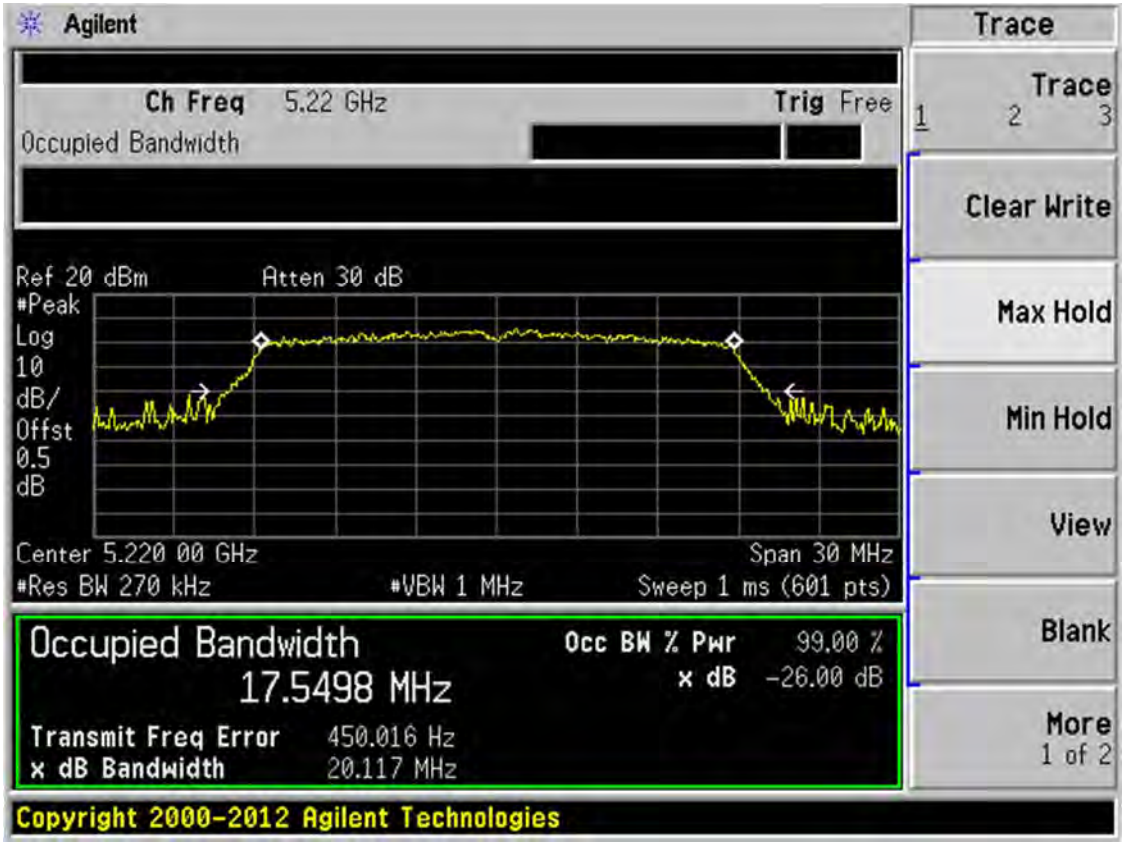
Band I 11a CH48



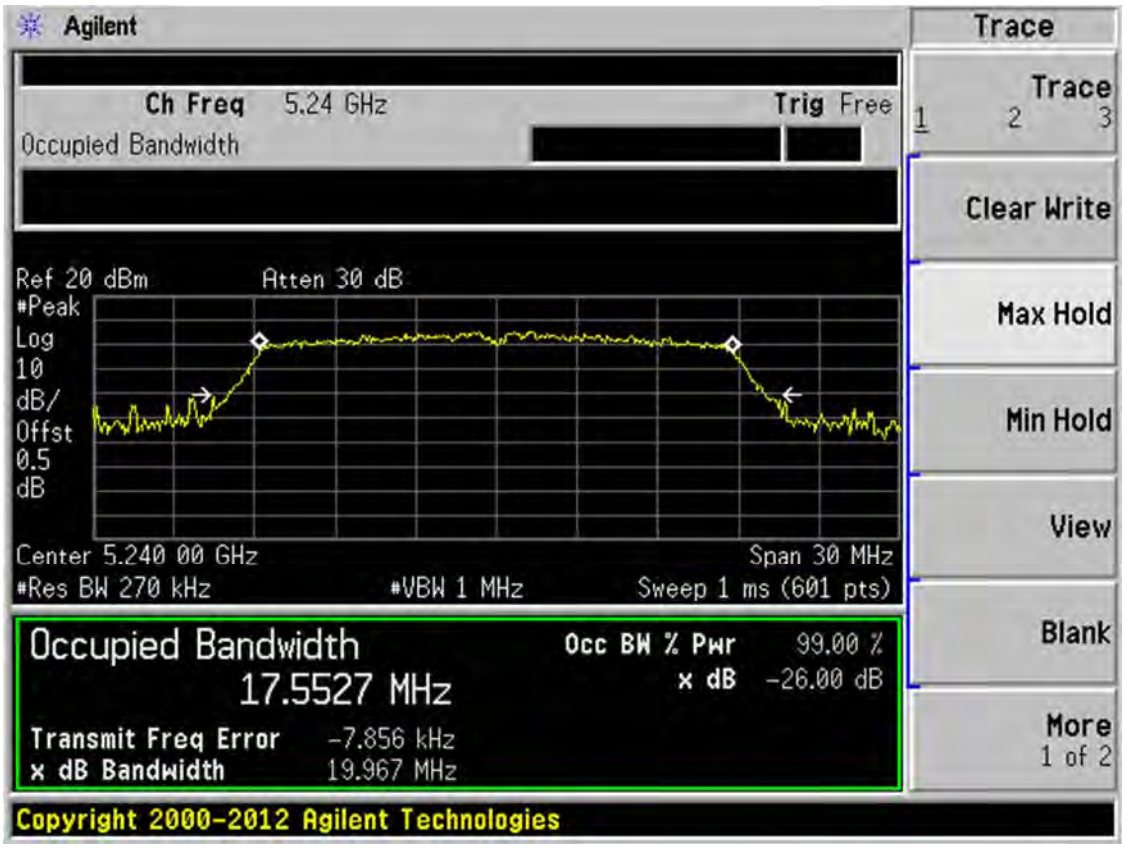
Band I 11n(HT20) CH36



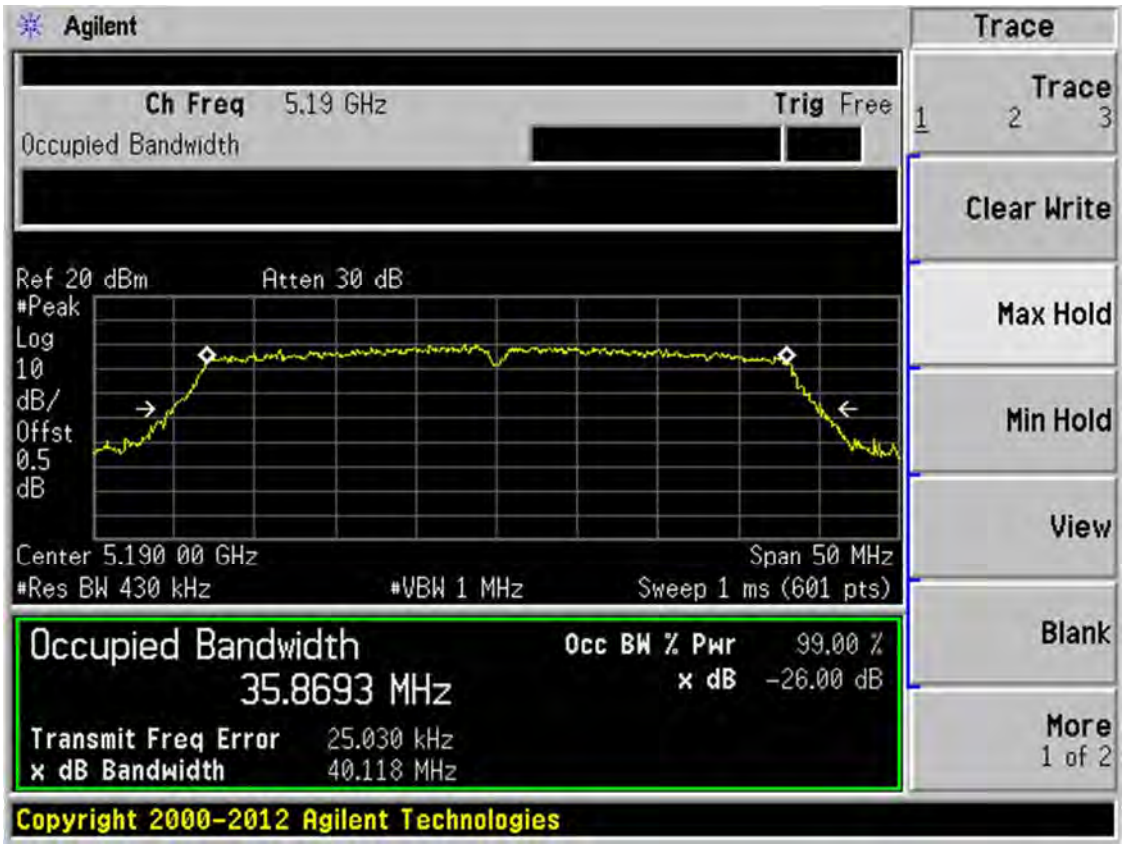
Band I 11n(HT20) CH44



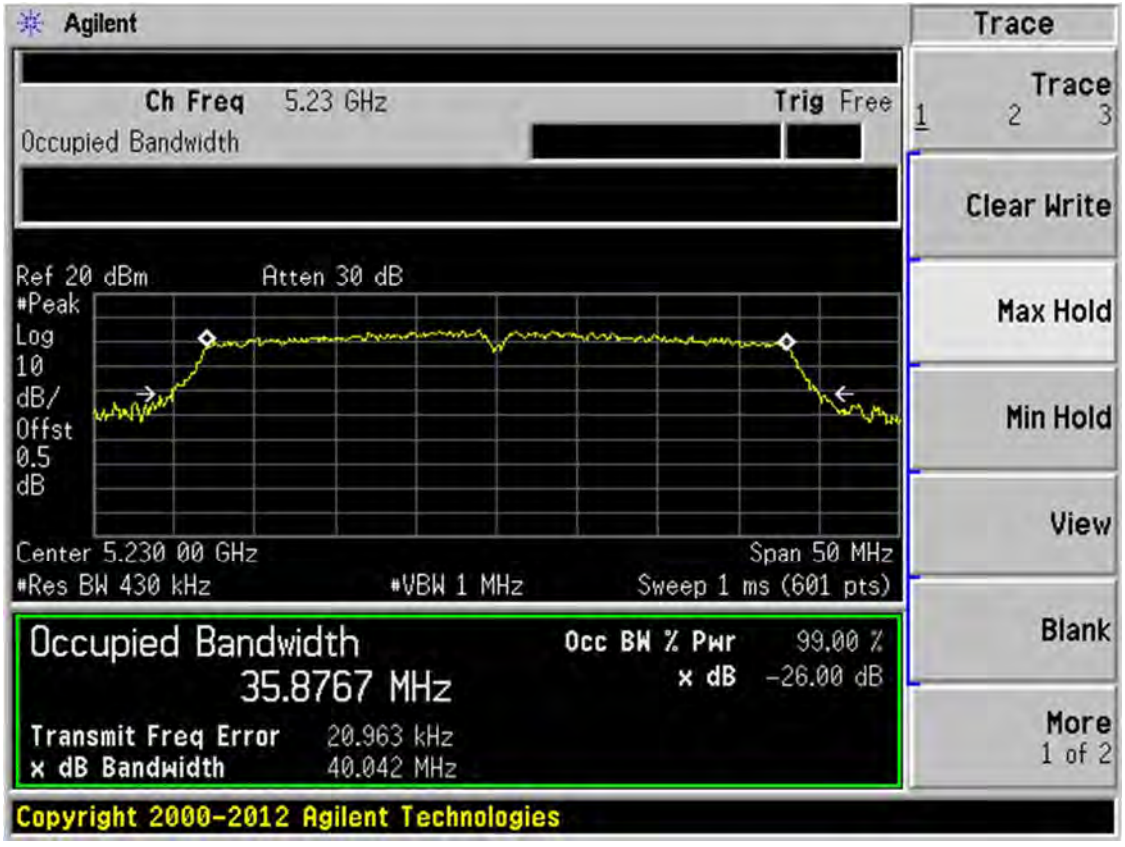
Band I 11n(HT20) CH48



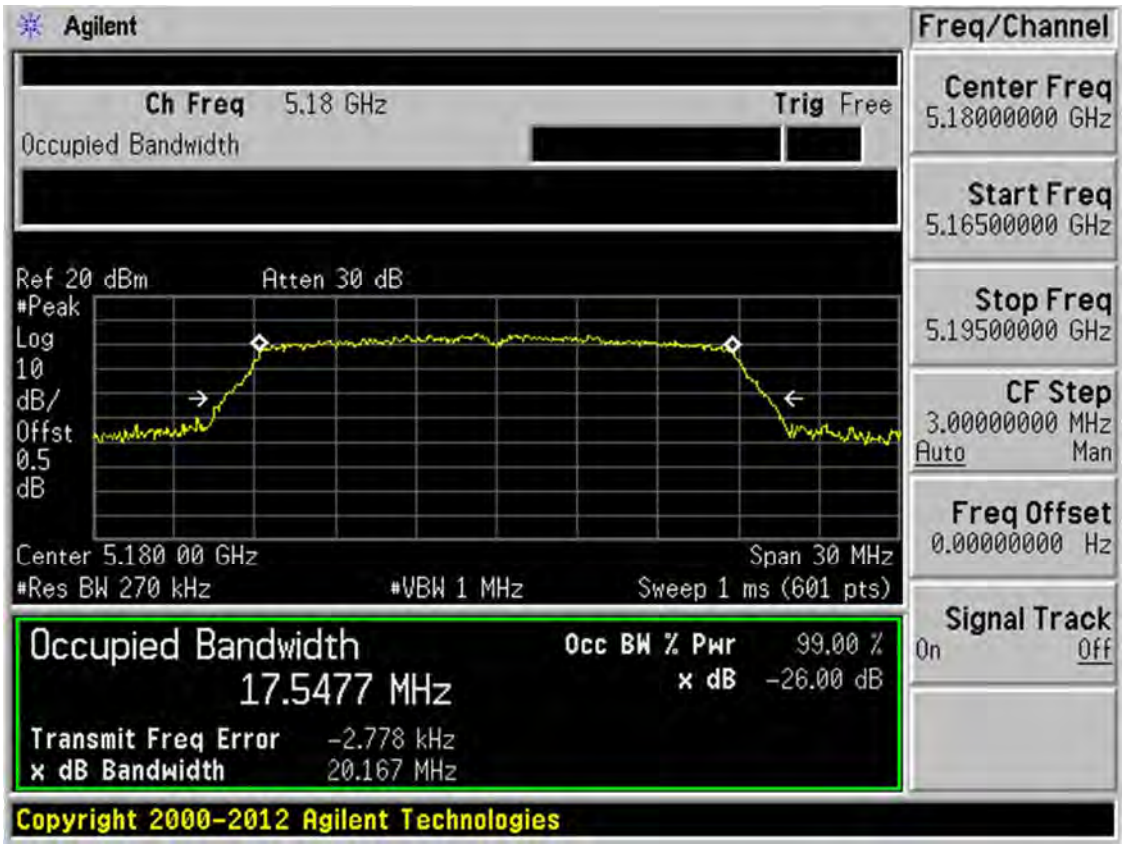
Band I 11n(HT40) CH38



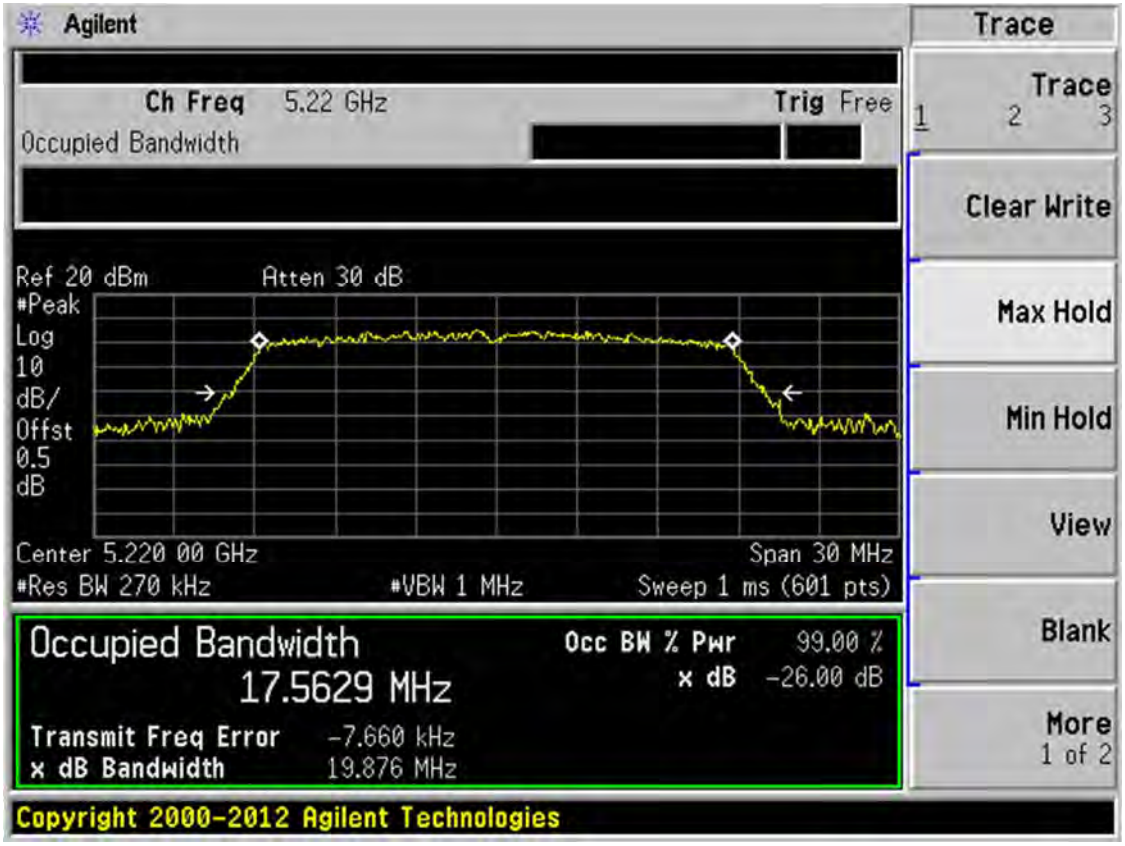
Band I 11n(HT40) CH46



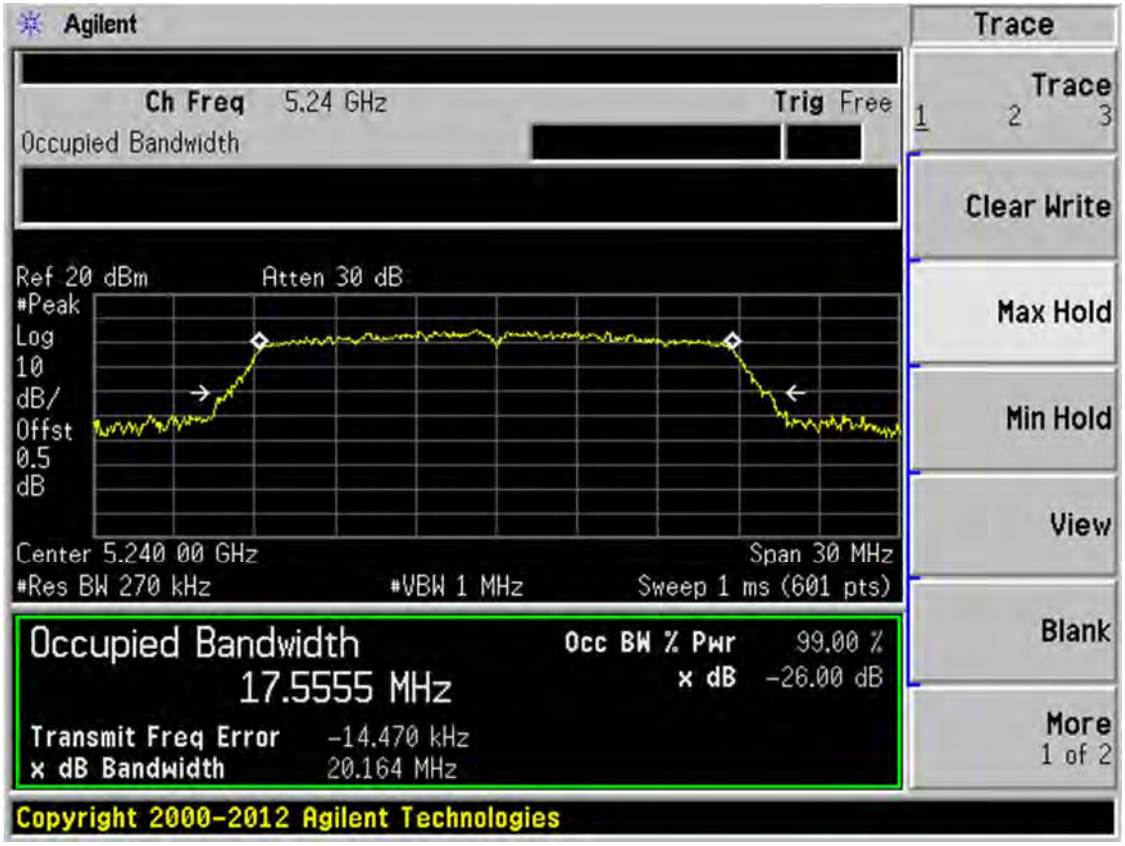
Band I 11ac(HT20) CH36



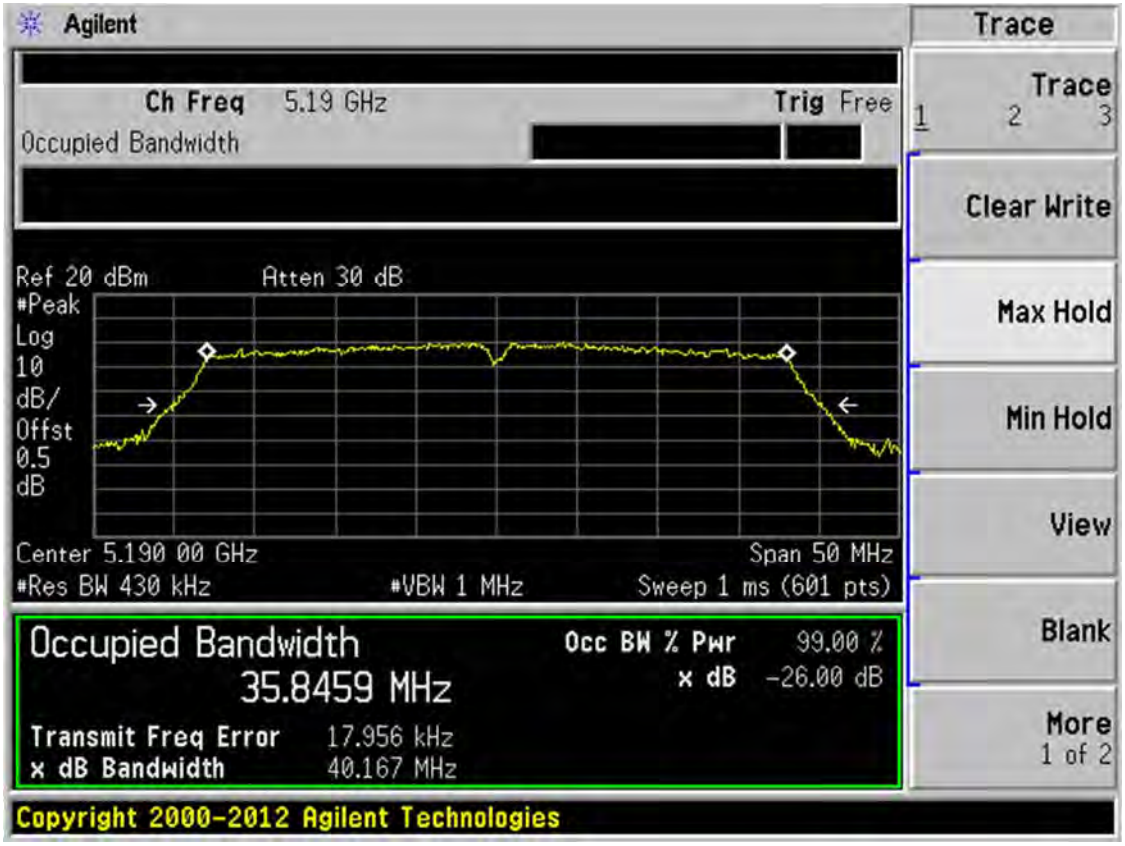
Band I 11ac(HT20) CH44



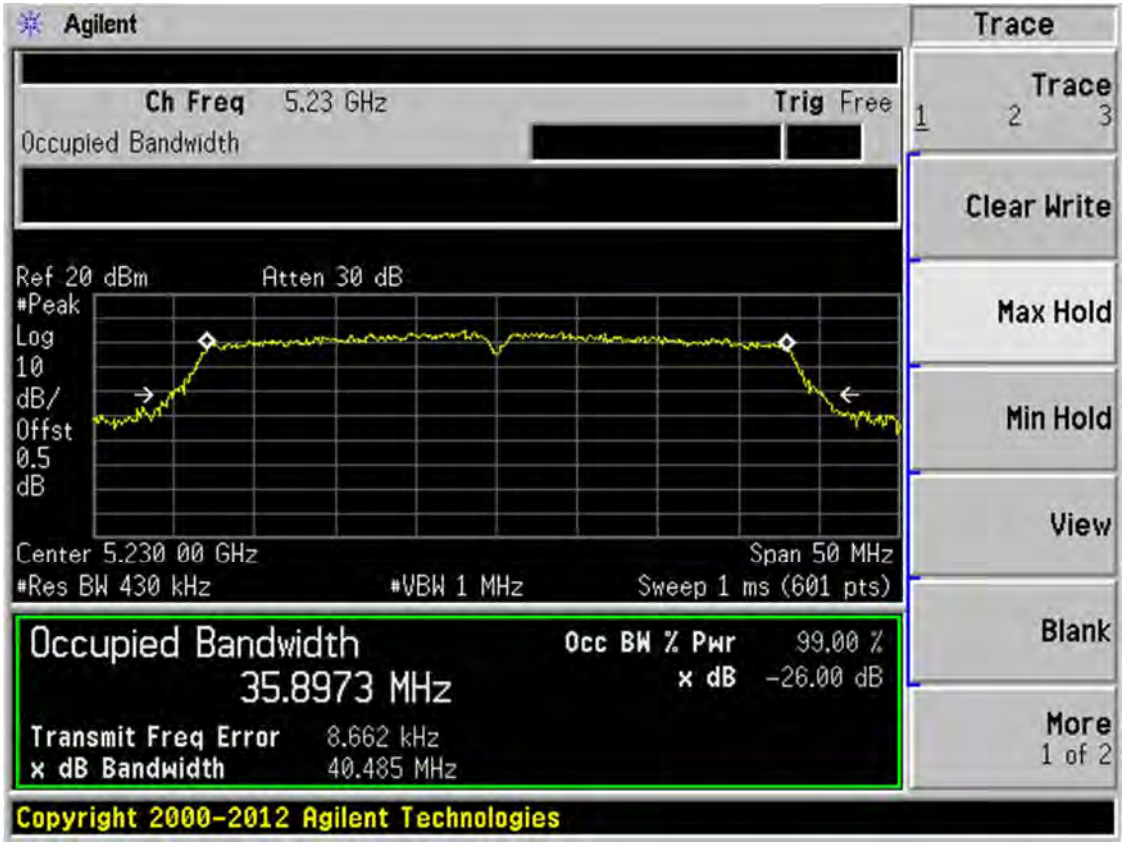
Band I 11ac(HT20) CH48



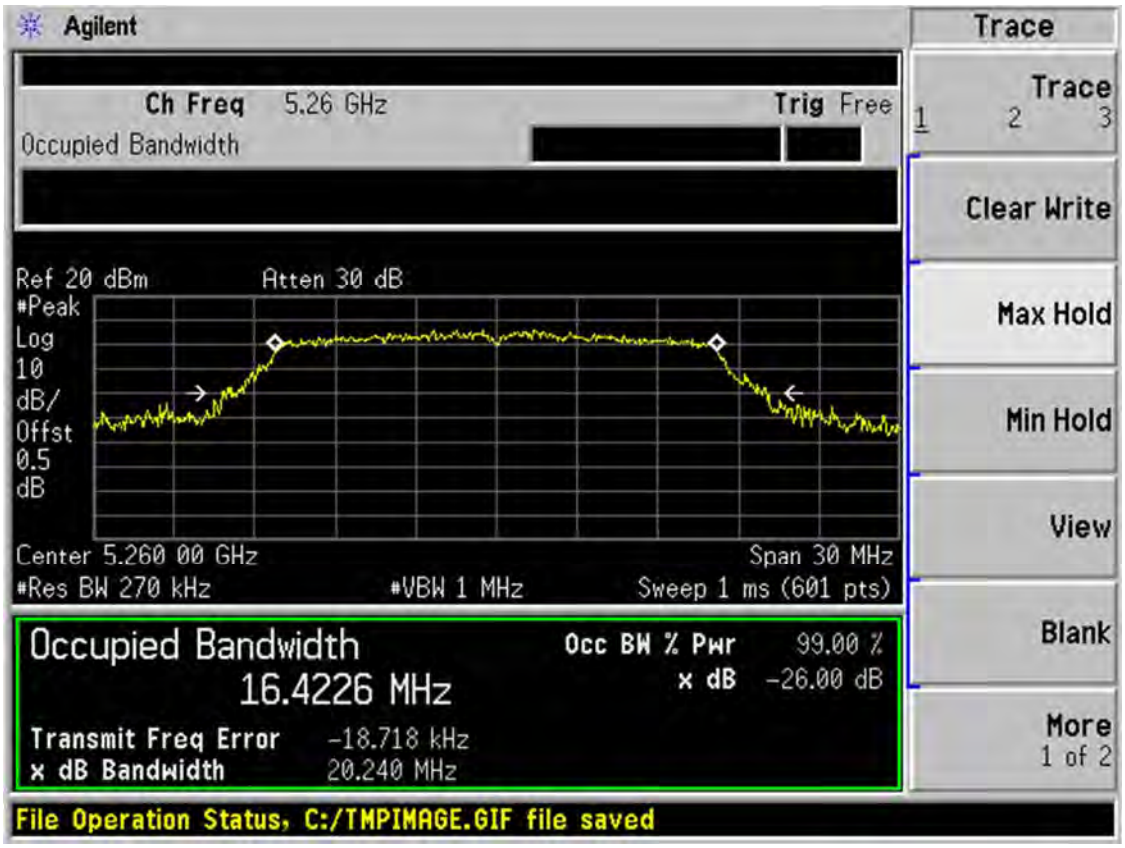
Band I 11ac(HT40) CH38



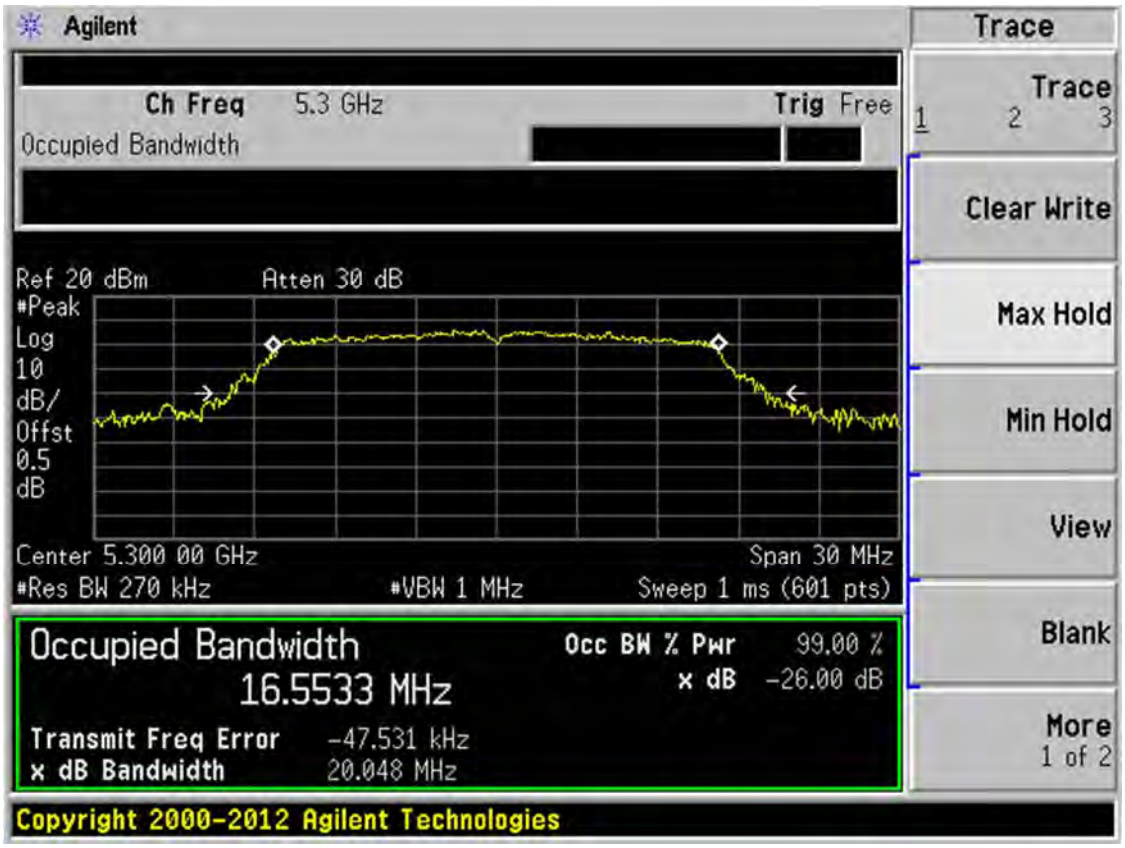
Band I 11ac(HT40) CH46



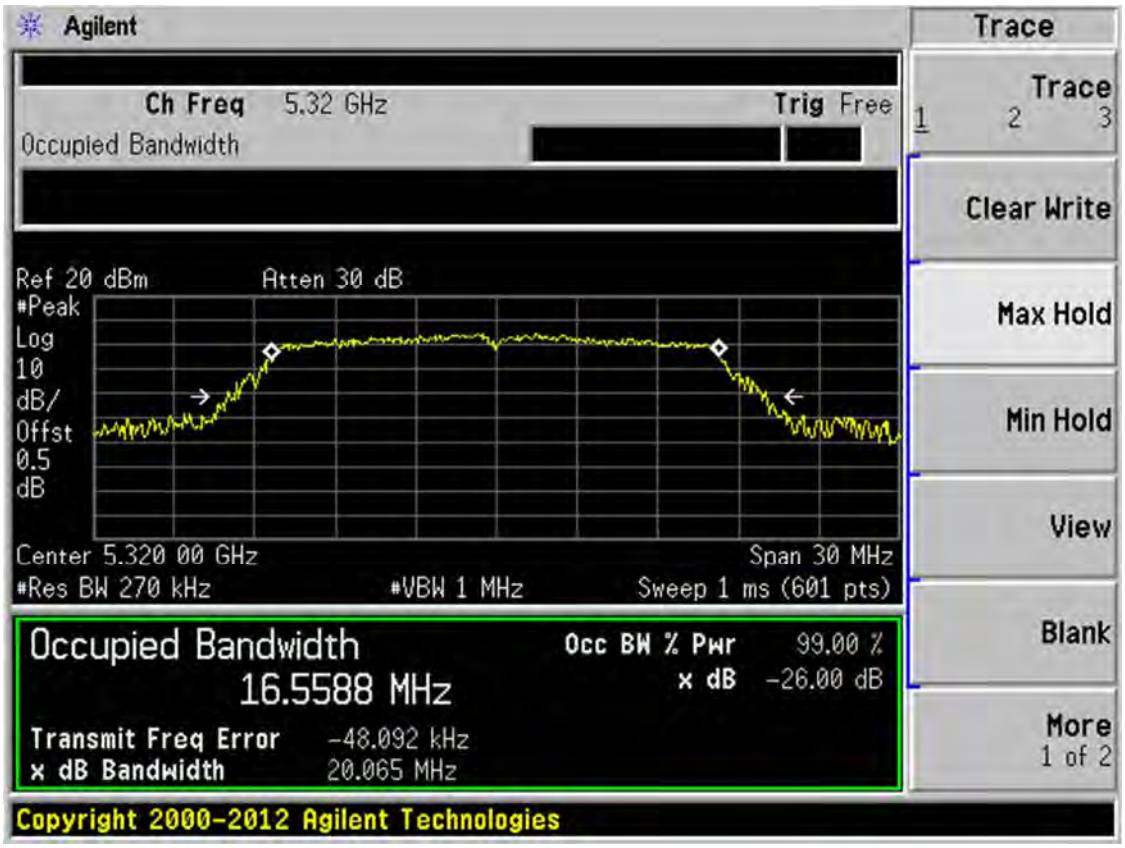
Band II 11a CH52



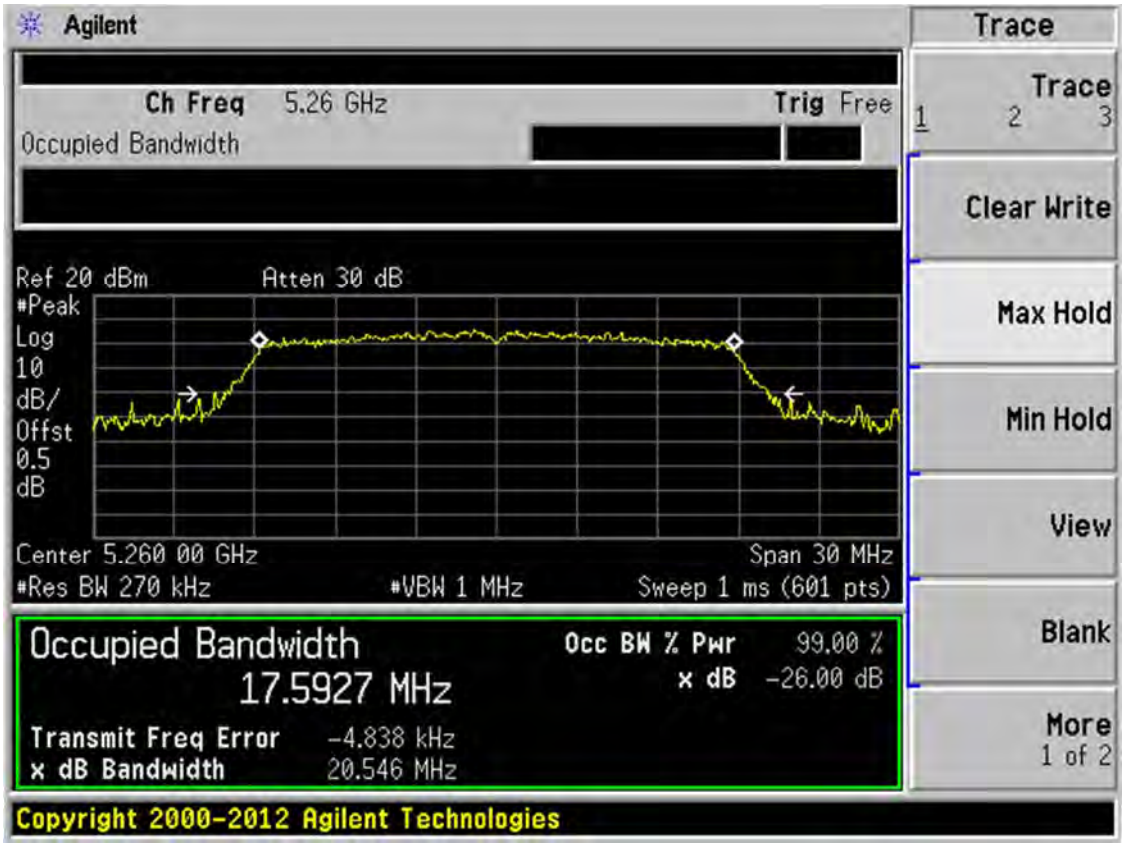
Band II 11a CH60



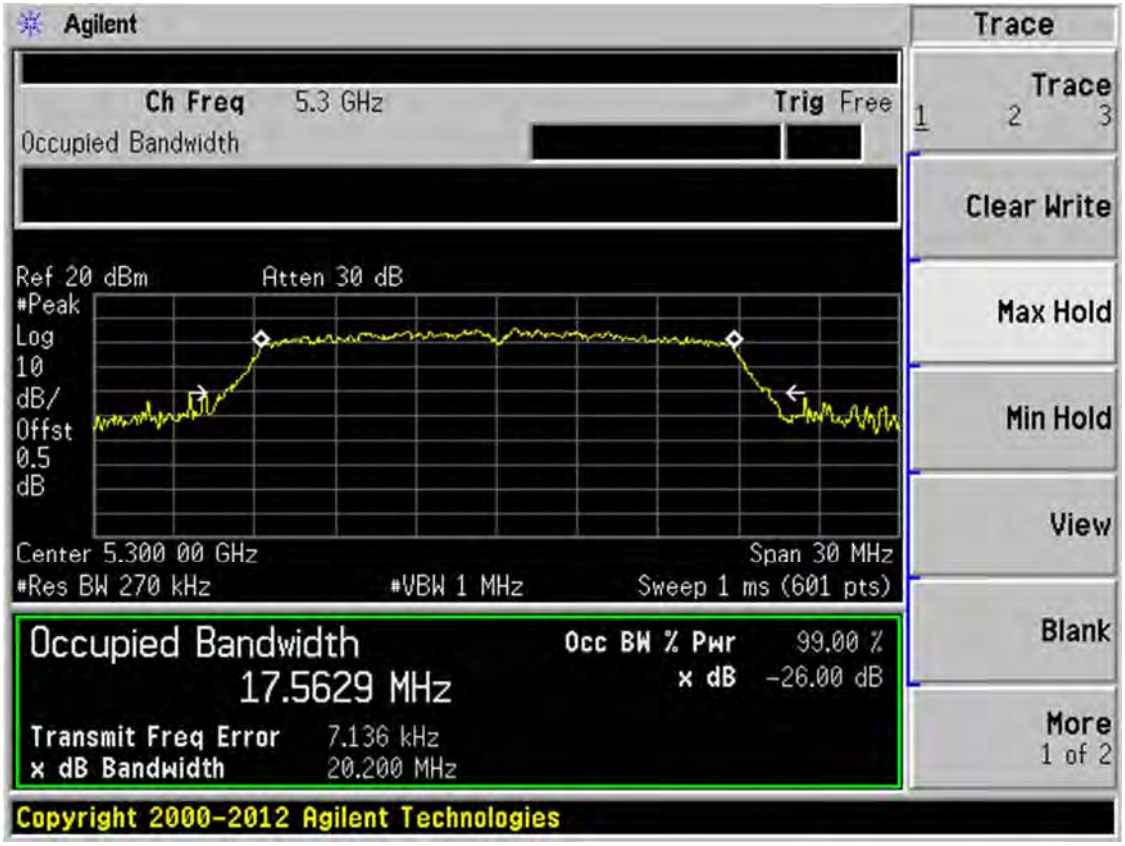
Band II 11a CH64



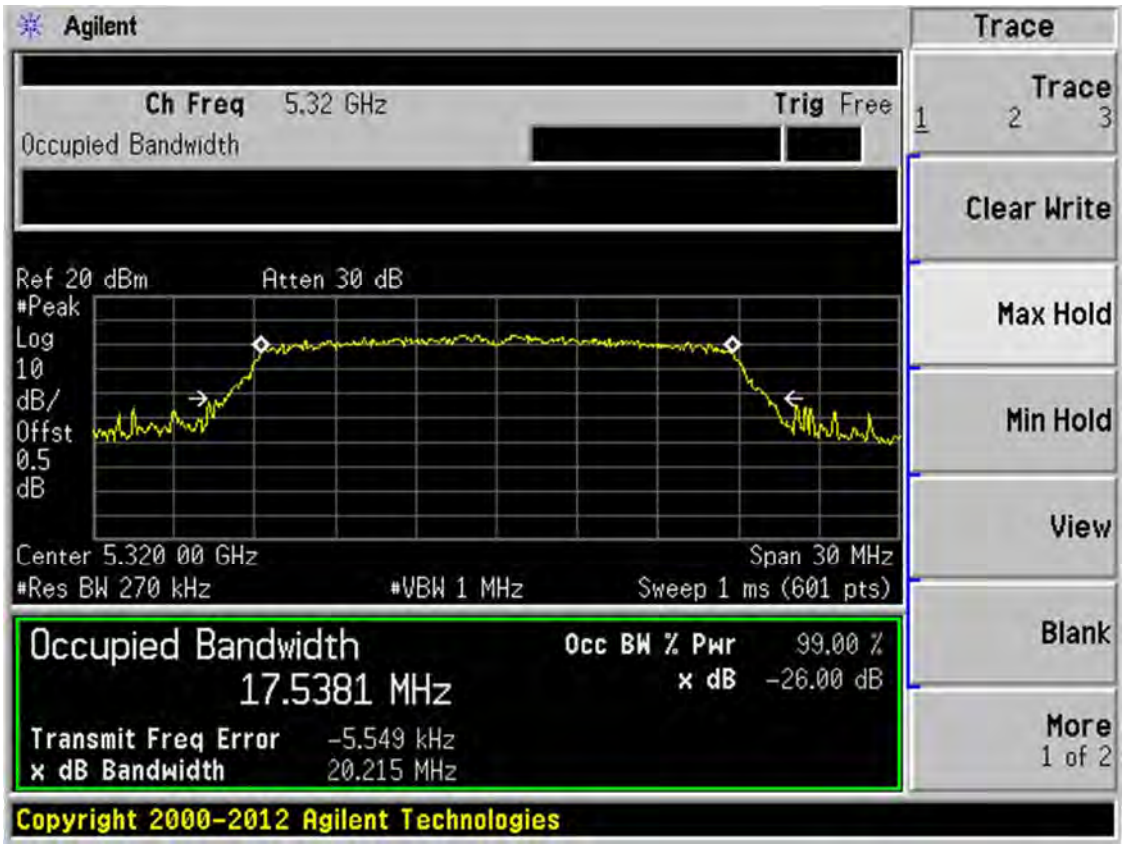
Band II 11n(HT20) CH52



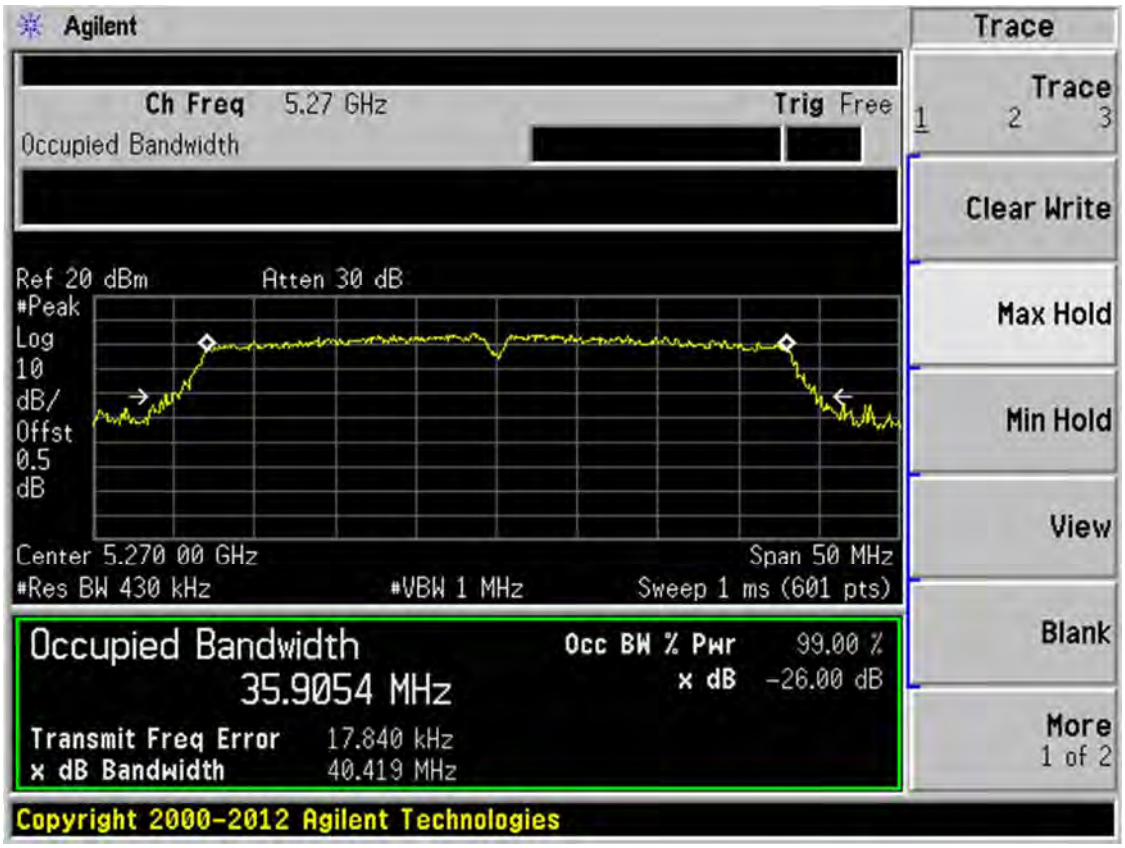
Band II 11n(HT20) CH60



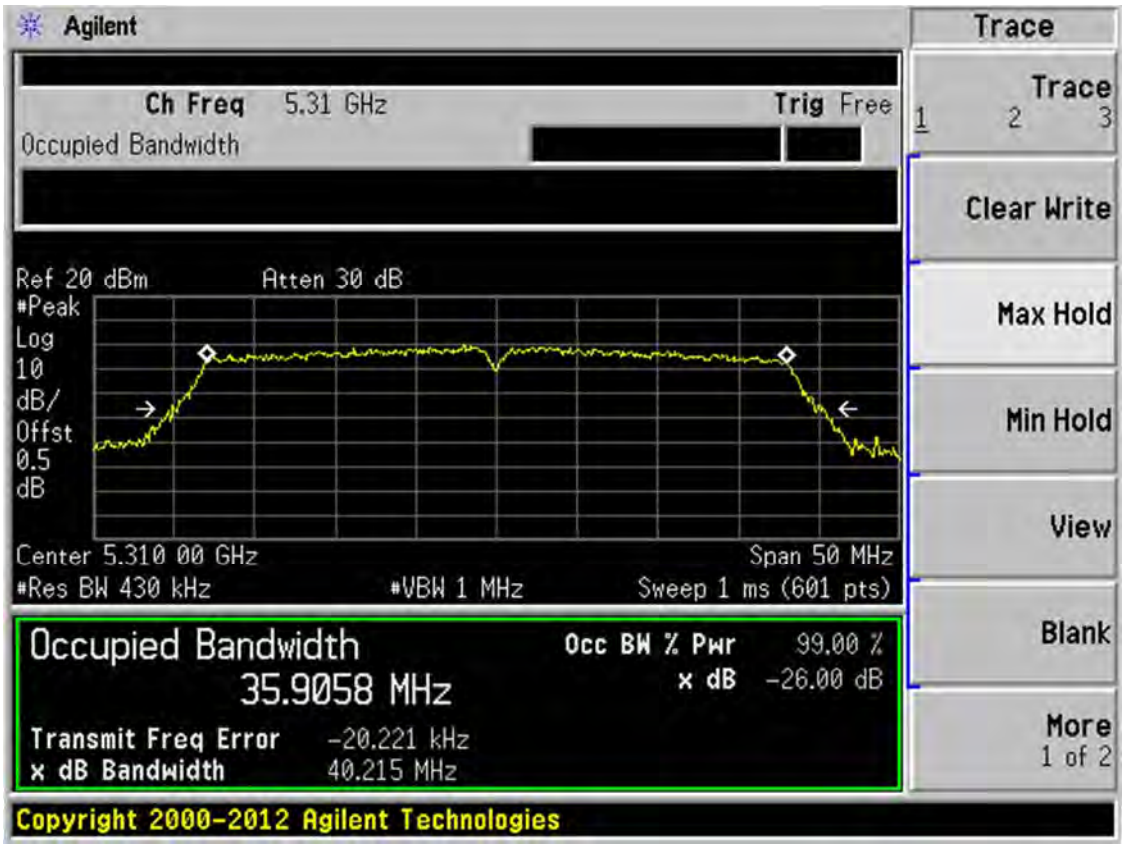
Band II 11n(HT20) CH64



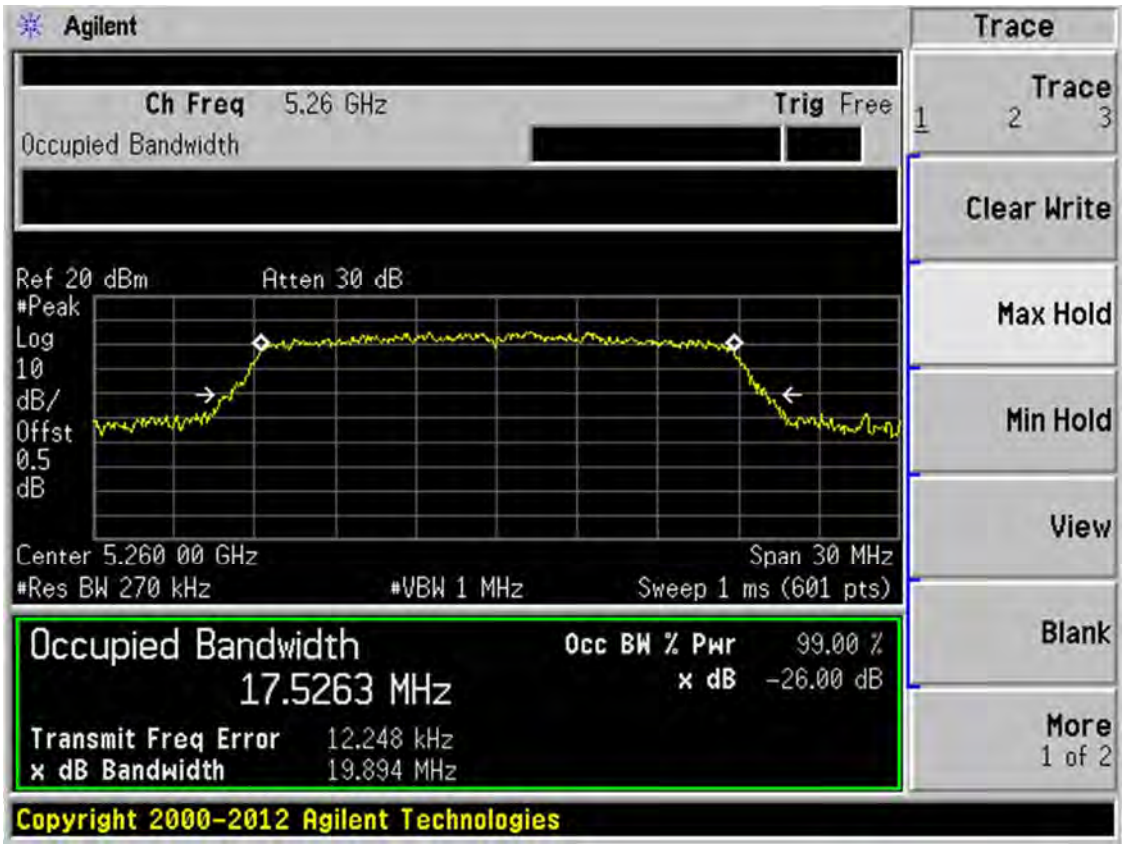
Band II 11n(HT40) CH54



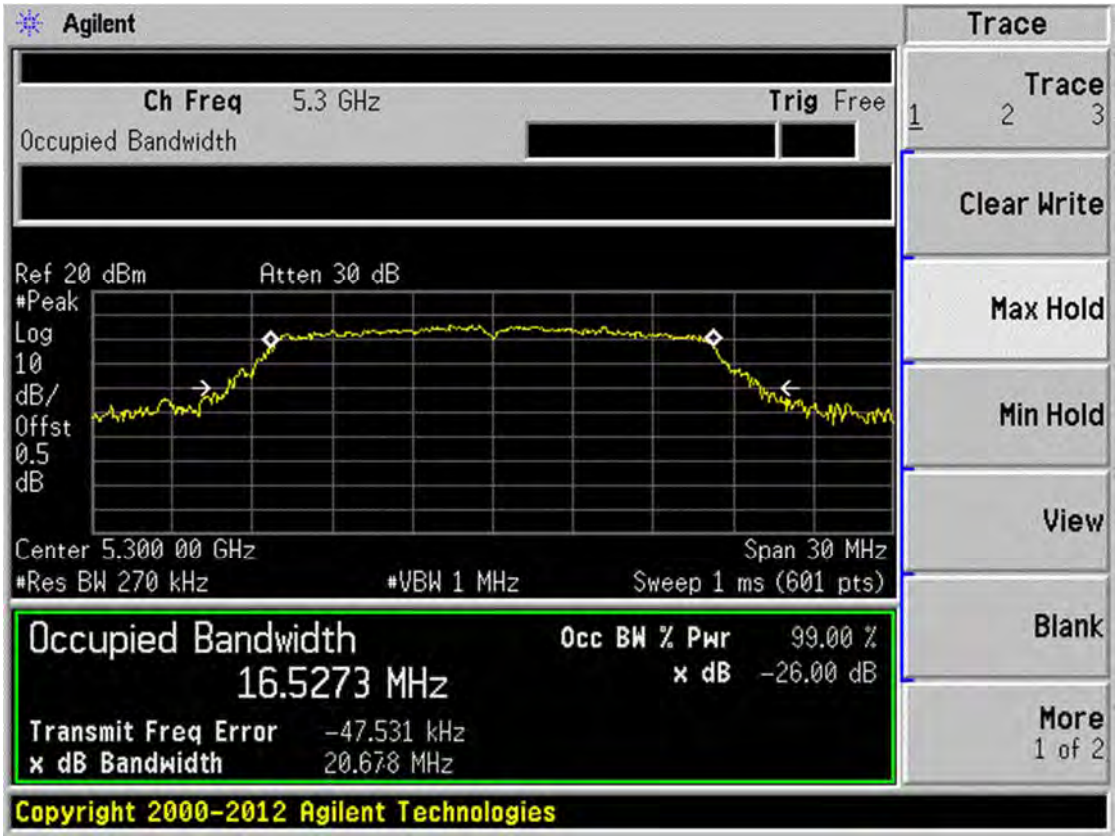
Band II 11n(HT40) CH62



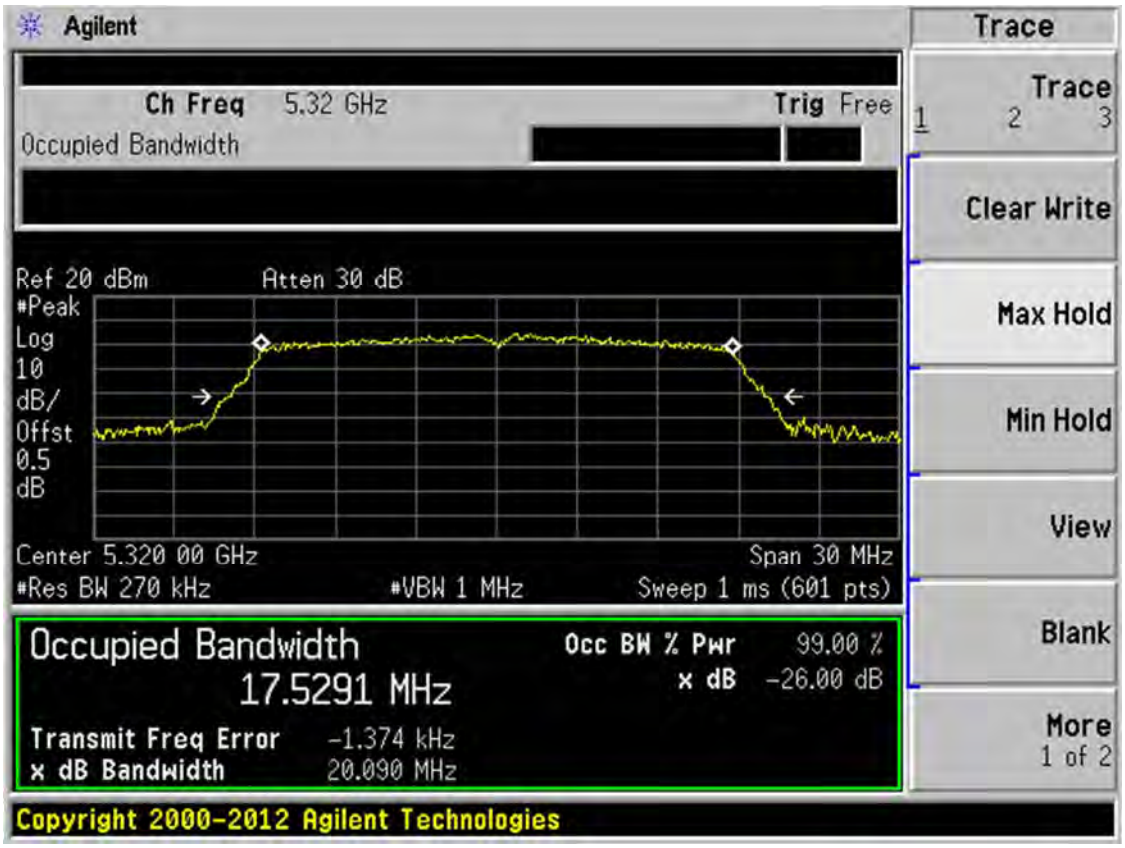
Band II 11ac(HT20) CH52



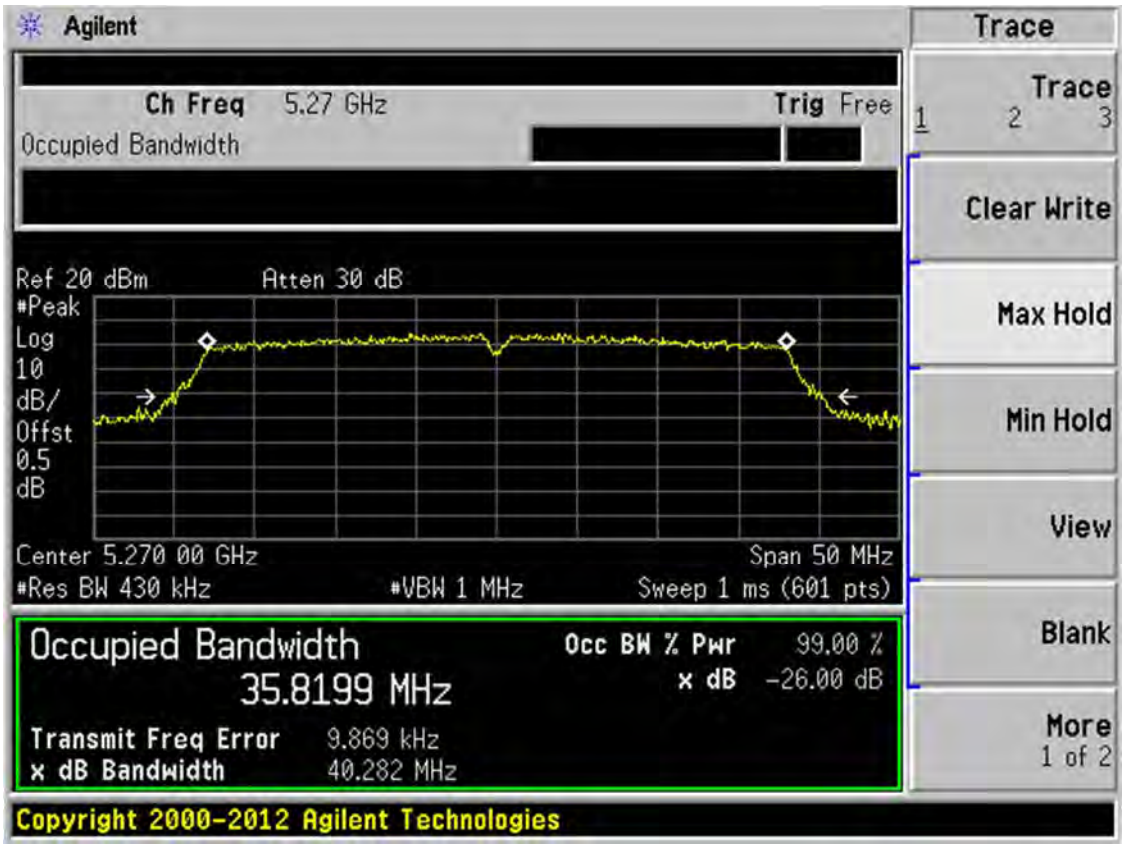
Band II 11ac(HT20) CH60



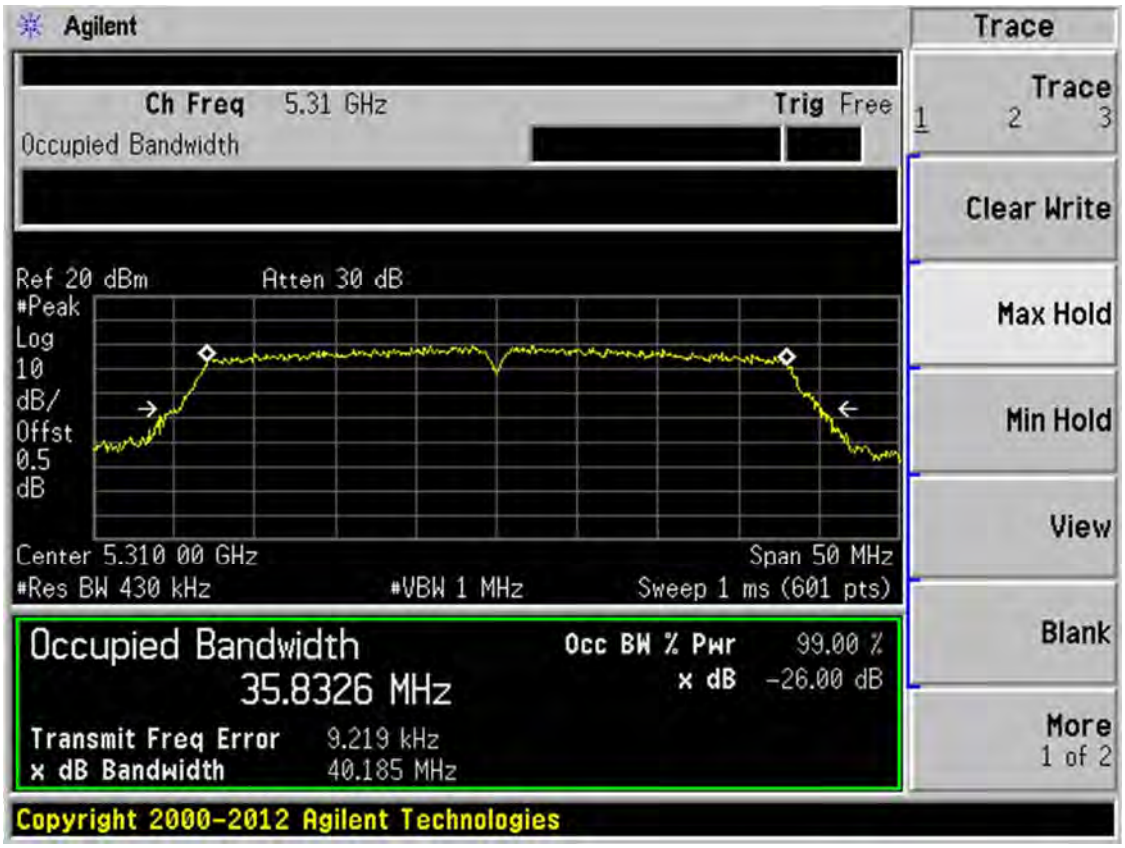
Band II 11ac(HT20) CH64



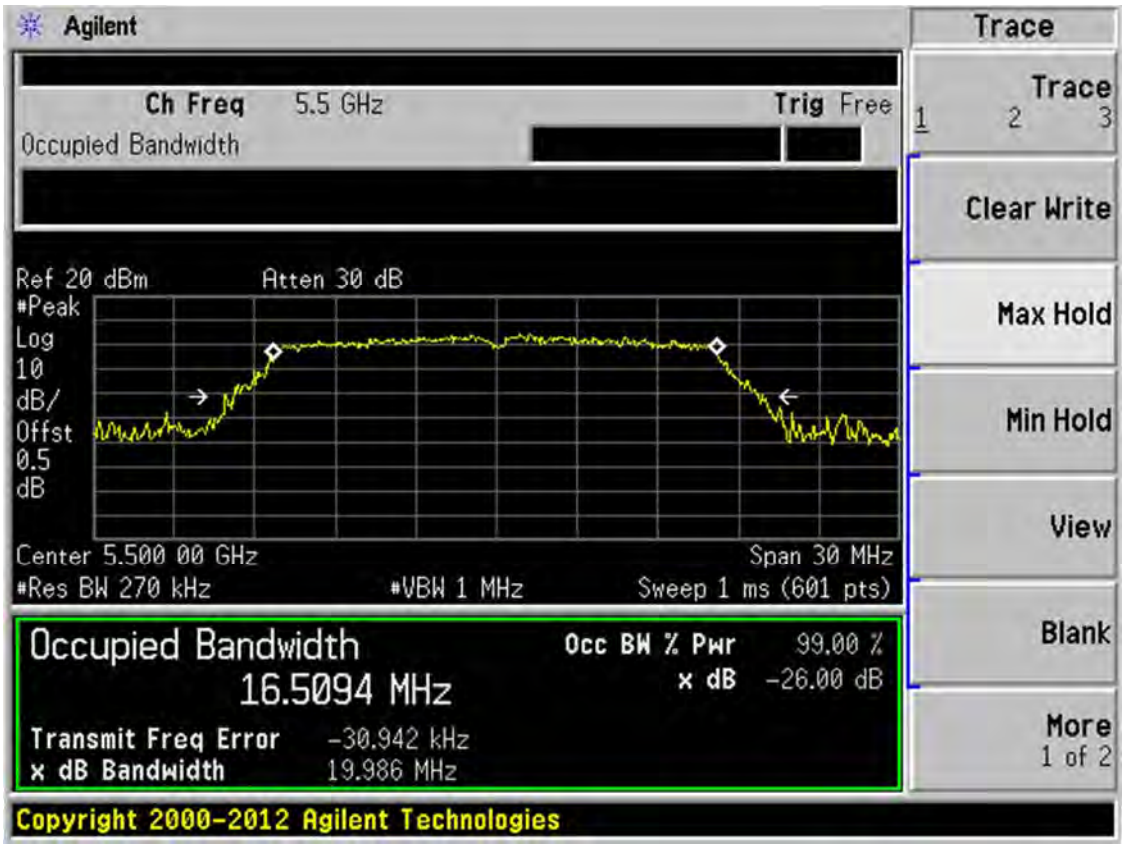
Band II 11ac(HT40) CH54



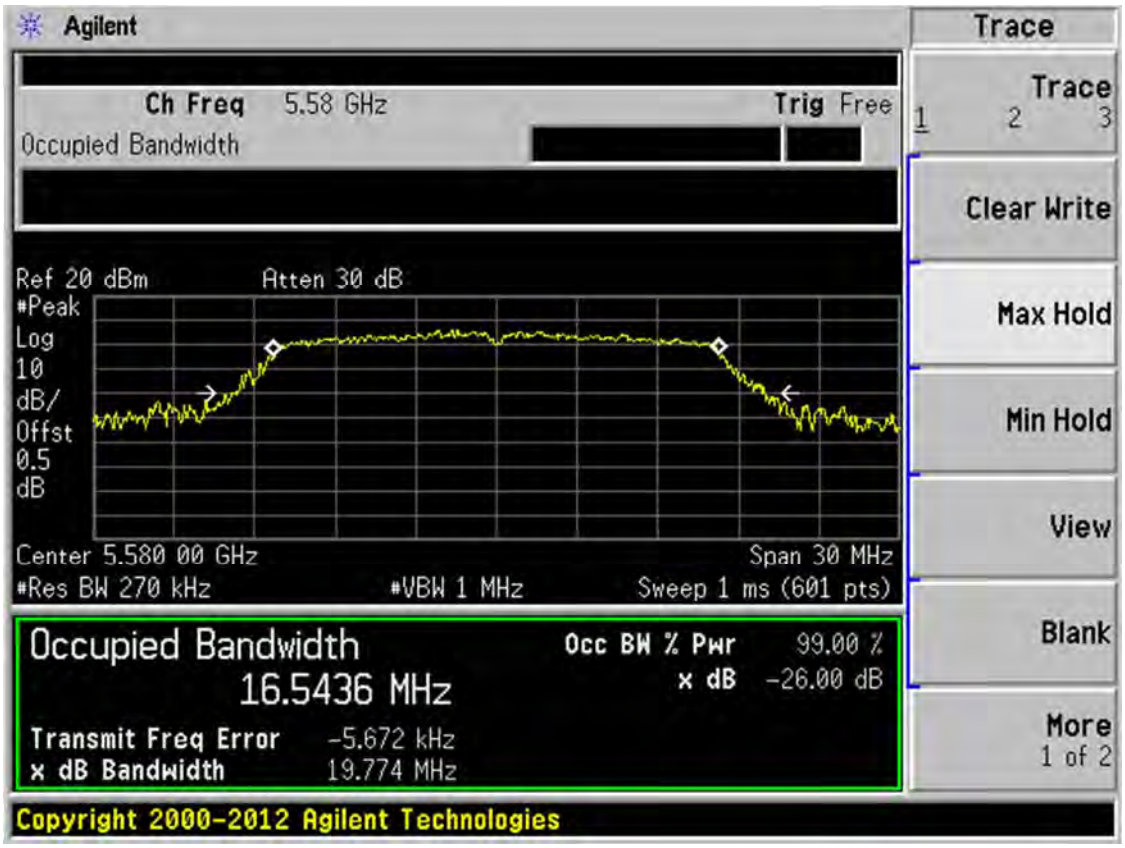
Band II 11ac(HT40) CH62



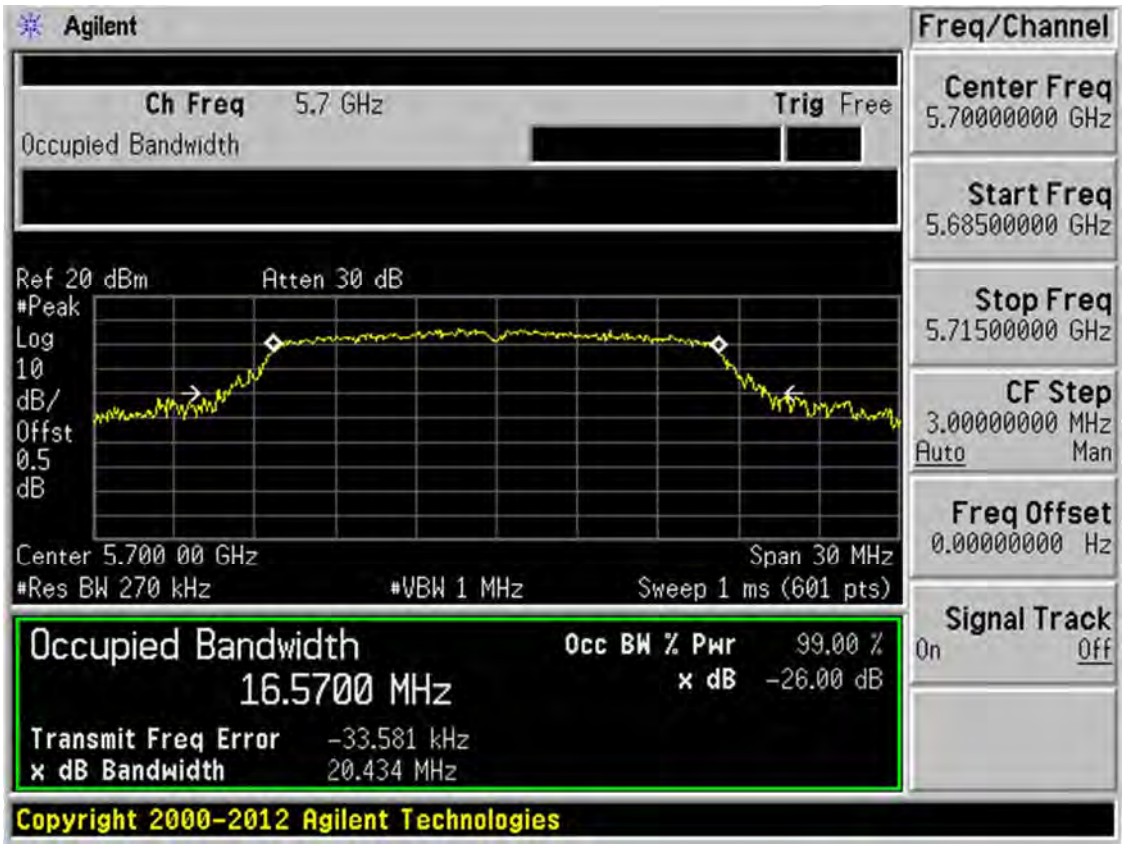
Band III 11a CH100



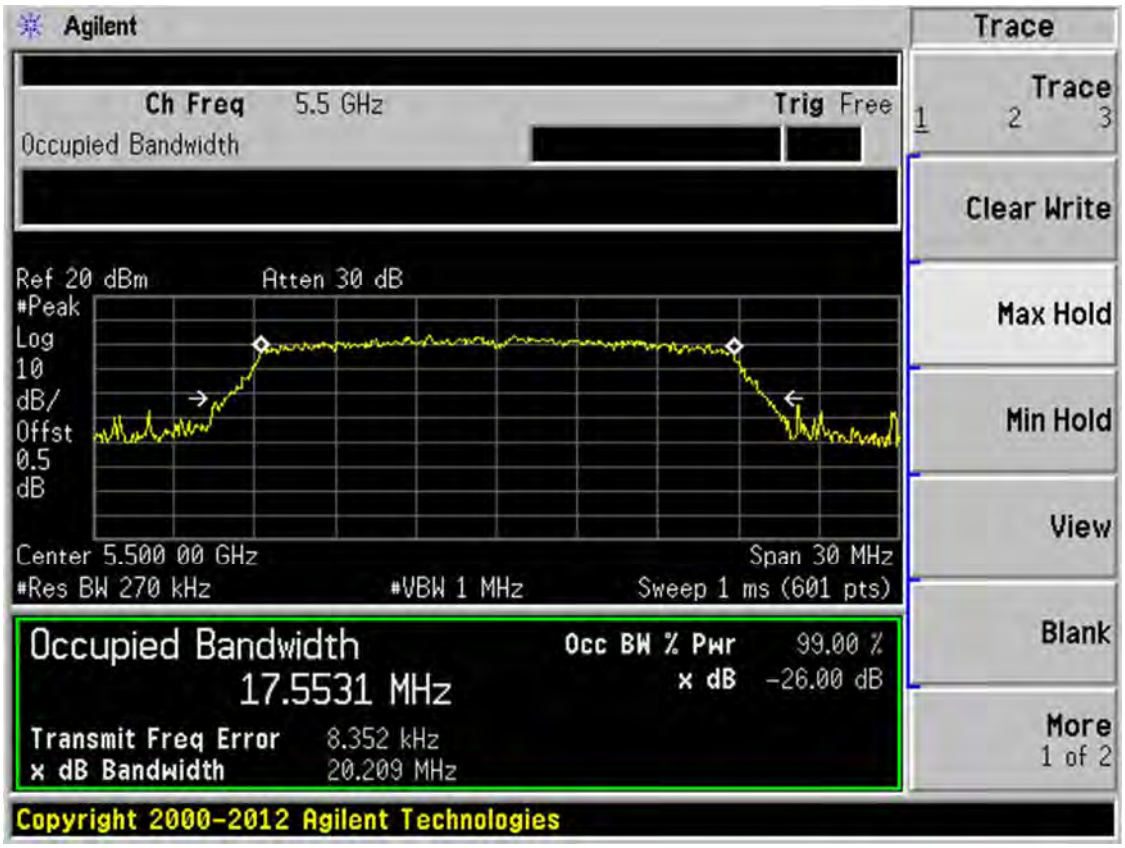
Band III 11a CH116



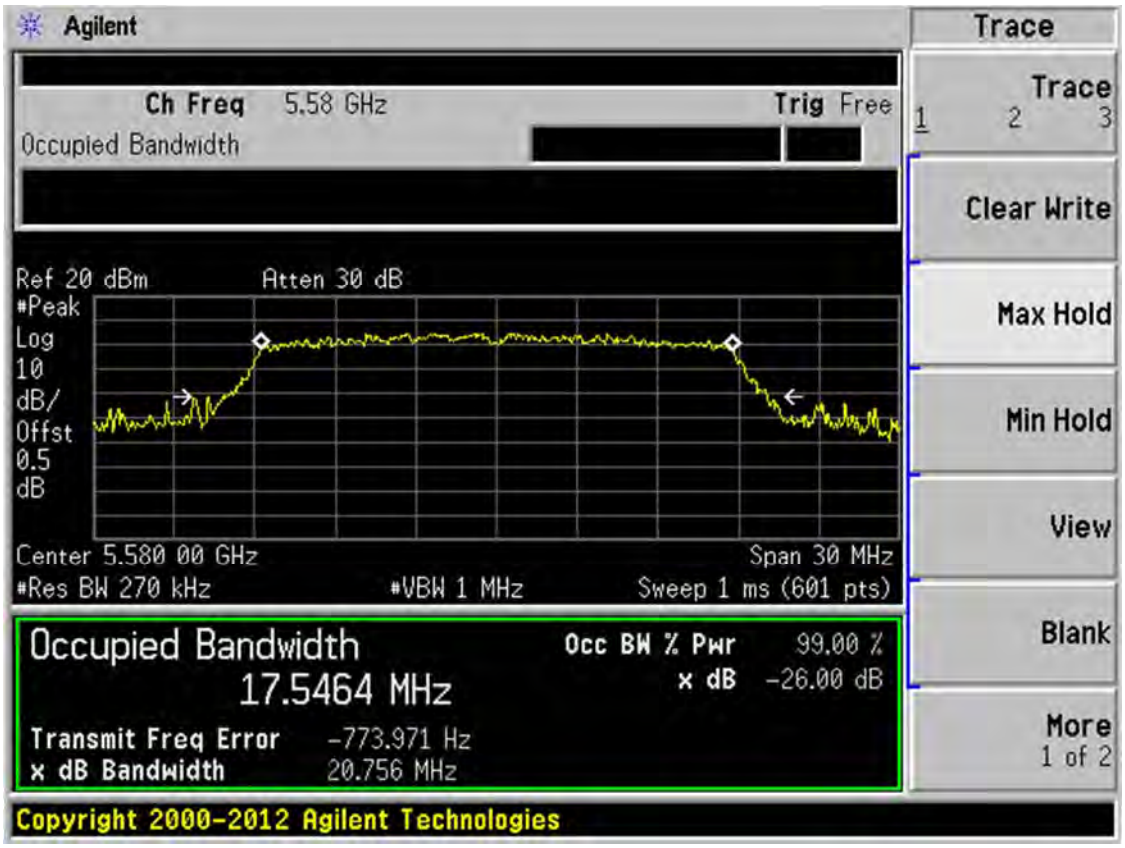
Band III 11a CH140



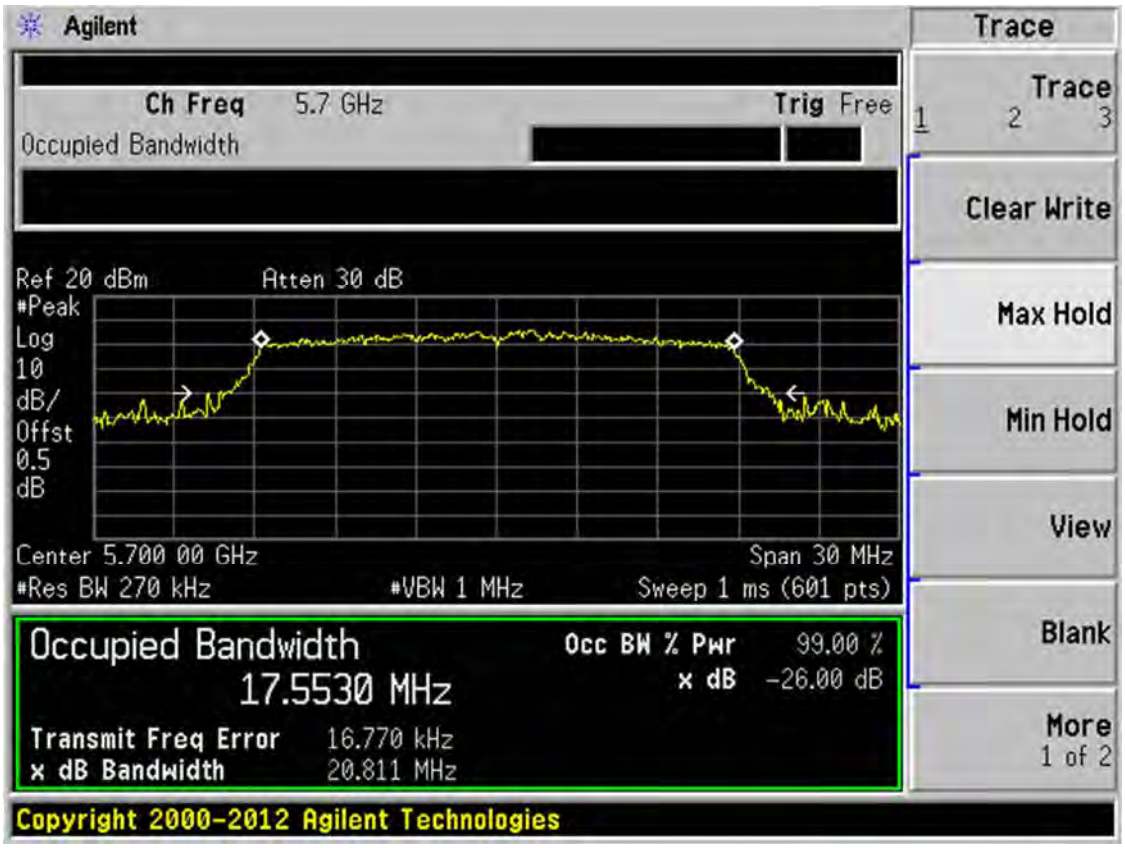
Band III 11n(HT20) CH100



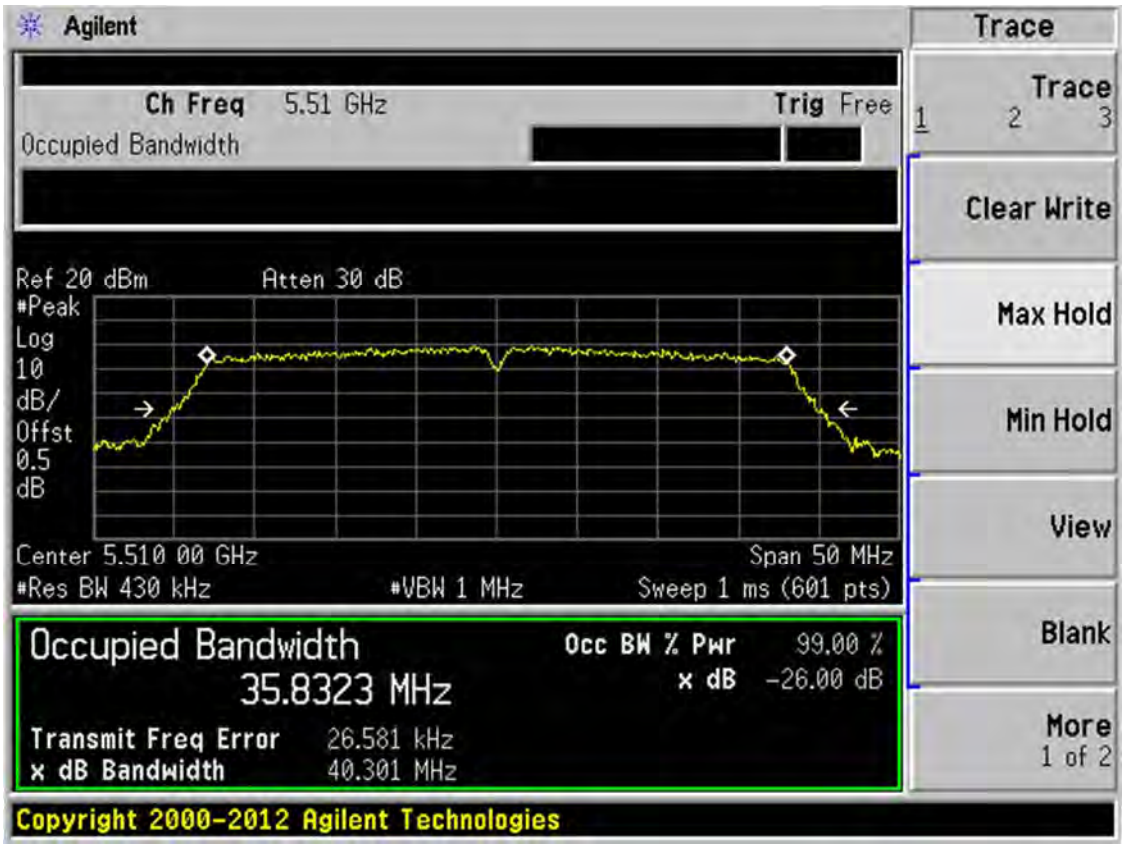
Band III 11n(HT20) CH116



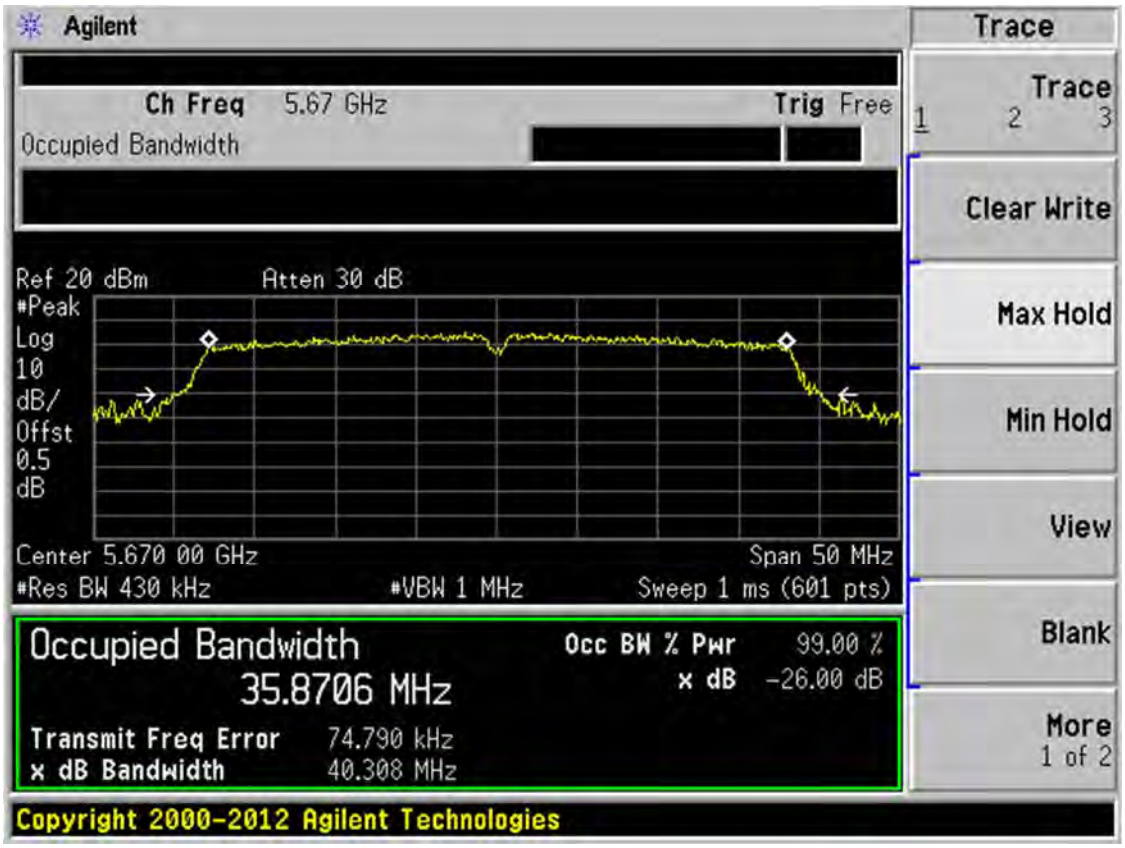
Band III 11n(HT20) CH140



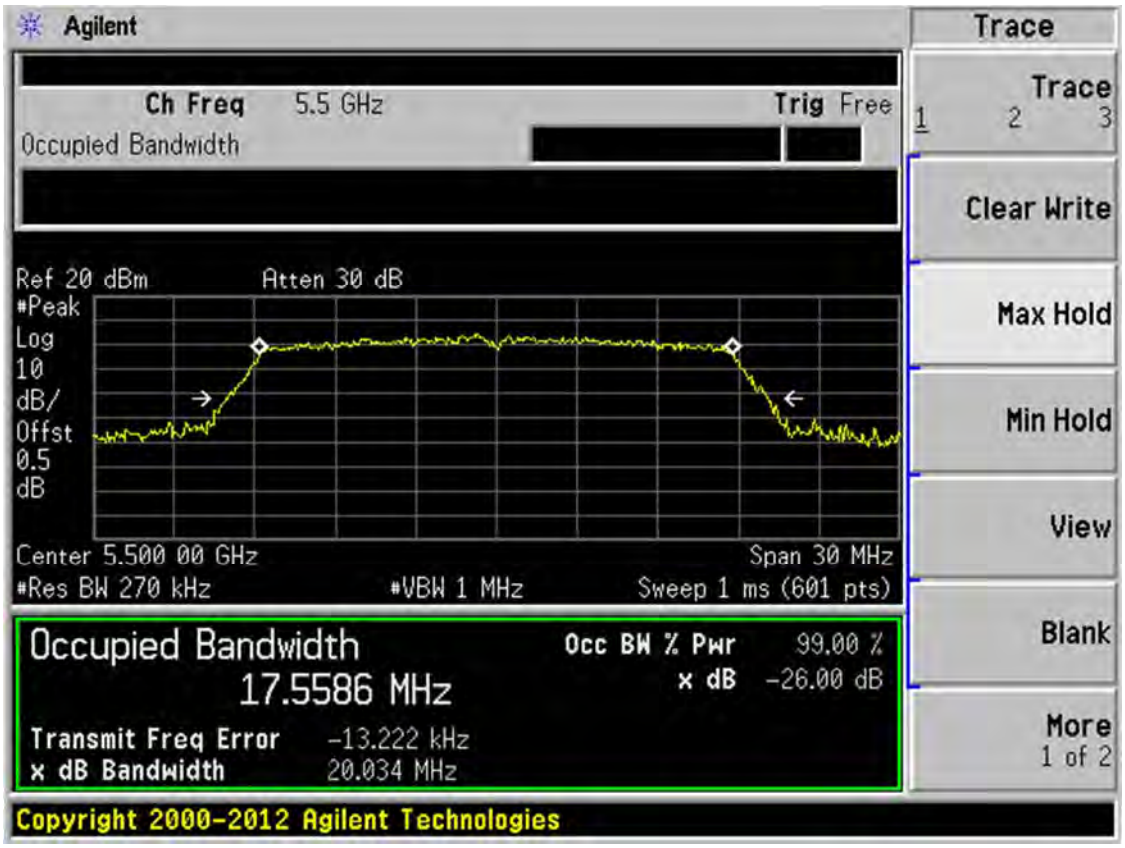
Band III 11n(HT40) CH102



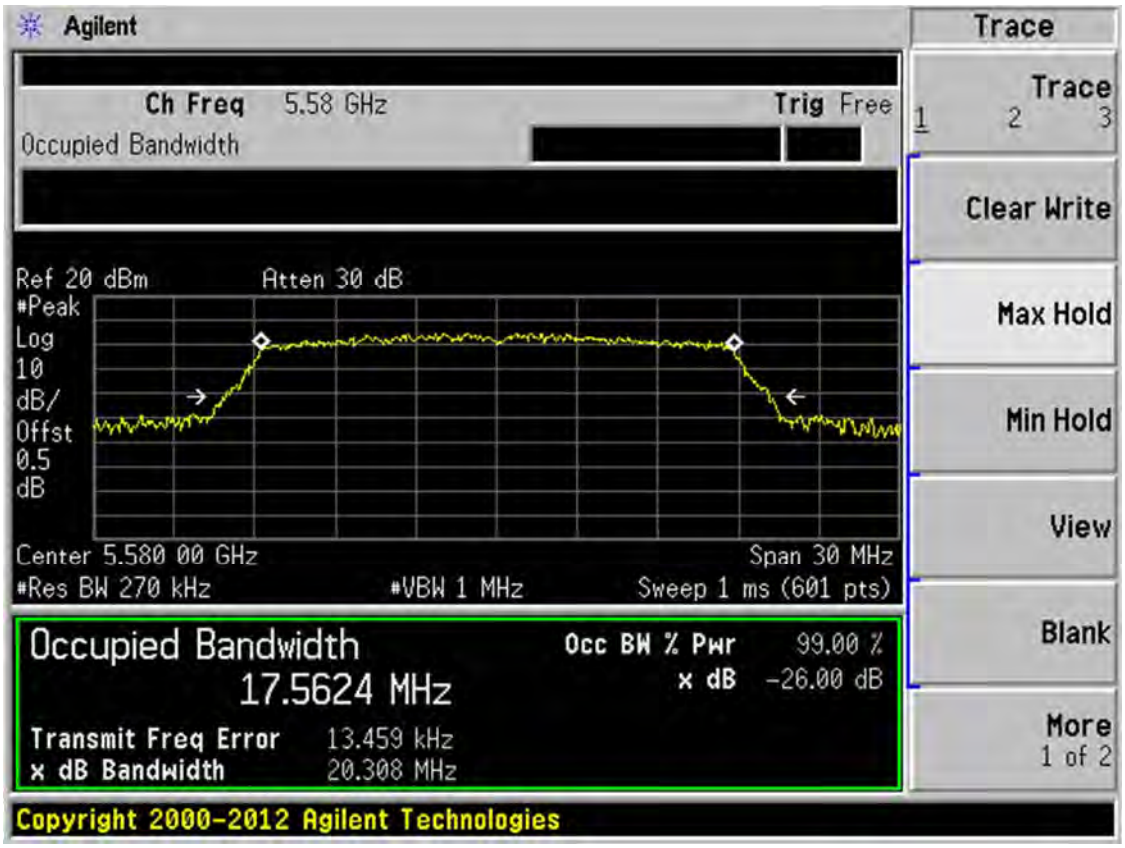
Band III 11n(HT40) CH134



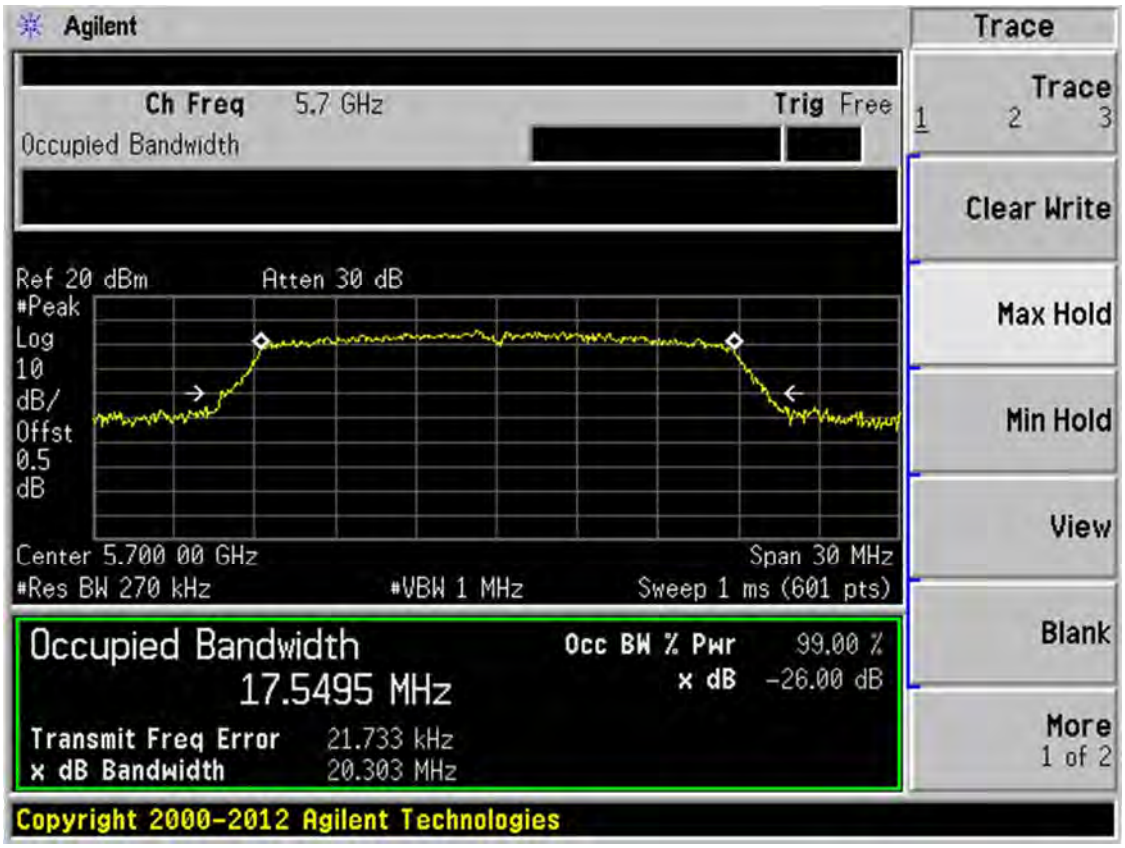
Band III 11ac(HT20) CH100



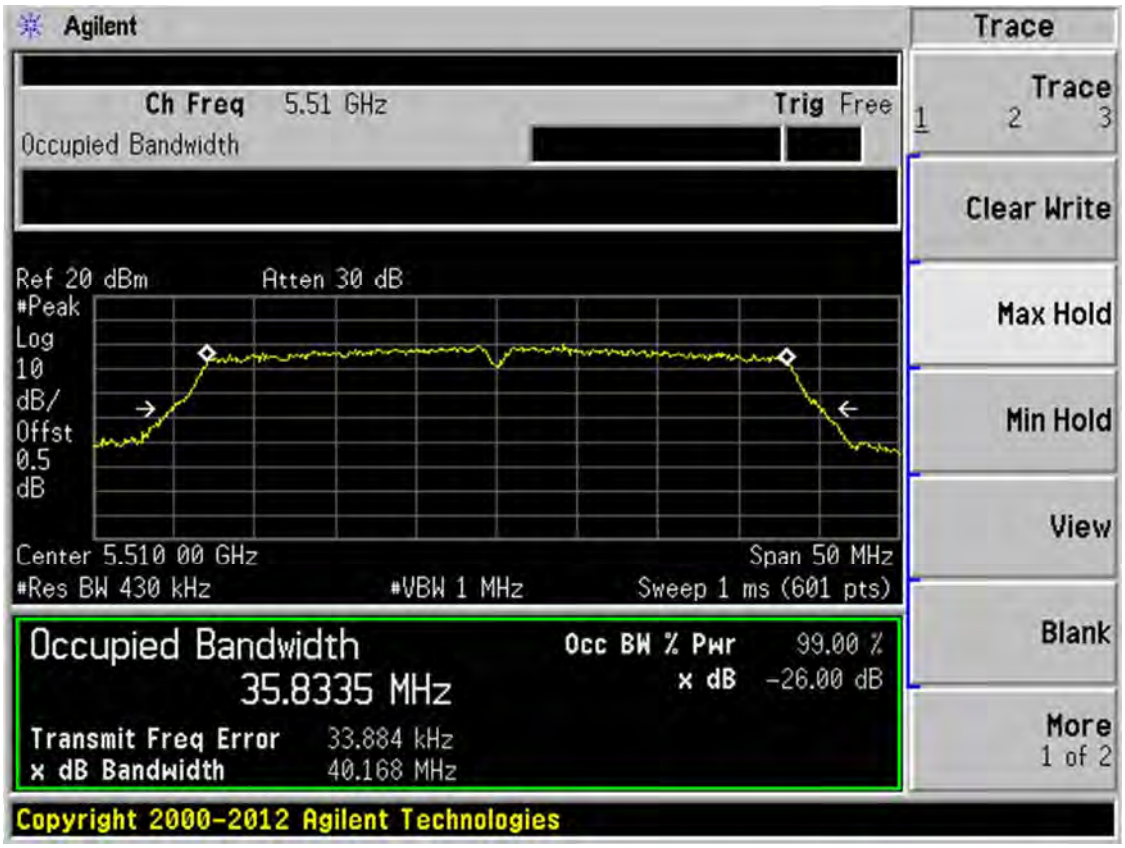
Band III 11ac(HT20) CH116



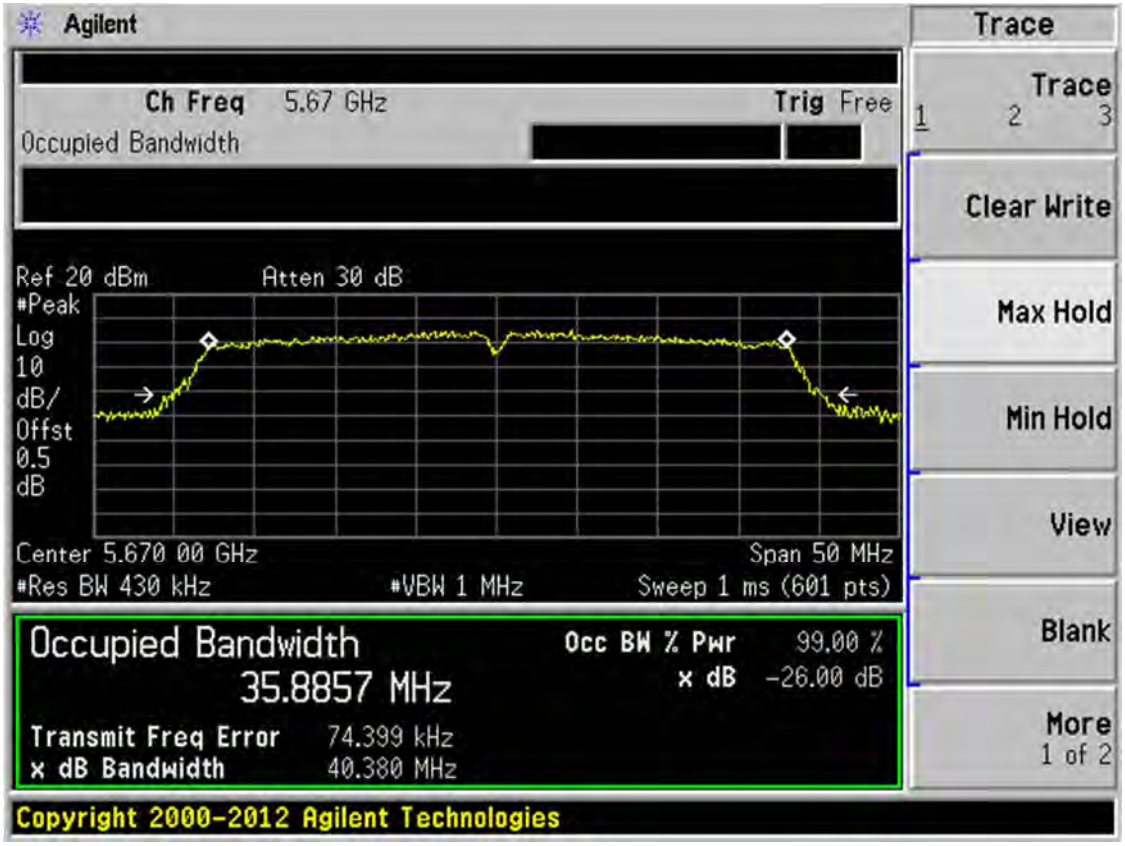
Band III 11ac(HT20) CH140



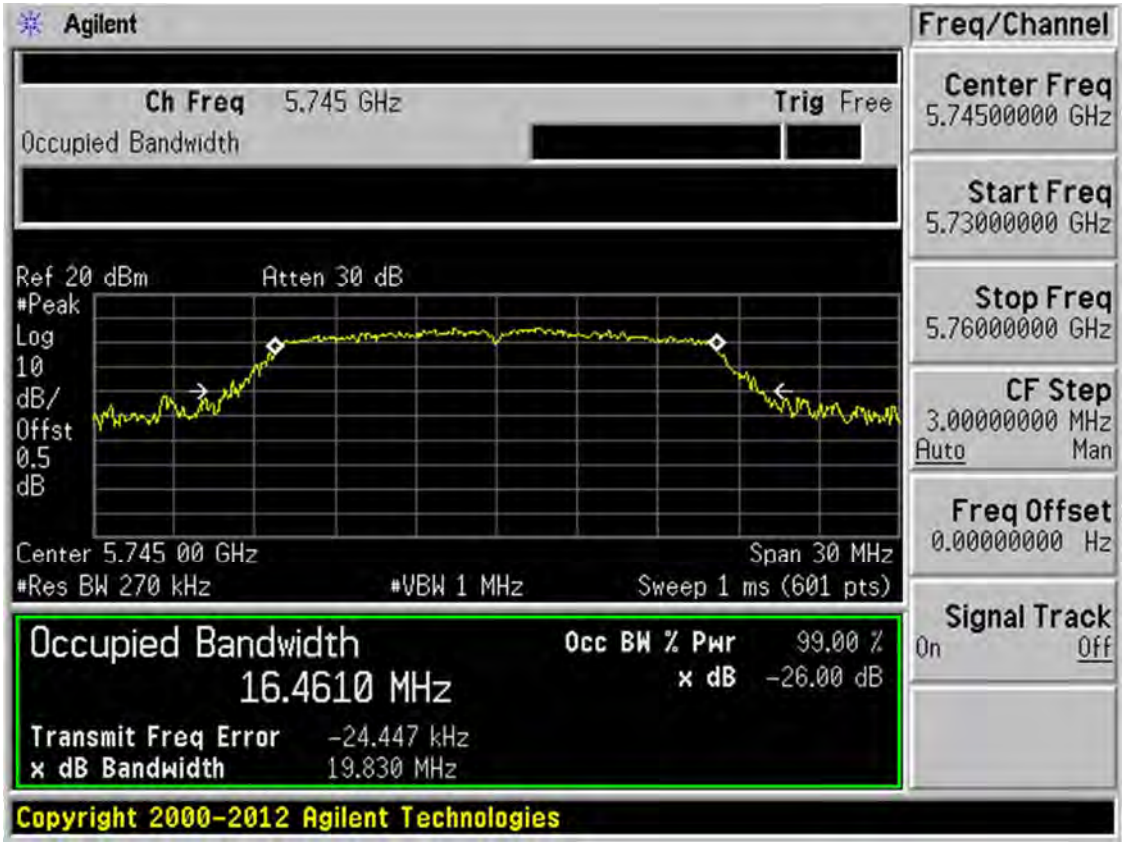
Band III 11ac(HT40) CH102



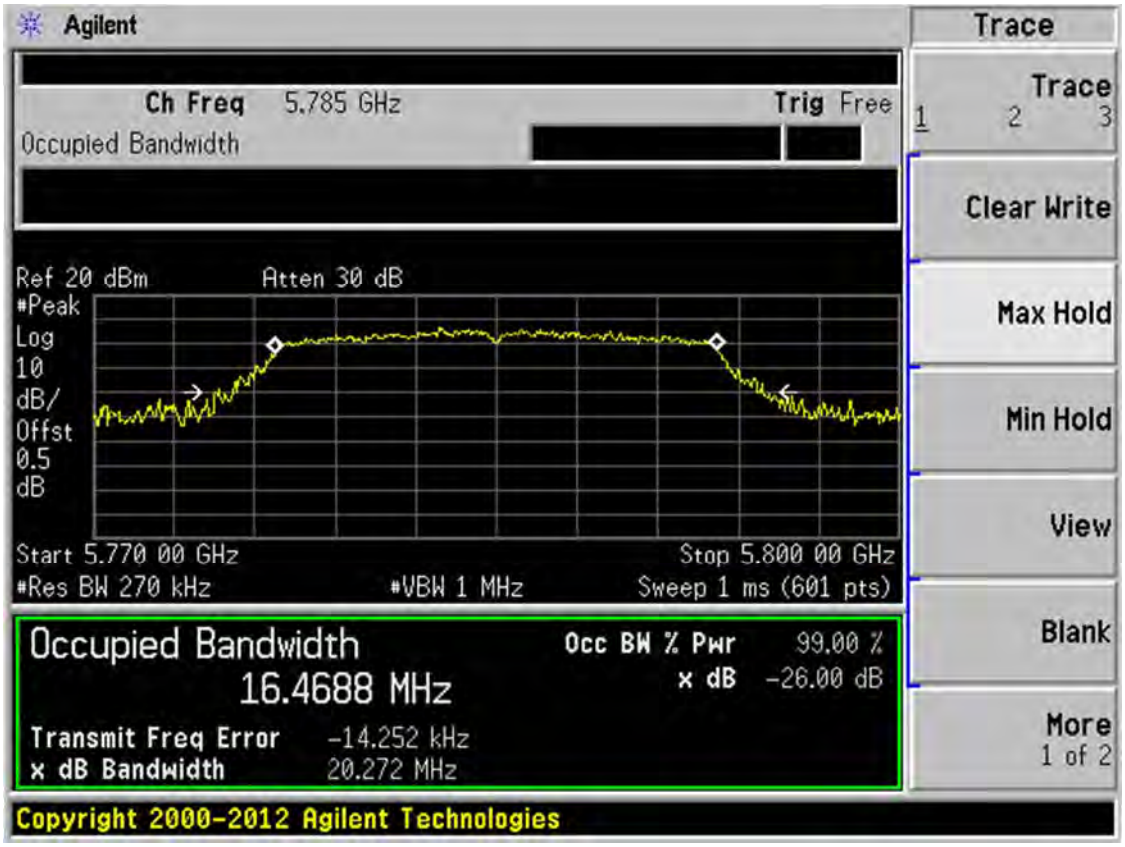
Band III 11ac(HT40) CH134



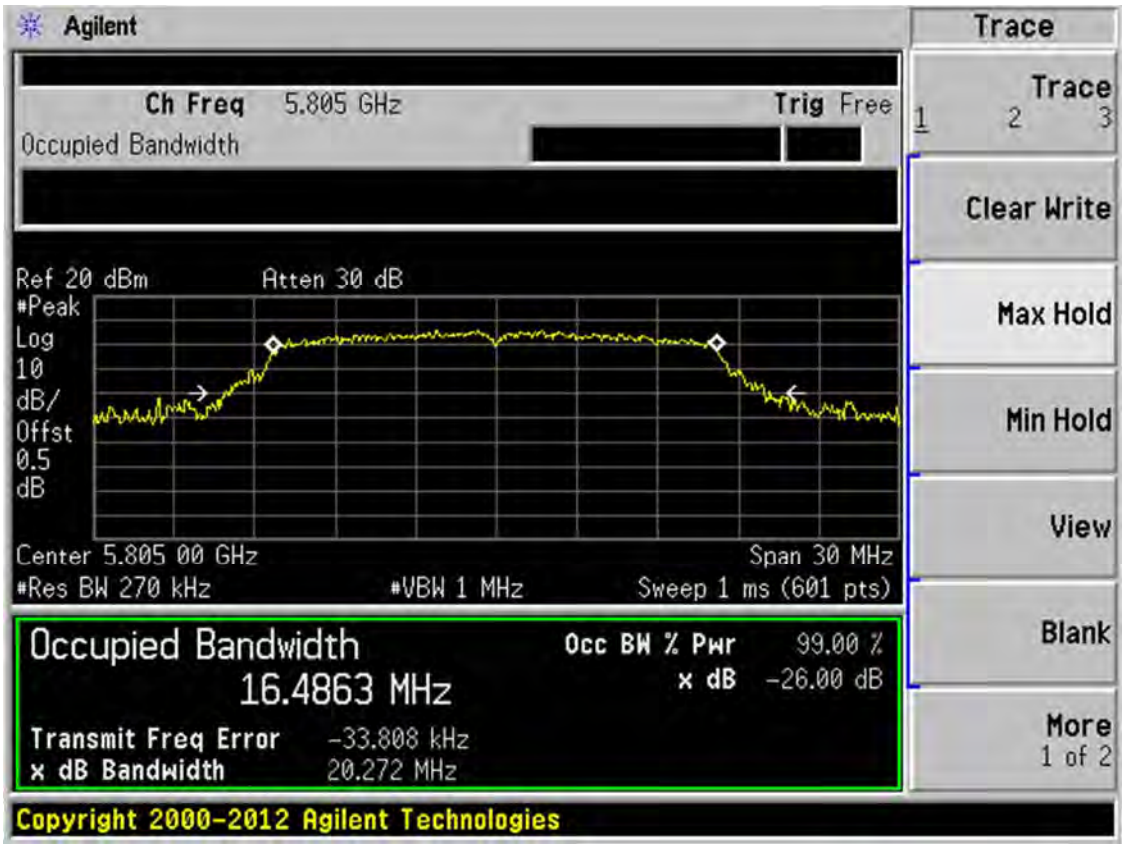
Band IV 11a CH149



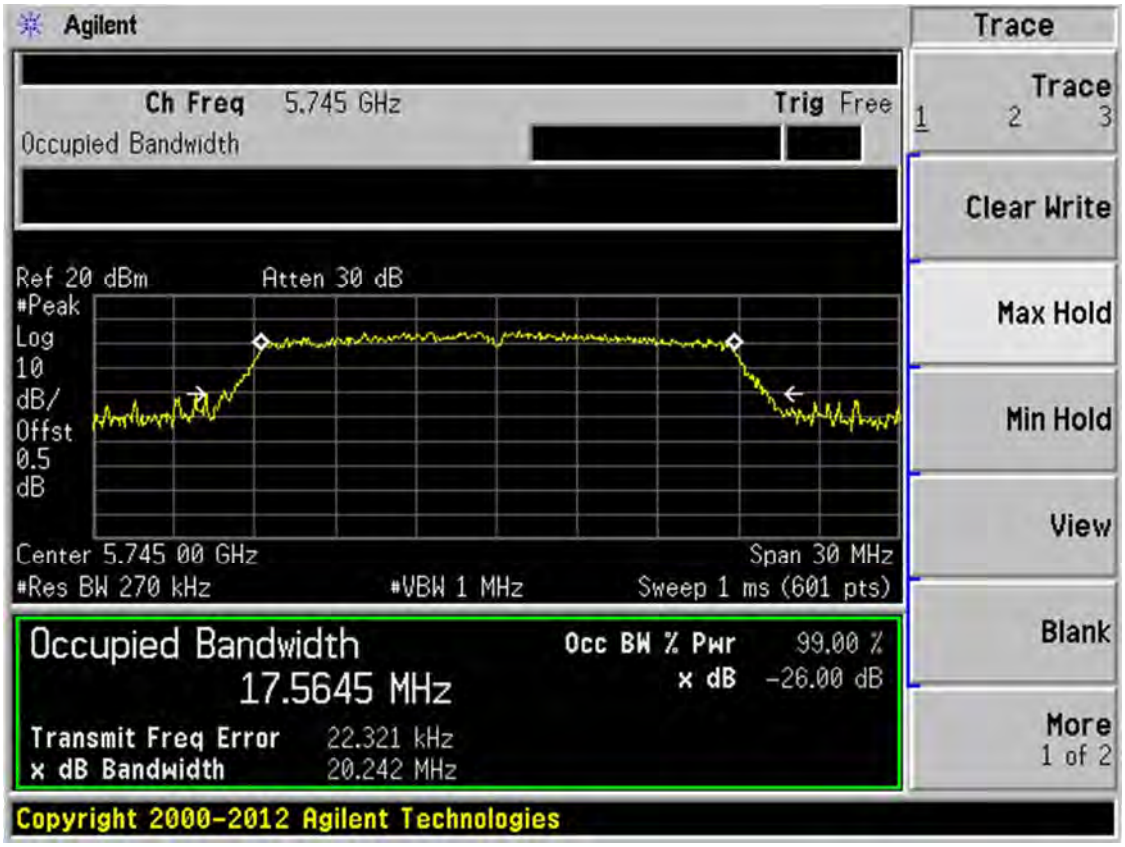
Band IV 11a CH157



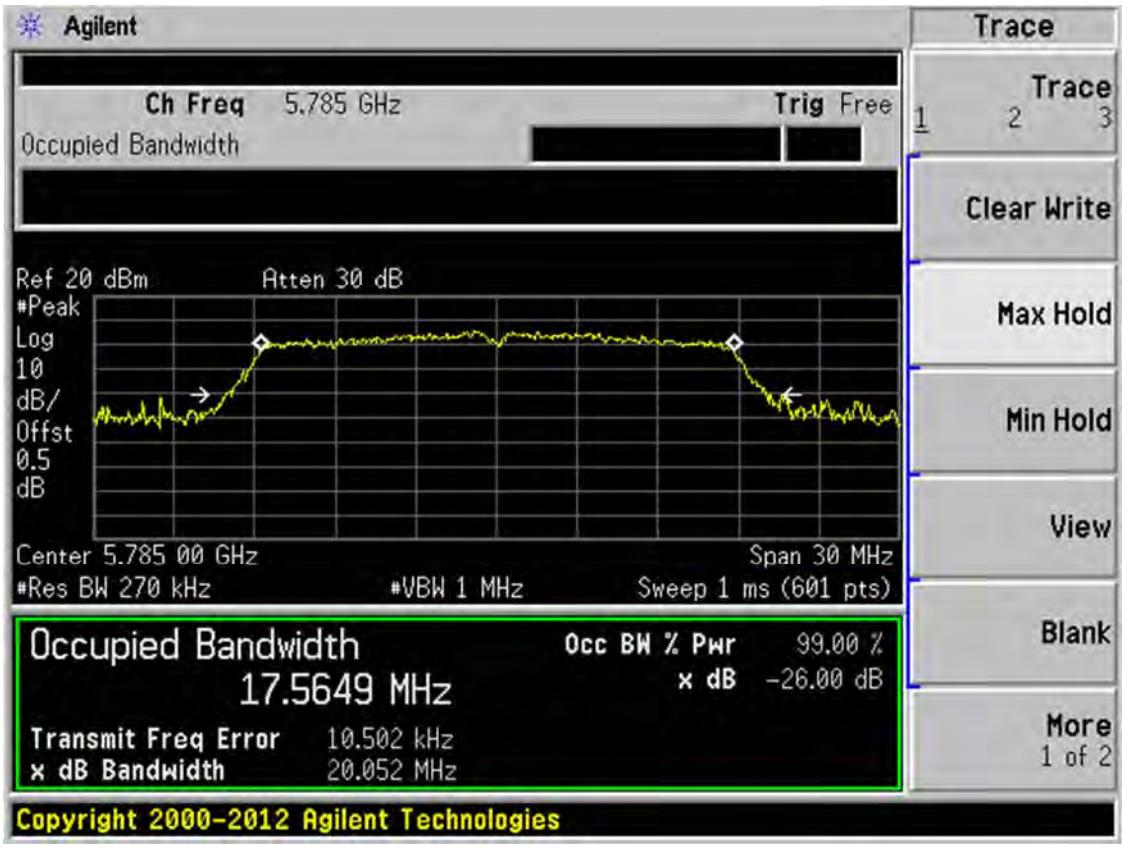
Band IV 11a CH161



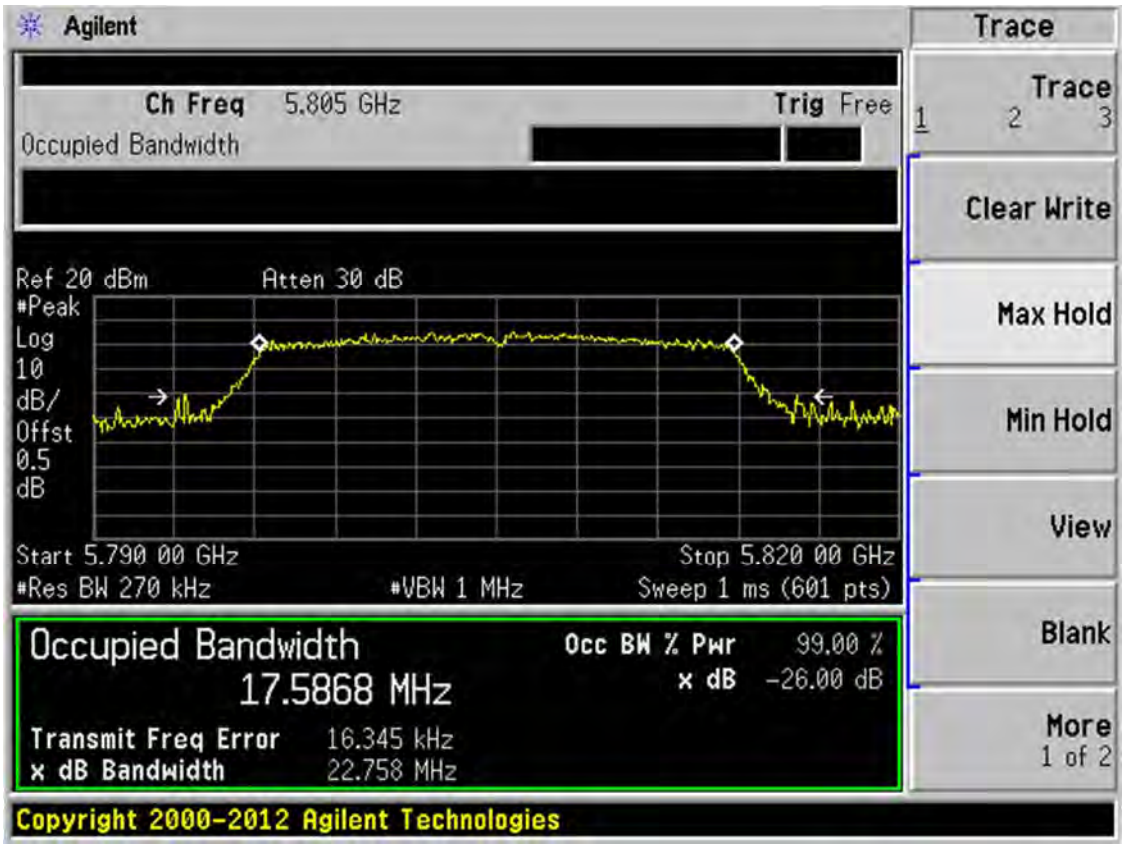
Band IV 11n(HT20) CH149



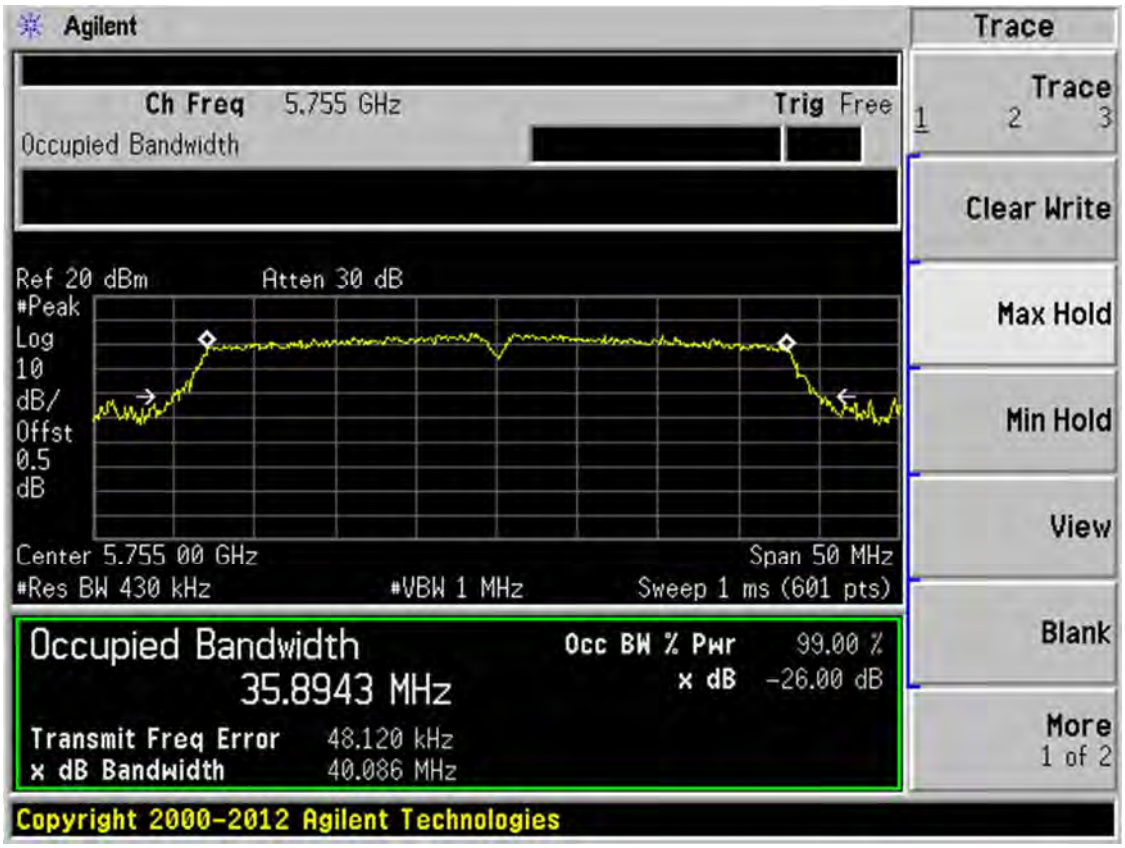
Band IV 11n(HT20) CH157



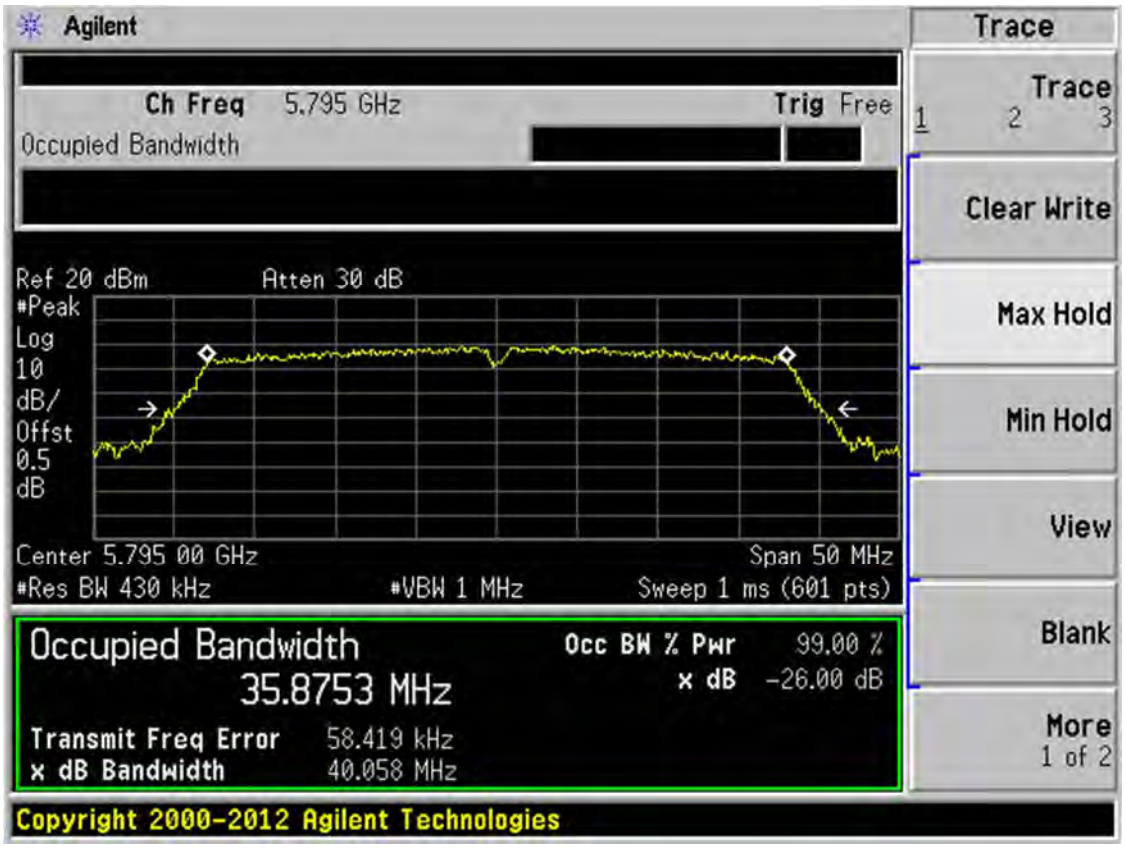
Band IV 11n(HT20) CH161



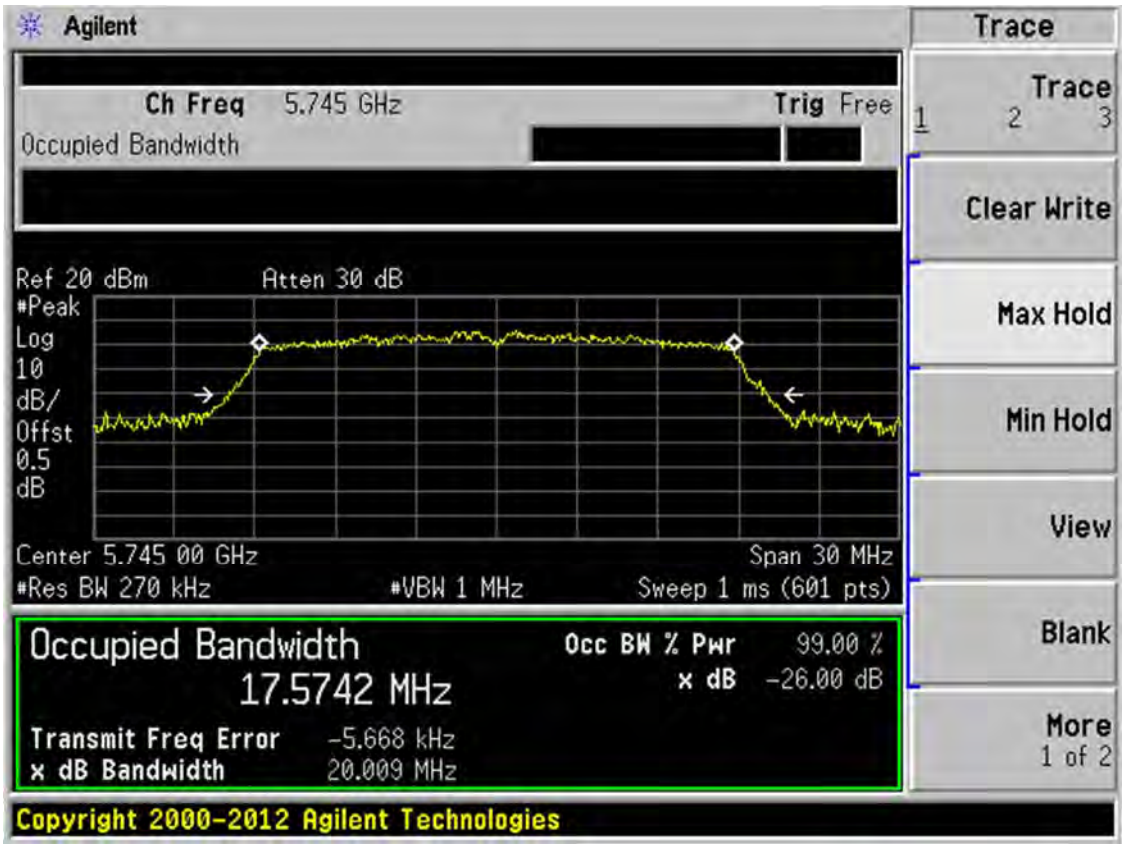
Band IV 11n(HT40) CH151



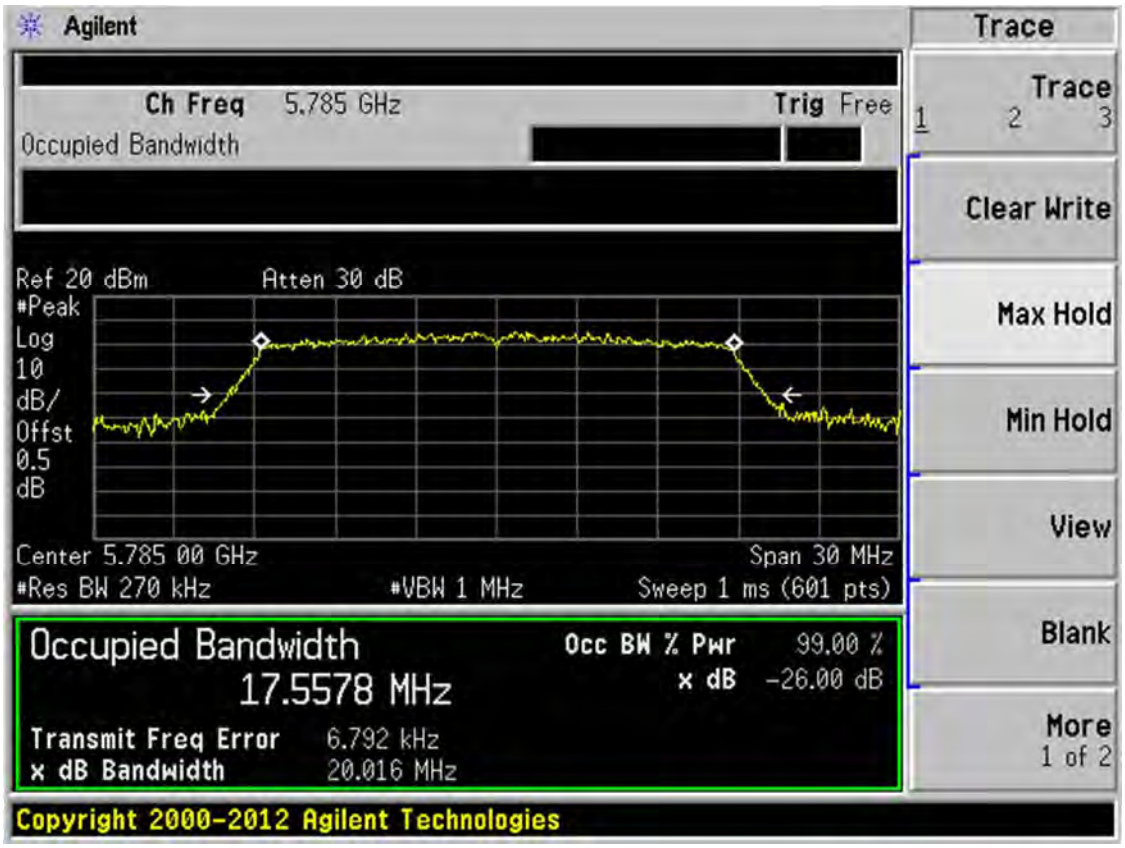
Band IV 11n(HT40) CH159



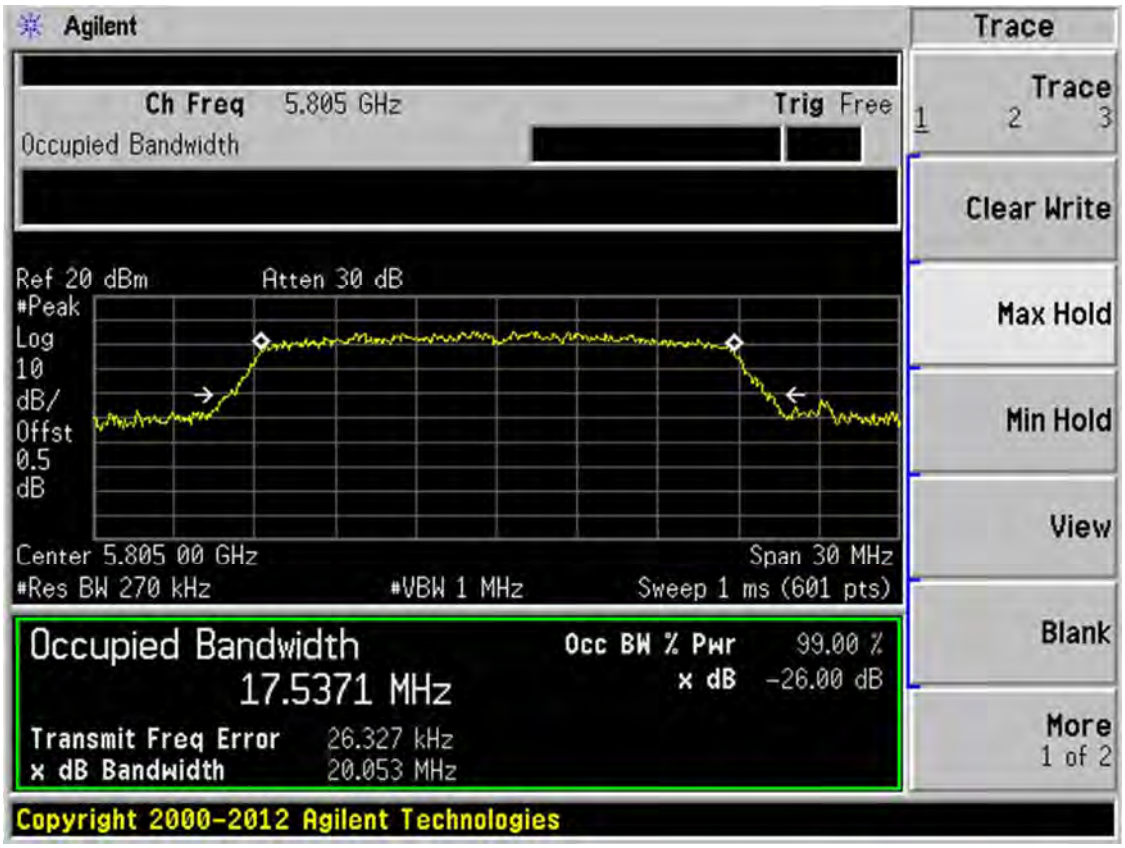
Band IV 11ac(HT20) CH149



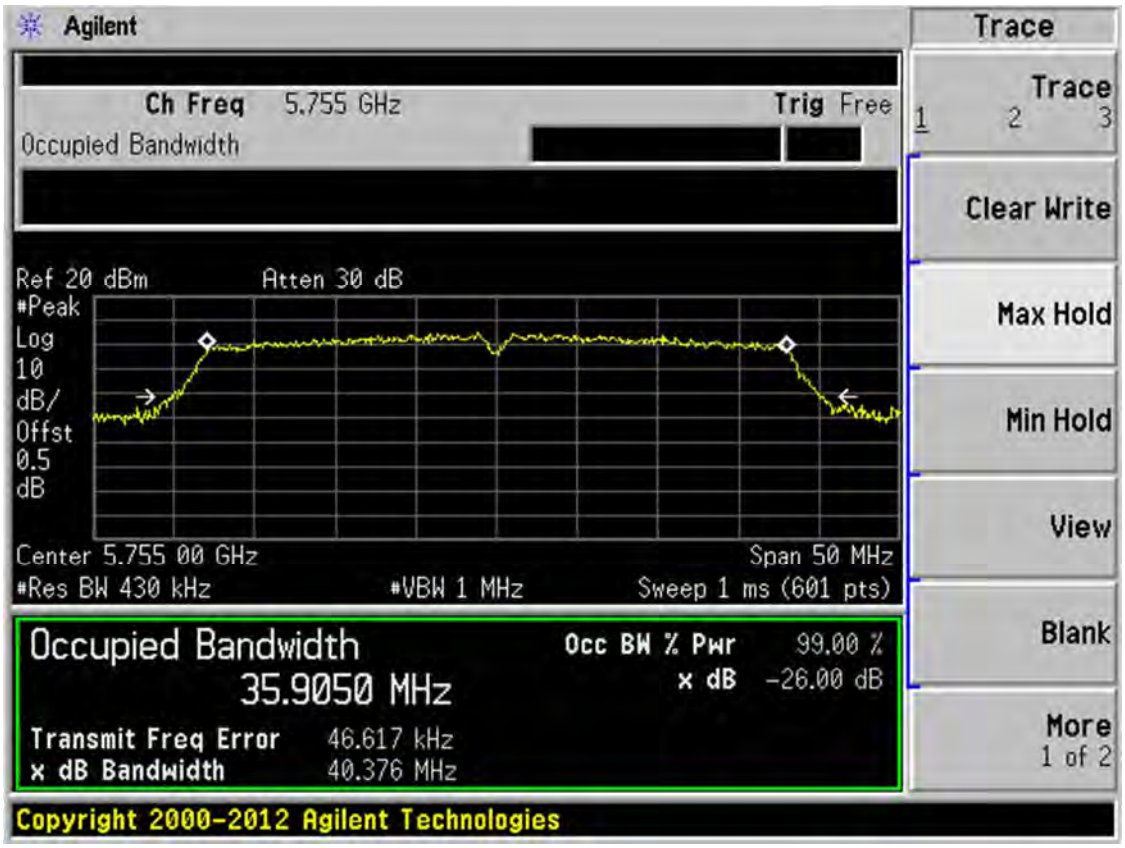
Band IV 11ac(HT20) CH157



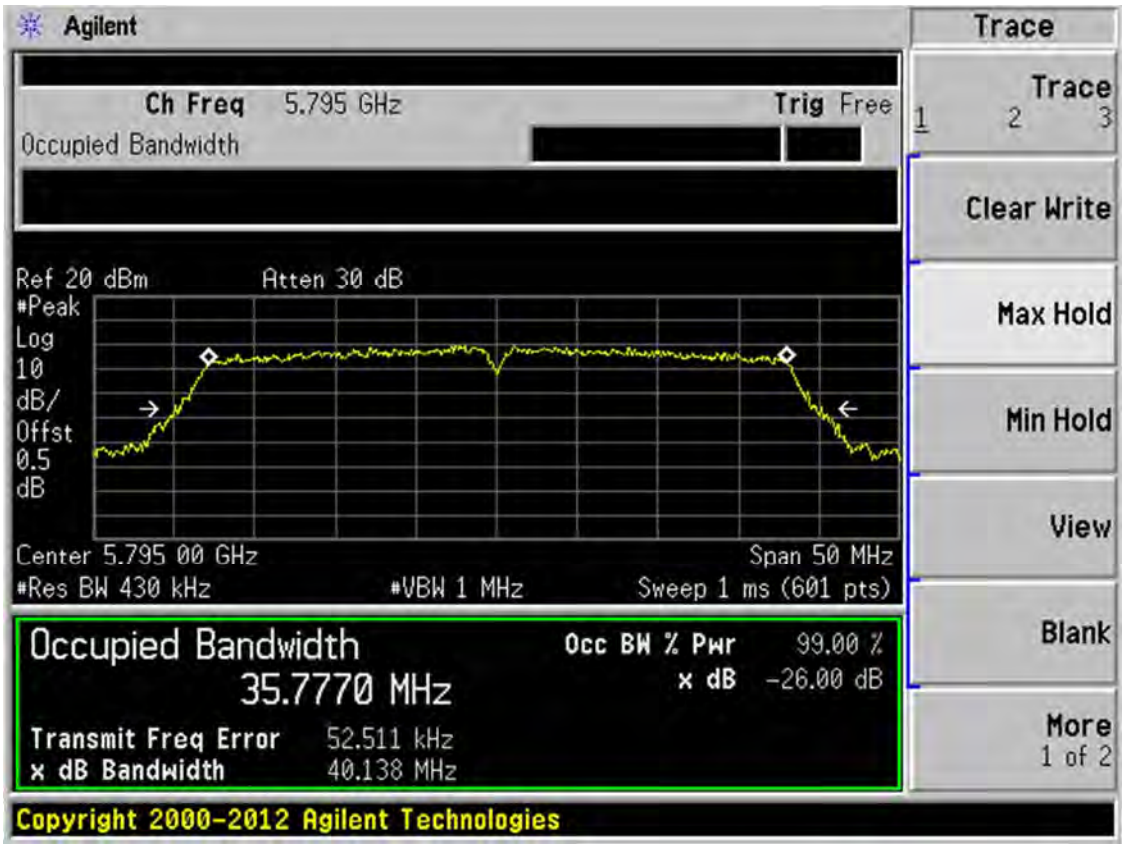
Band IV 11ac(HT20) CH161



Band IV 11ac(HT40) CH151



Band IV 11ac(HT40) CH159



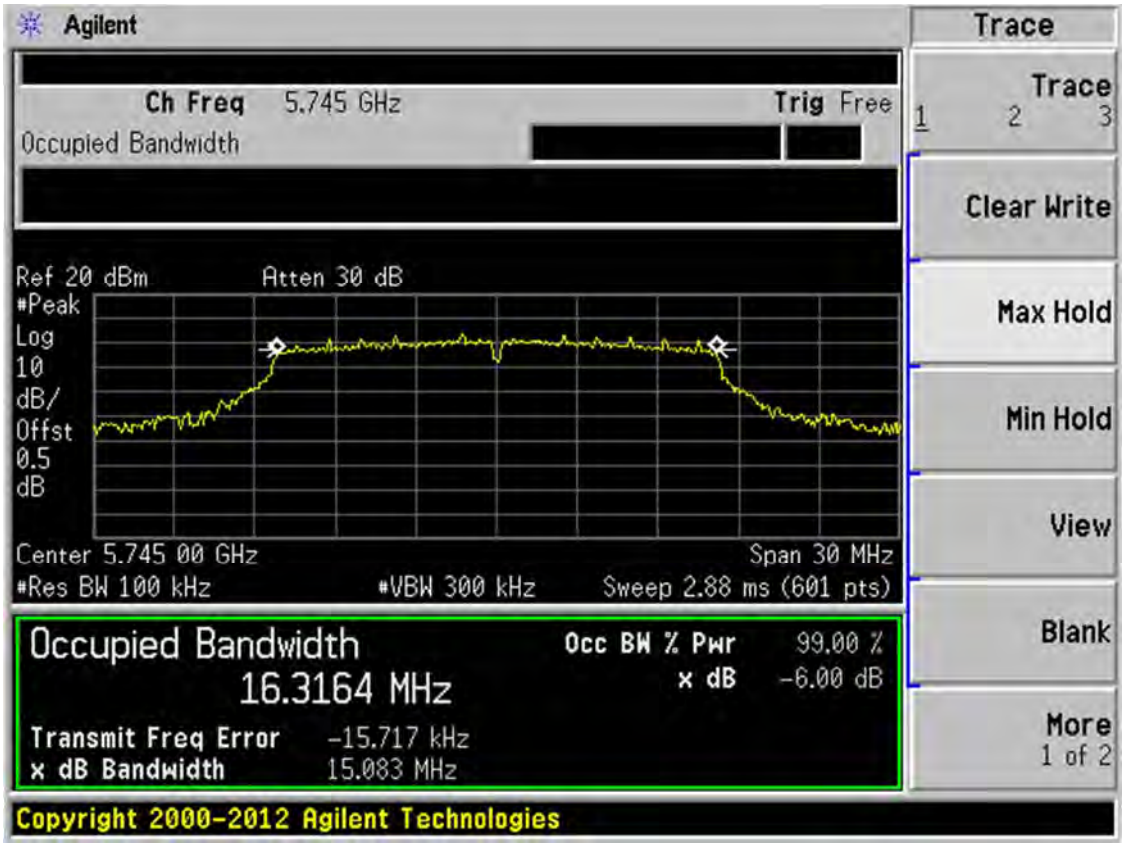
A.3 6 dB Bandwidth

Test Data

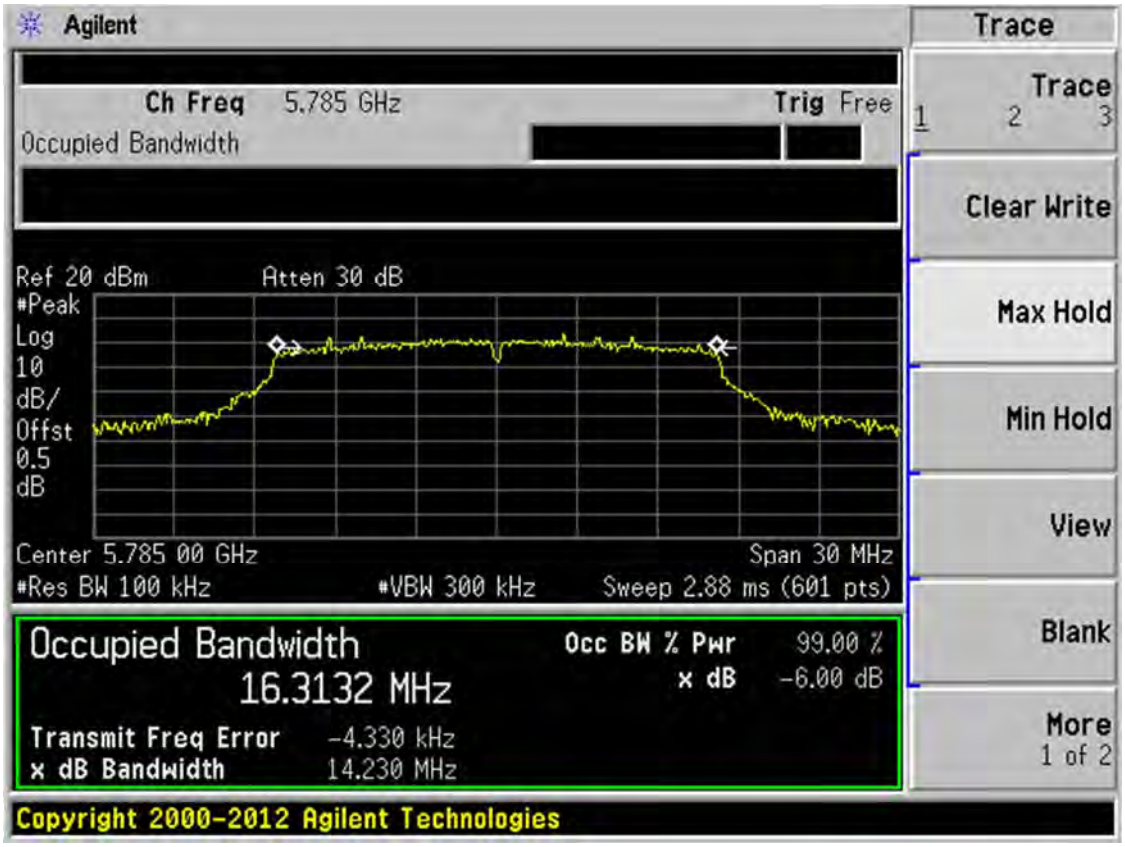
Band IV (5725 - 5850 MHz)					
Mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Verdict
11a	CH149	5745	15.083	0.5	Pass
11a	CH157	5785	14.230	0.5	Pass
11a	CH161	5825	15.164	0.5	Pass
11n (HT20)	CH149	5745	16.252	0.5	Pass
11n (HT20)	CH157	5785	15.108	0.5	Pass
11n (HT20)	CH161	5825	15.115	0.5	Pass
11n (HT40)	CH151	5755	35.123	0.5	Pass
11n (HT40)	CH159	5795	35.077	0.5	Pass
11ac (HT20)	CH149	5745	13.871	0.5	Pass
11ac (HT20)	CH157	5785	11.386	0.5	Pass
11ac (HT20)	CH161	5805	15.081	0.5	Pass
11ac (HT40)	CH151	5755	35.110	0.5	Pass
11ac (HT40)	CH159	5795	35.110	0.5	Pass

Test Plots

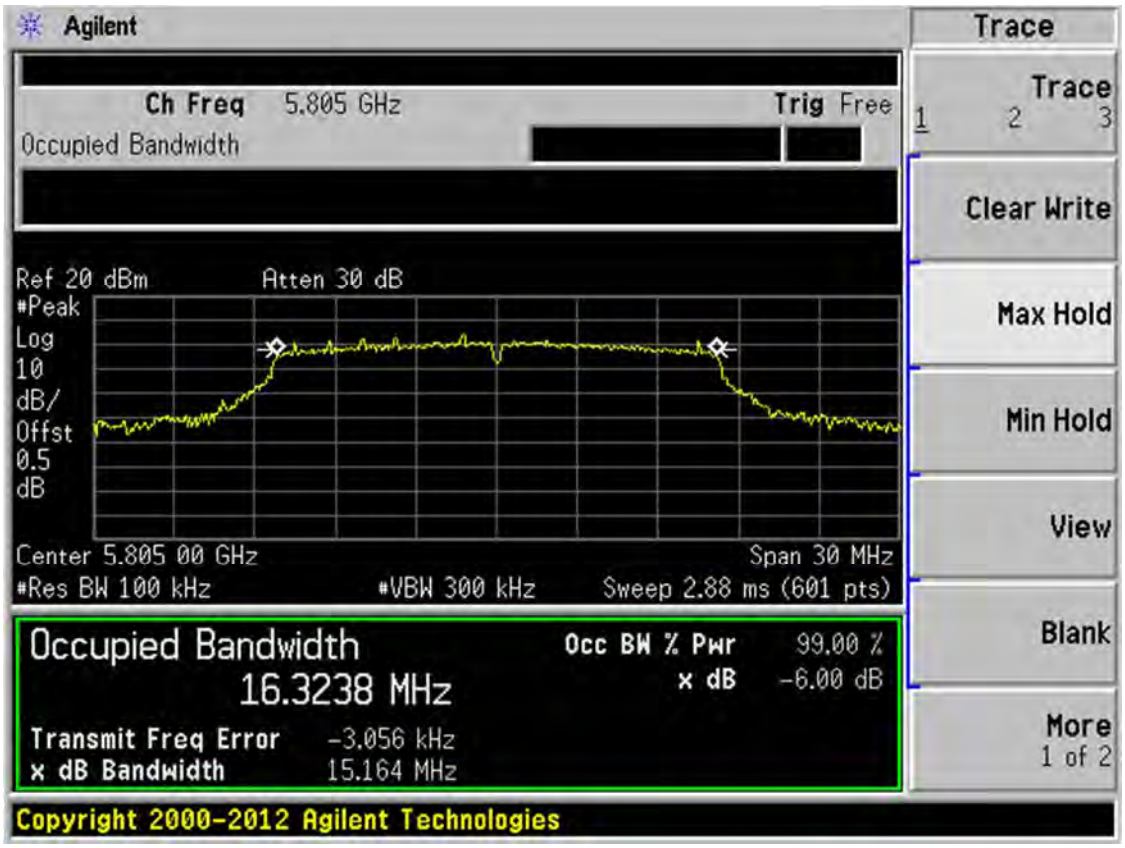
Band IV 11a CH149



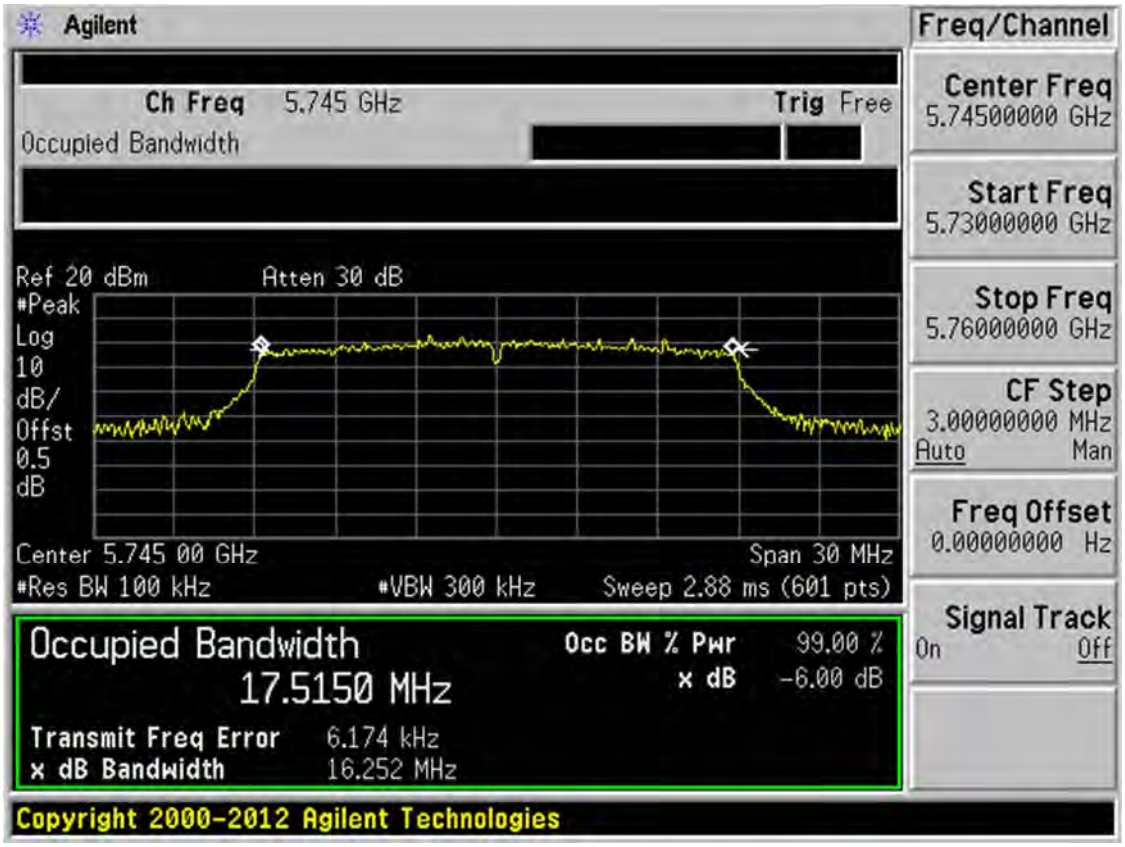
Band IV 11a CH157



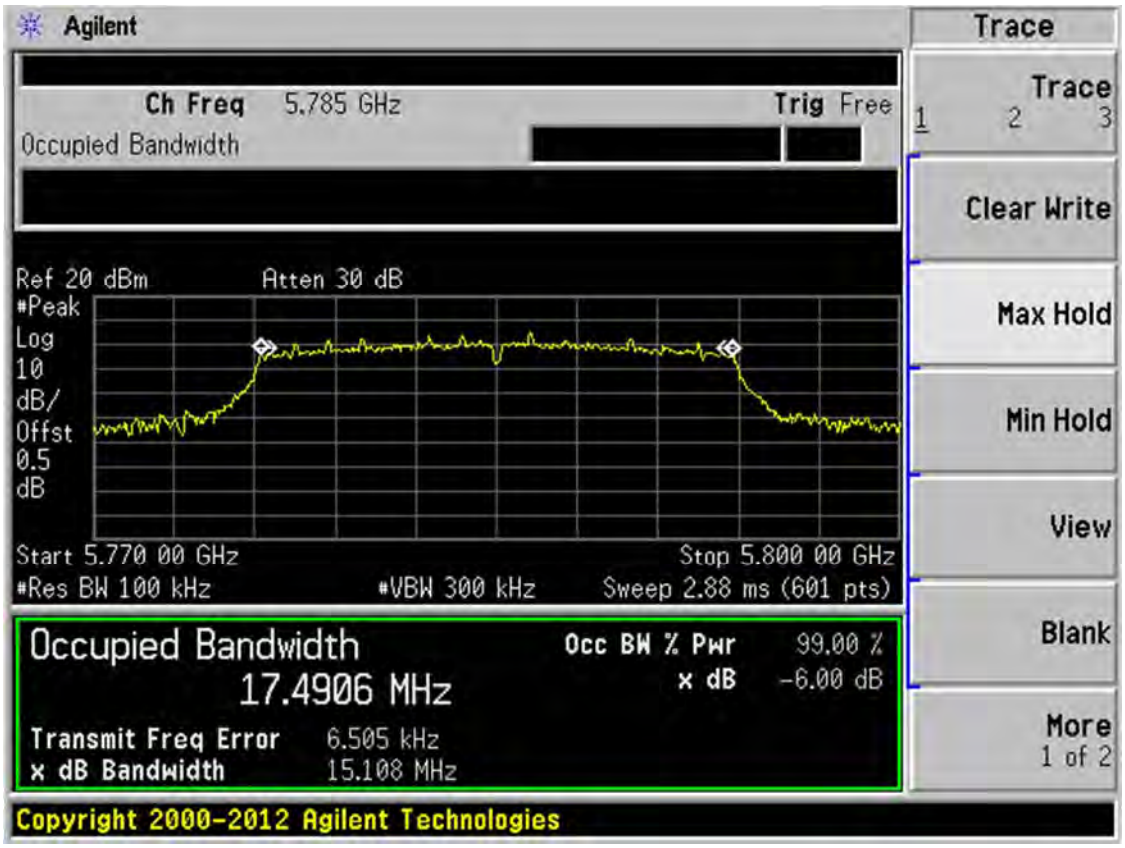
Band IV 11a CH161



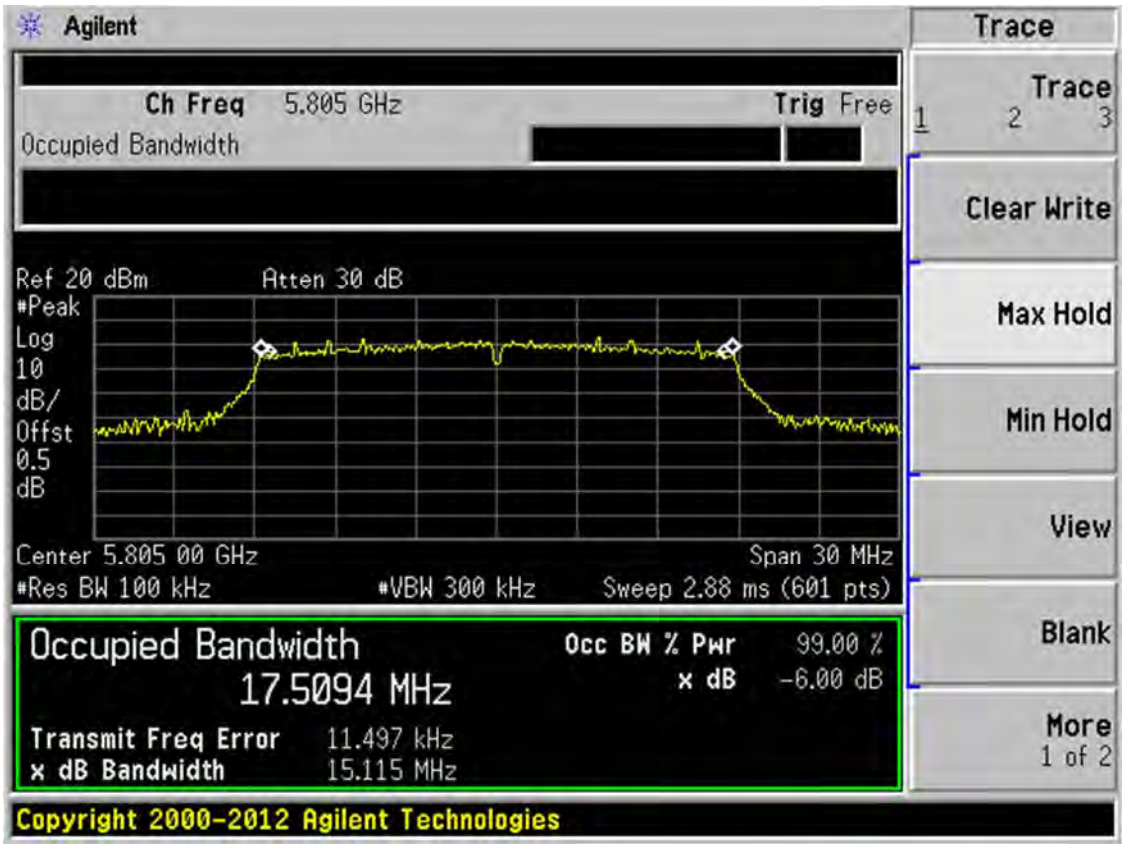
Band IV 11n(HT20) CH149



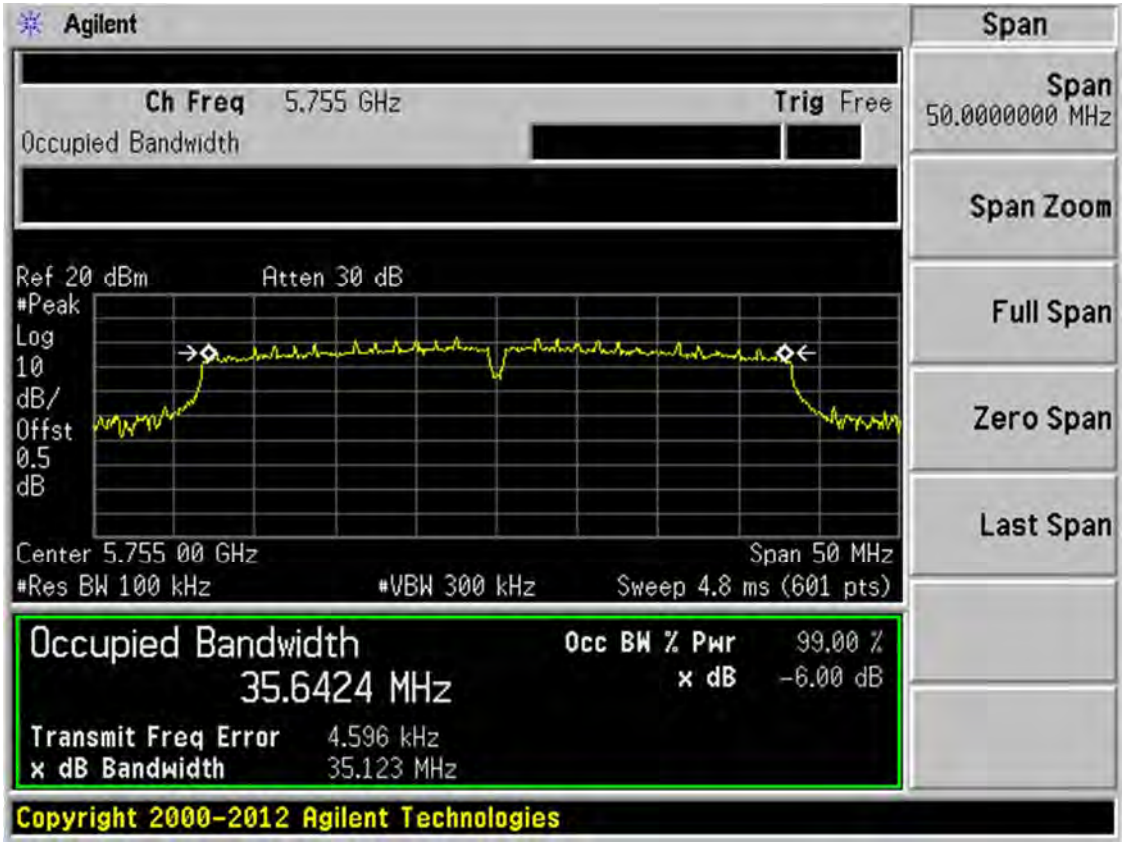
Band IV 11n(HT20) CH157



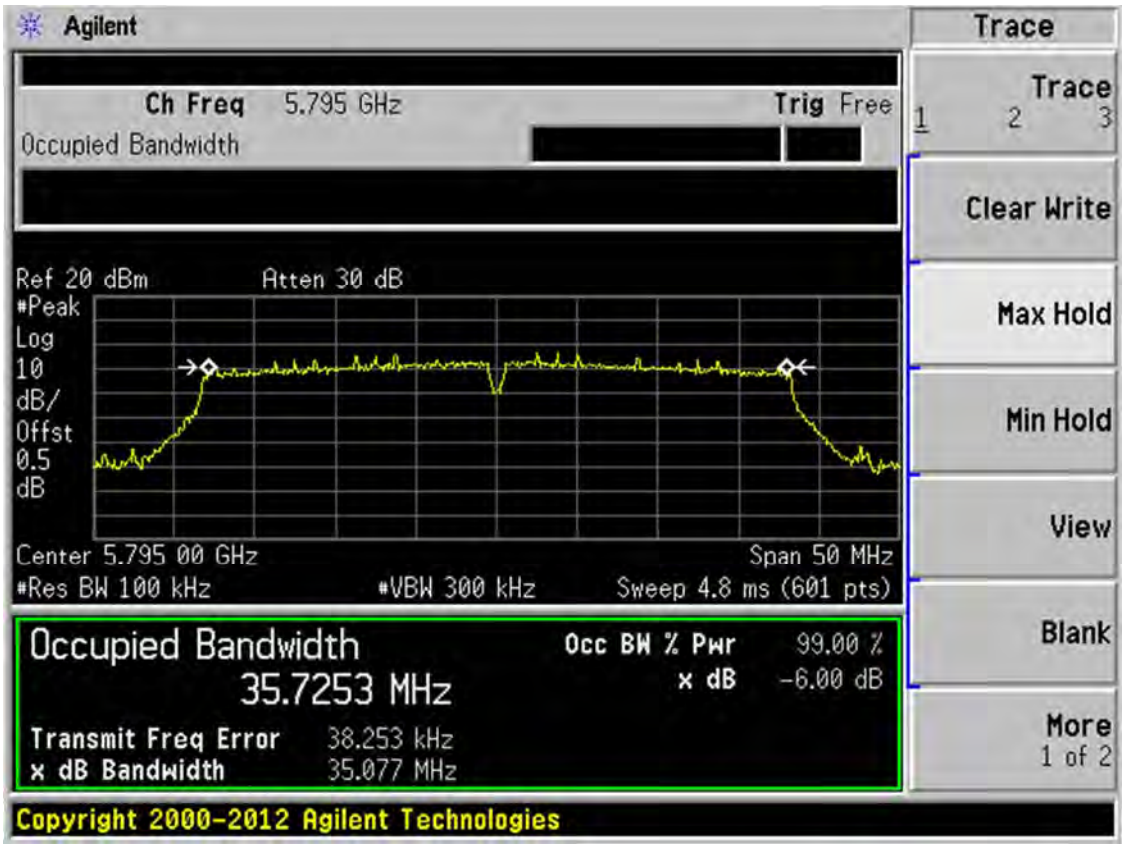
Band IV 11n(HT20) CH161



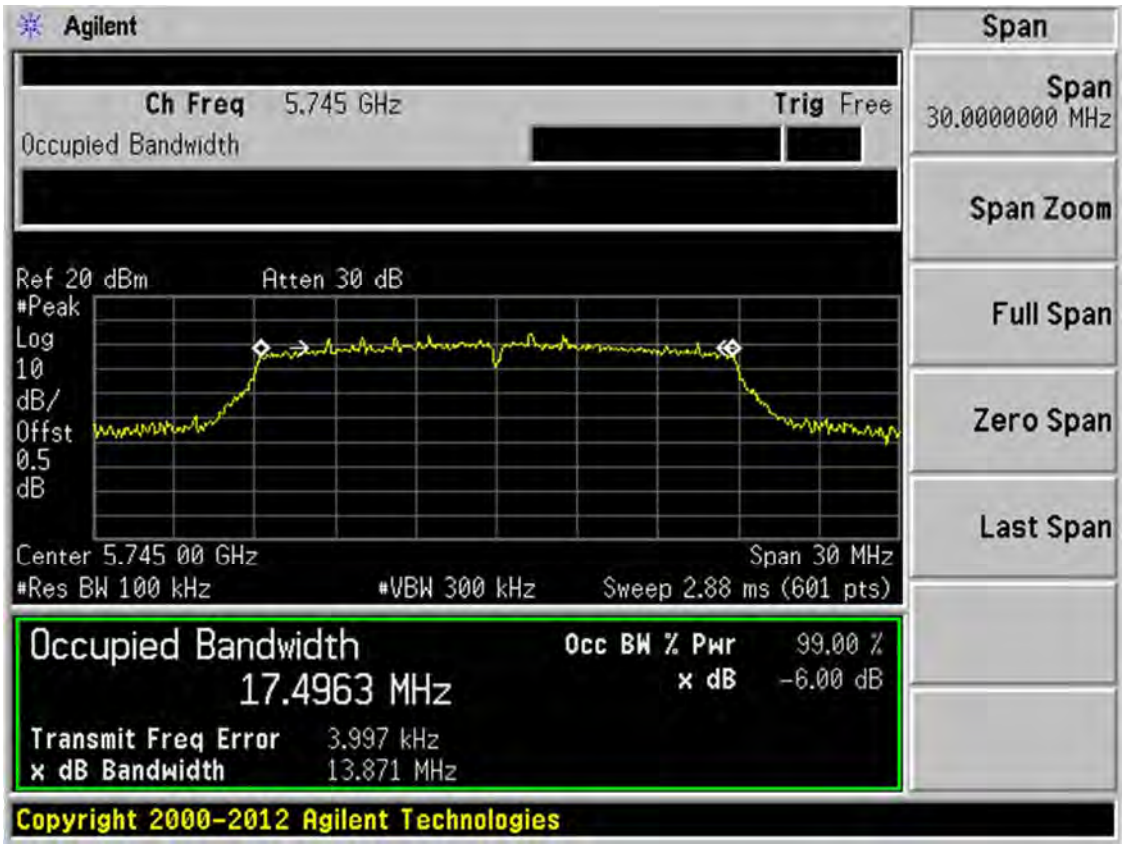
Band IV 11n(HT40) CH151



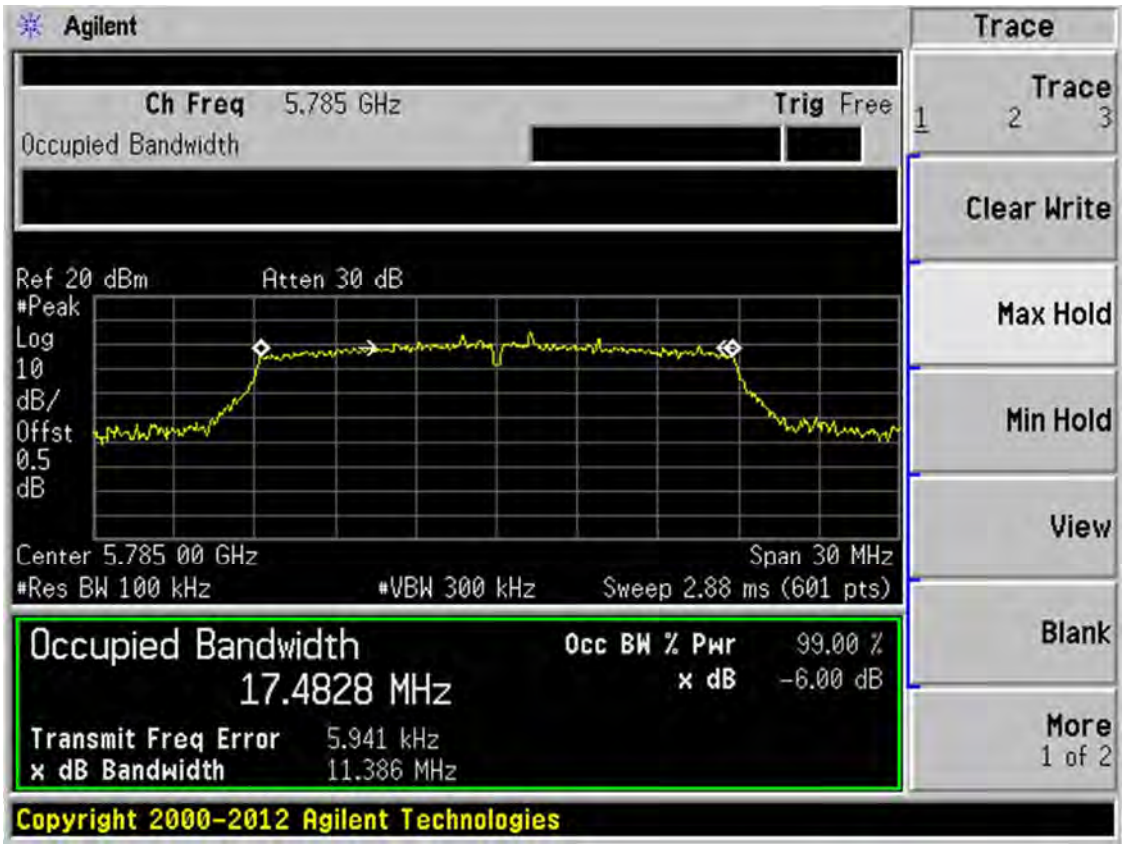
Band IV 11n(HT40) CH159



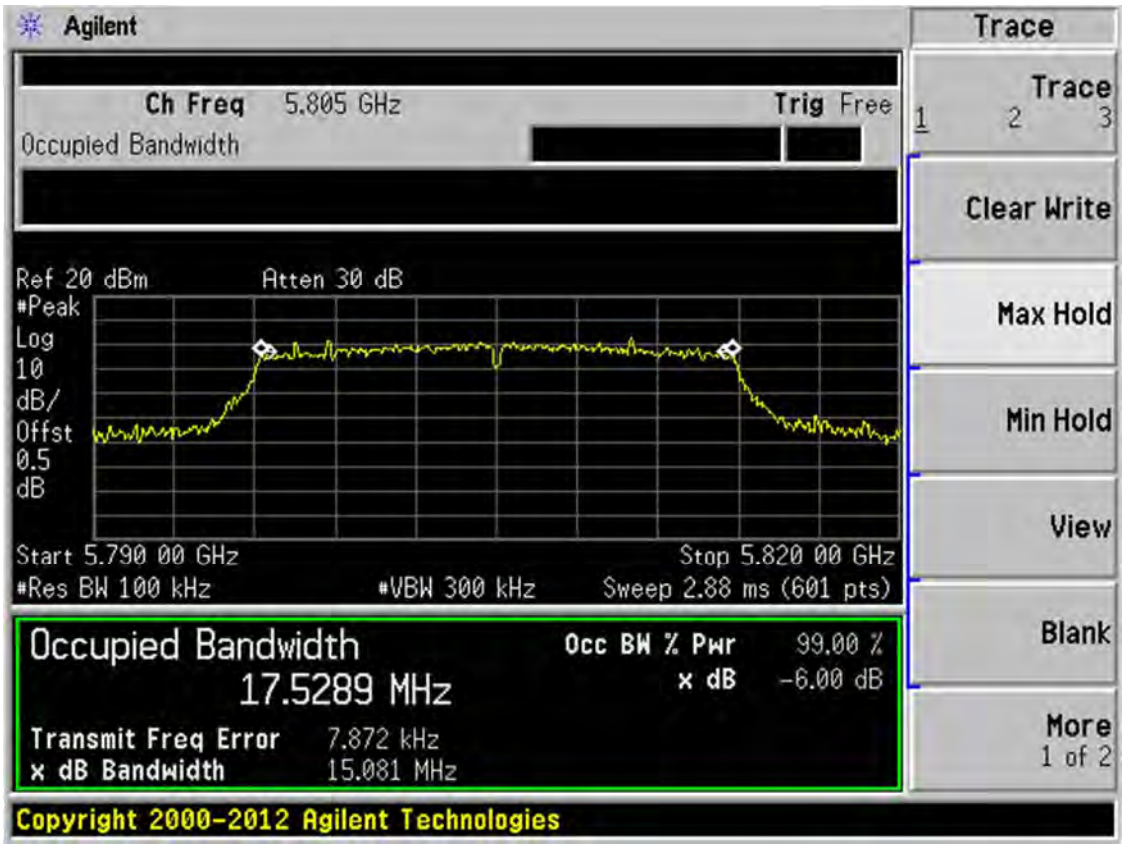
Band IV 11ac(HT20) CH149



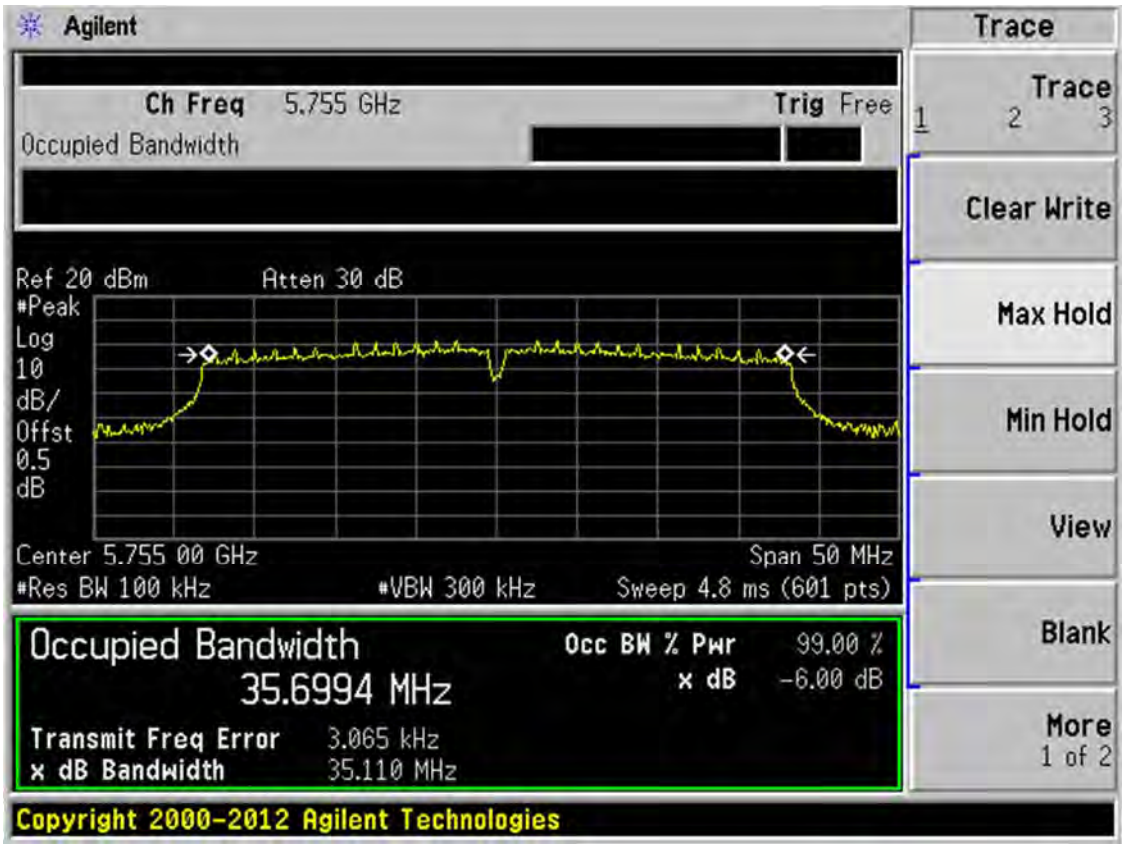
Band IV 11ac(HT20) CH157



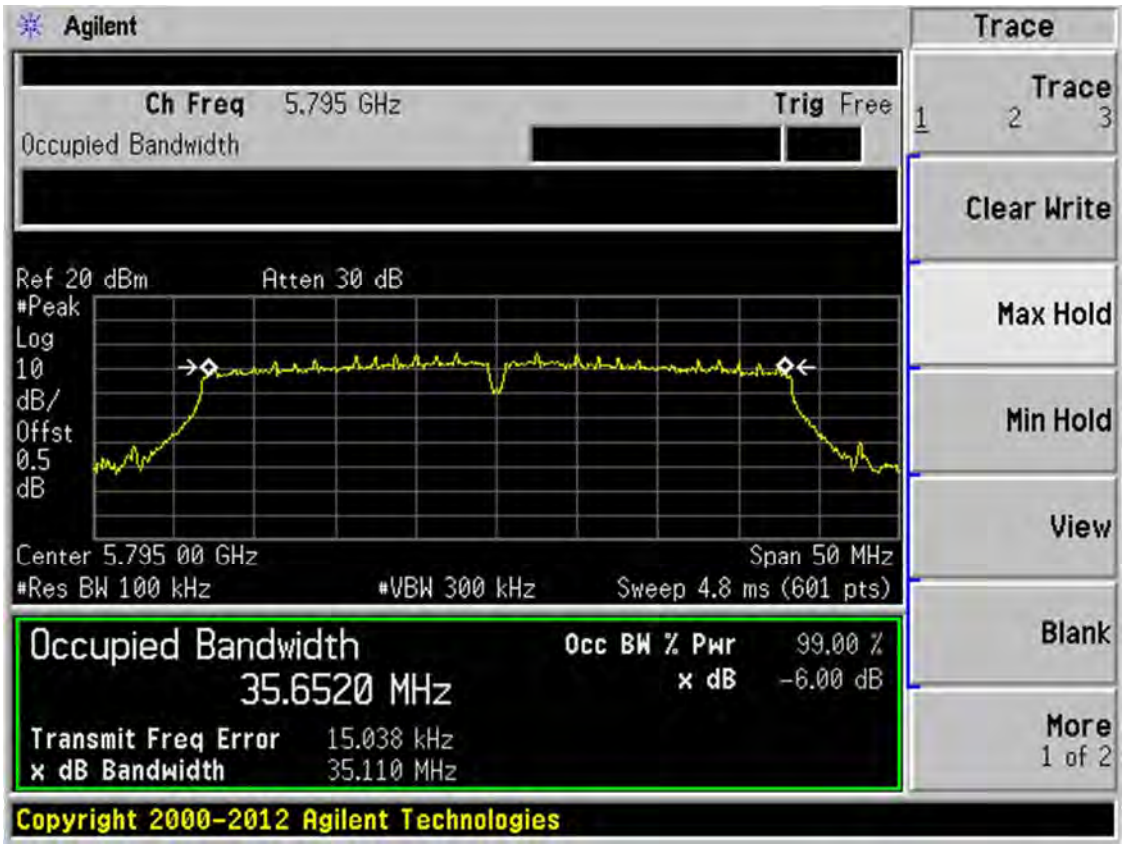
Band IV 11ac(HT20) CH161



Band IV 11ac(HT40) CH151



Band IV 11ac(HT40) CH159



A.4 Power Spectral Density

Test Data

Band I (5150 - 5250 MHz)						
Mode	Channel	Frequency (MHz)	PSD (dBm/MHz)	FCC Limit(dBm/MHz)	IC Limit (dBm/MHz)	Verdict
11a	CH36	5180	8.04	11	N/A	Pass
11a	CH44	5220	8.67	11	N/A	Pass
11a	CH48	5240	8.41	11	N/A	Pass
11n (HT20)	CH36	5180	7.29	11	N/A	Pass
11n (HT20)	CH44	5220	8.36	11	N/A	Pass
11n (HT20)	CH48	5240	8.18	11	N/A	Pass
11n (HT40)	CH38	5190	0.19	11	N/A	Pass
11n (HT40)	CH46	5230	5.31	11	N/A	Pass
11ac (HT20)	CH36	5180	7.47	11	N/A	Pass
11ac (HT20)	CH44	5220	8.74	11	N/A	Pass
11ac (HT20)	CH48	5240	7.94	11	N/A	Pass
11ac (HT40)	CH38	5190	0.76	11	N/A	Pass
11ac (HT40)	CH46	5230	6.17	11	N/A	Pass

Band II (5250 - 5350 MHz)					
Mode	Channel	Frequency (MHz)	PSD (dBm/MHz)	FCC/IC Limit (dBm/MHz)	Verdict
11a	CH52	5260	8.68	11	Pass
11a	CH60	5300	8.54	11	Pass
11a	CH64	5320	7.21	11	Pass
11n (HT20)	CH52	5260	8.35	11	Pass
11n (HT20)	CH60	5300	7.75	11	Pass
11n (HT20)	CH64	5320	7.16	11	Pass
11n (HT40)	CH54	5270	5.78	11	Pass
11n (HT40)	CH62	5310	0.64	11	Pass
11ac (HT20)	CH52	5260	8.44	11	Pass
11ac (HT20)	CH60	5300	8.29	11	Pass
11ac (HT20)	CH64	5320	6.66	11	Pass
11ac (HT40)	CH54	5270	5.66	11	Pass
11ac (HT40)	CH62	5310	0.65	11	Pass

Band III (5470 - 5725 MHz)					
Mode	Channel	Frequency (MHz)	PSD (dBm/MHz)	FCC/IC Limit (dBm/MHz)	Verdict
11a	CH100	5500	7.25	11	Pass
11a	CH116	5580	8.48	11	Pass
11a	CH140	5700	9.02	11	Pass
11n (HT20)	CH100	5500	7.14	11	Pass
11n (HT20)	CH116	5580	8.42	11	Pass
11n (HT20)	CH140	5700	8.52	11	Pass
11n (HT40)	CH102	5510	0.21	11	Pass
11n (HT40)	CH134	5670	6.08	11	Pass
11ac (HT20)	CH100	5500	6.77	11	Pass
11ac (HT20)	CH116	5580	8.24	11	Pass
11ac (HT20)	CH140	5700	9.30	11	Pass
11ac (HT40)	CH102	5510	0.08	11	Pass
11ac (HT40)	CH134	5670	5.97	11	Pass

Band IV (5725 - 5850 MHz)					
Mode	Channel	Frequency (MHz)	PSD (dBm/500kHz)	FCC/IC Limit (dBm/500kHz)	Verdict
11a	CH149	5745	8.14	30	Pass
11a	CH157	5785	5.65	30	Pass
11a	CH161	5825	8.43	30	Pass
11n (HT20)	CH149	5745	7.73	30	Pass
11n (HT20)	CH157	5785	8.26	30	Pass
11n (HT20)	CH161	5825	8.18	30	Pass
11n (HT40)	CH151	5755	4.28	30	Pass
11n (HT40)	CH159	5795	0.05	30	Pass
11ac (HT20)	CH149	5745	6.61	30	Pass
11ac (HT20)	CH157	5785	8.42	30	Pass
11ac (HT20)	CH161	5805	8.17	30	Pass
11ac (HT40)	CH151	5755	5.41	30	Pass
11ac (HT40)	CH159	5795	0.38	30	Pass

EIRP PSD (IC Band 5150 – 5250 MHz)

Band I (5150 - 5250 MHz)							
Mode	Channel	Frequency (MHz)	PSD (dBm/MHz)	Gain (dBi)	EIRP PSD (dBm/MHz)	IC Limit (dBm/MHz)	Verdict
11a	CH36	5180	8.04	0.4	8.44	10	Pass
11a	CH44	5220	8.67	0.4	9.07	10	Pass
11a	CH48	5240	8.41	0.4	8.81	10	Pass
11n (HT20)	CH36	5180	7.29	0.4	7.69	10	Pass
11n (HT20)	CH44	5220	8.36	0.4	8.76	10	Pass
11n (HT20)	CH48	5240	8.18	0.4	8.58	10	Pass
11n (HT40)	CH38	5190	0.19	0.4	0.59	10	Pass
11n (HT40)	CH46	5230	5.31	0.4	5.71	10	Pass
11ac (HT20)	CH36	5180	7.47	0.4	7.87	10	Pass
11ac (HT20)	CH44	5220	8.74	0.4	9.14	10	Pass
11ac (HT20)	CH48	5240	7.94	0.4	8.34	10	Pass
11ac (HT40)	CH38	5190	0.76	0.4	1.16	10	Pass
11ac (HT40)	CH46	5230	6.17	0.4	6.57	10	Pass

Note 1: EIRP PSD = Conducted power spectral density Result + Antenna Gain

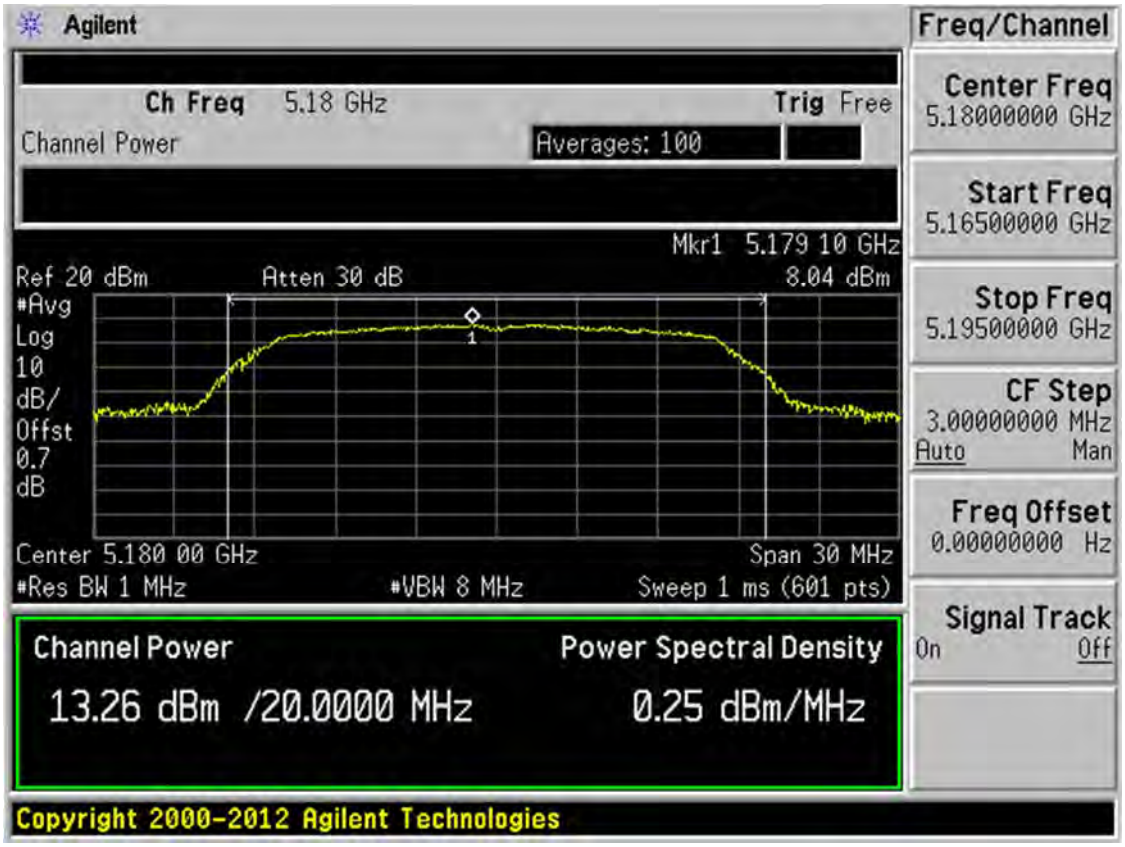
Where: Conducted PSD = measured PSD, in dBm/MHz;

Gain = gain of the transmitting antenna, in dBi.

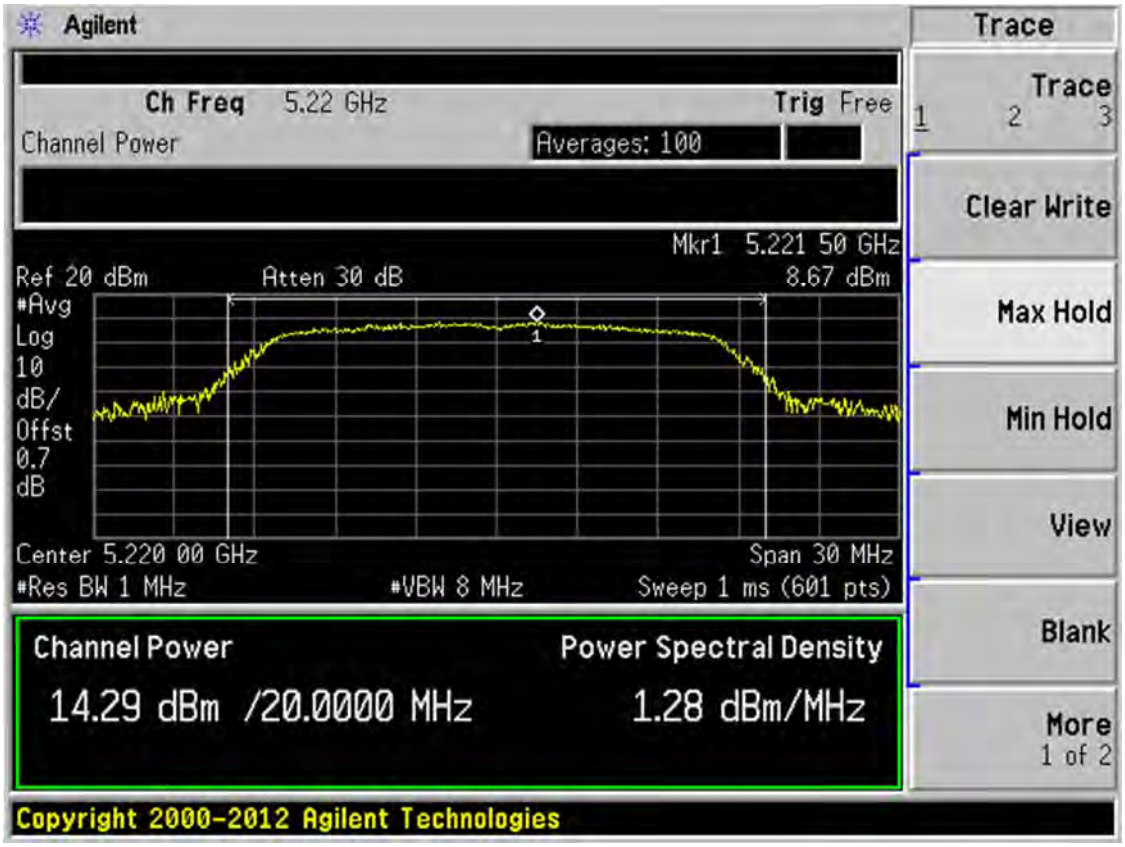
Note 2: The Conducted PSD plots are same to FCC band 1 PSD, please see the plots band 1.

Test Plots

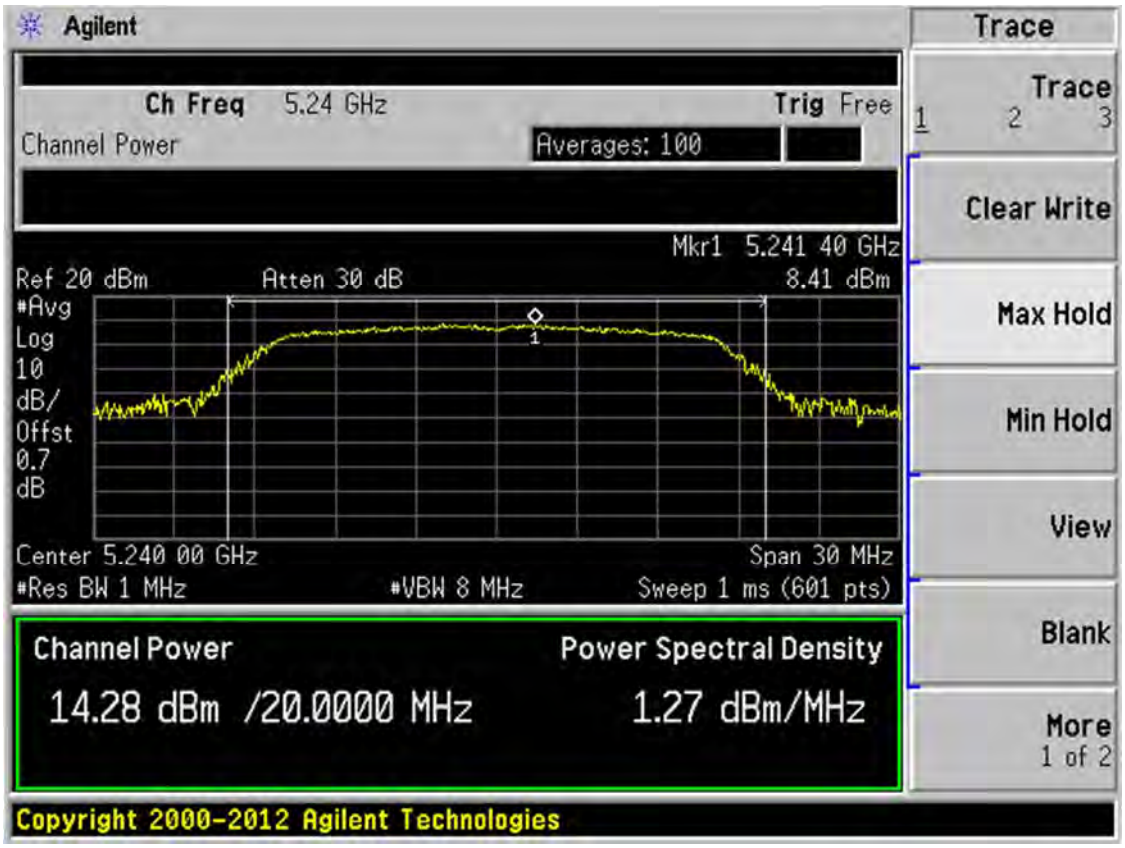
Band I 11a CH36



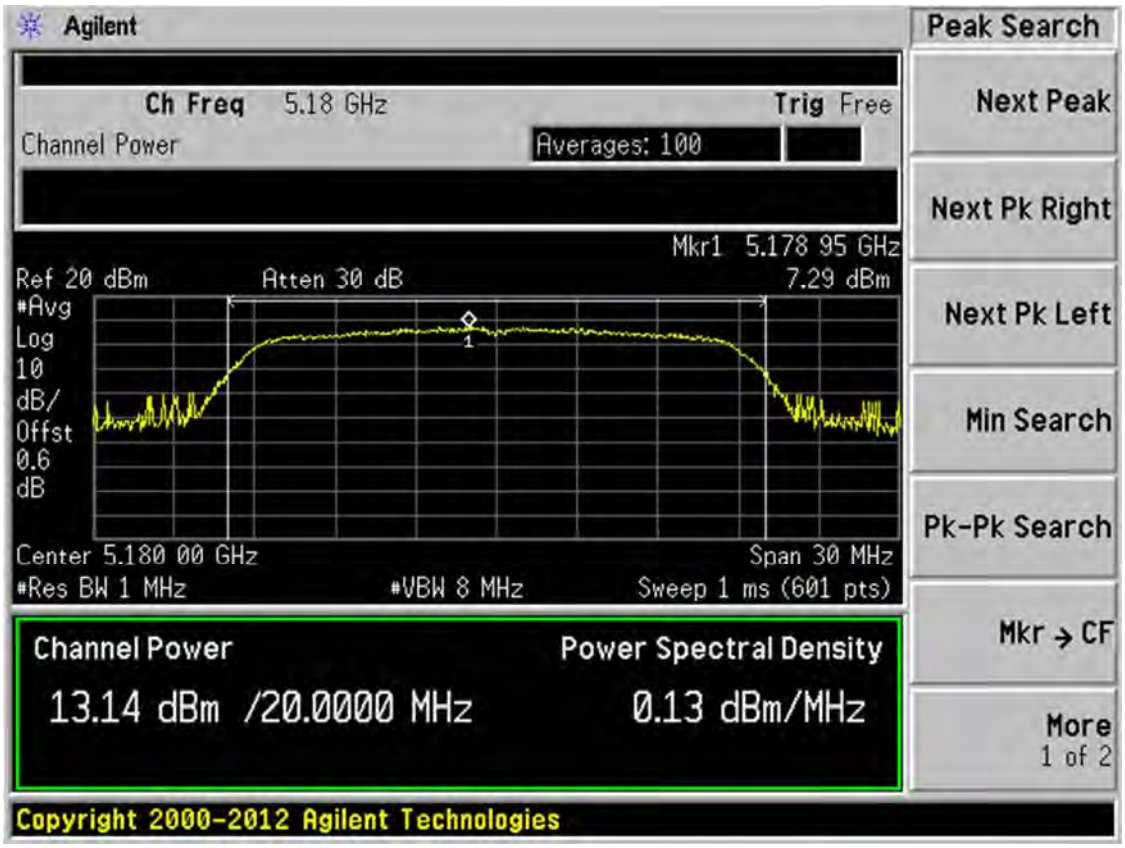
Band I 11a CH44



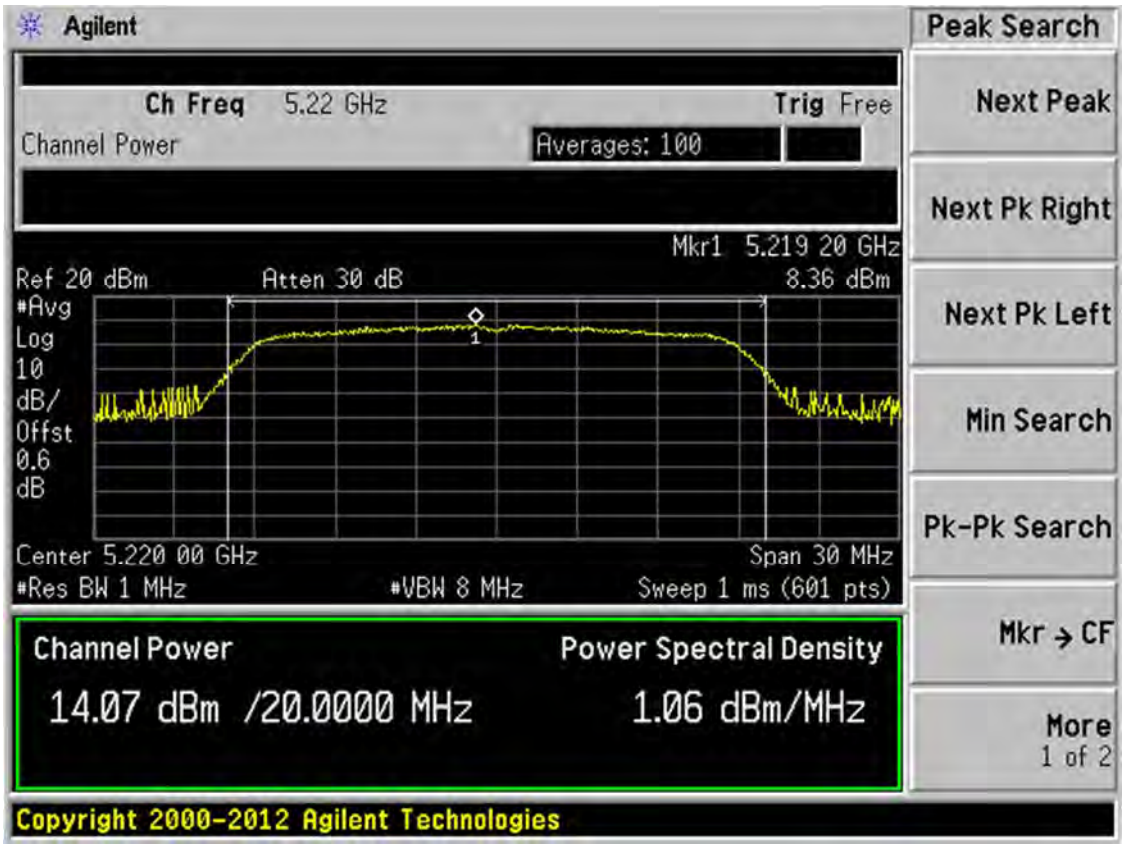
Band I 11a CH48



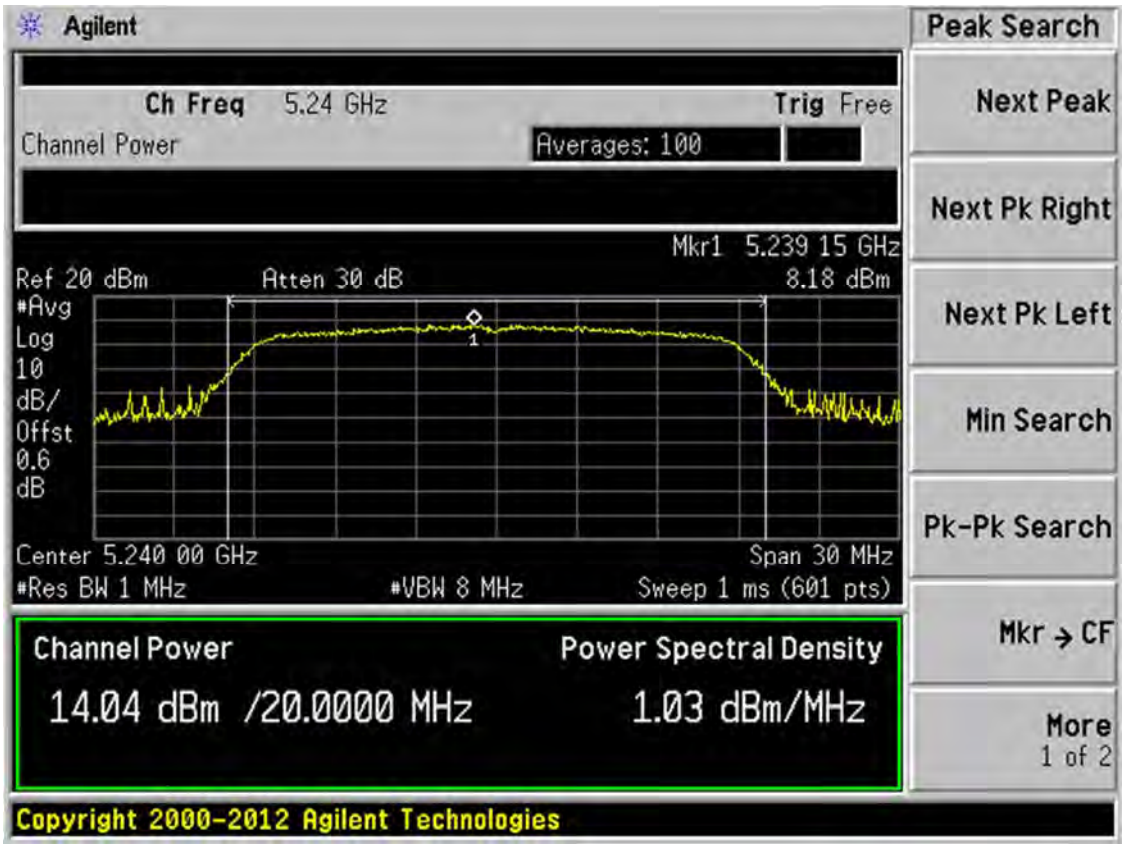
Band I 11n(HT20) CH36



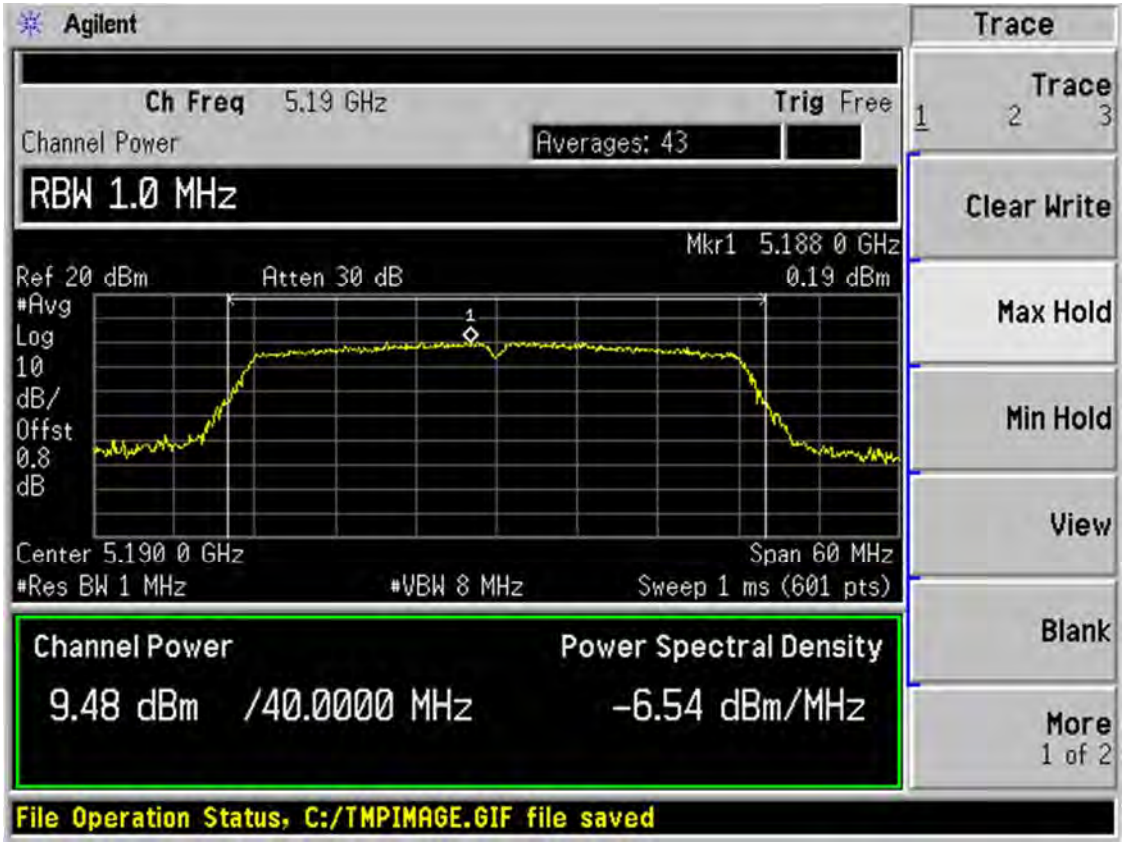
Band I 11n(HT20) CH44



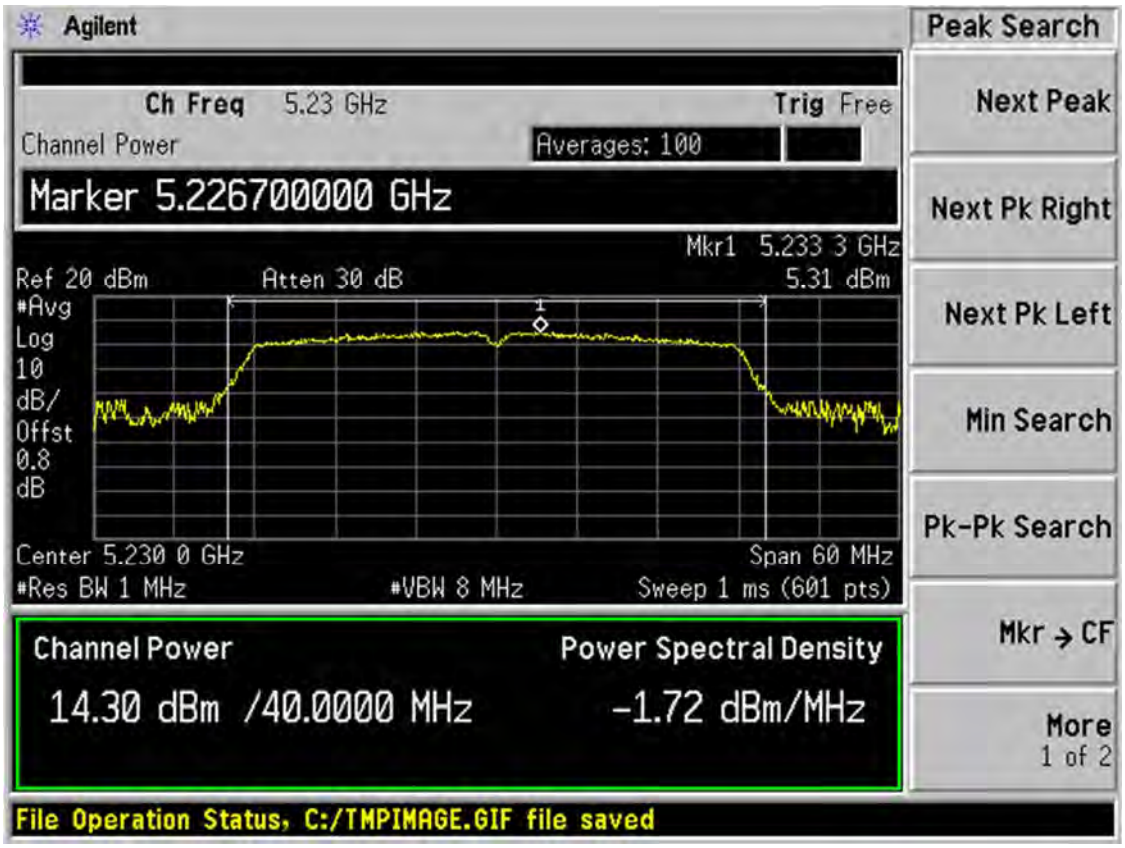
Band I 11n(HT20) CH48



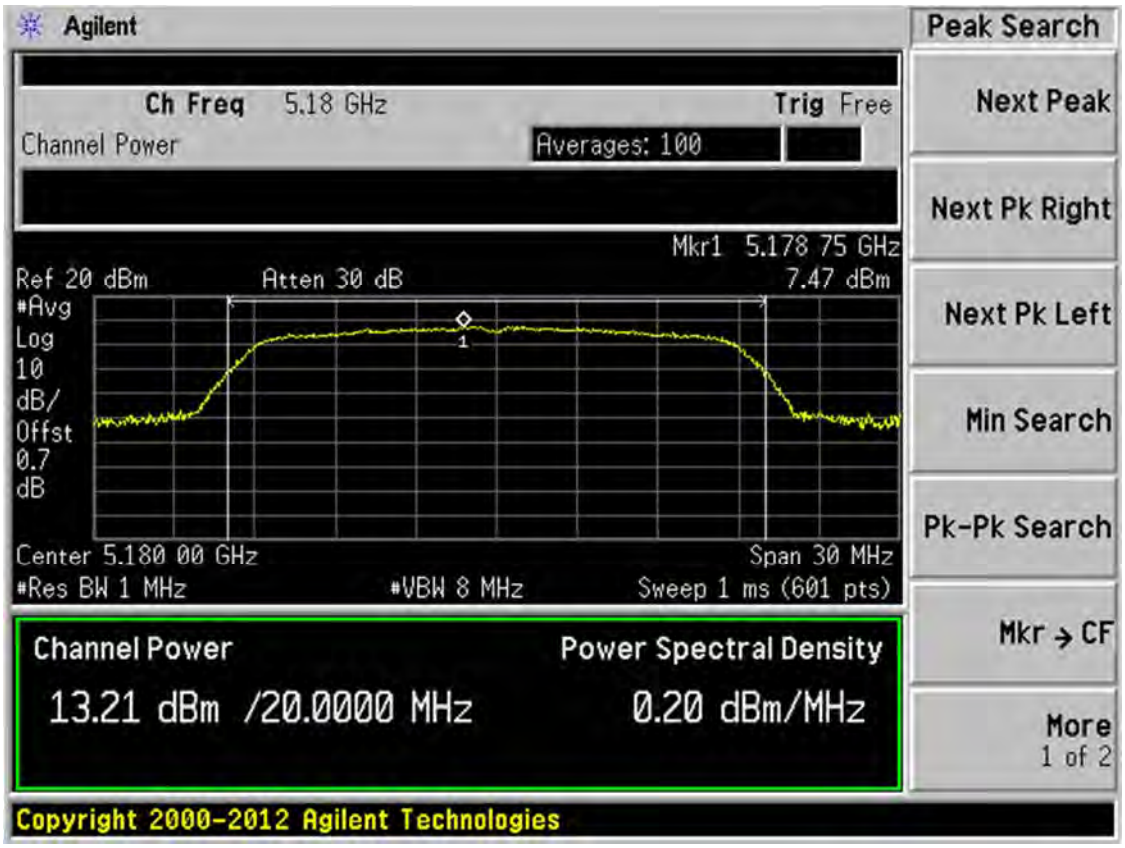
Band I 11n(HT40) CH38



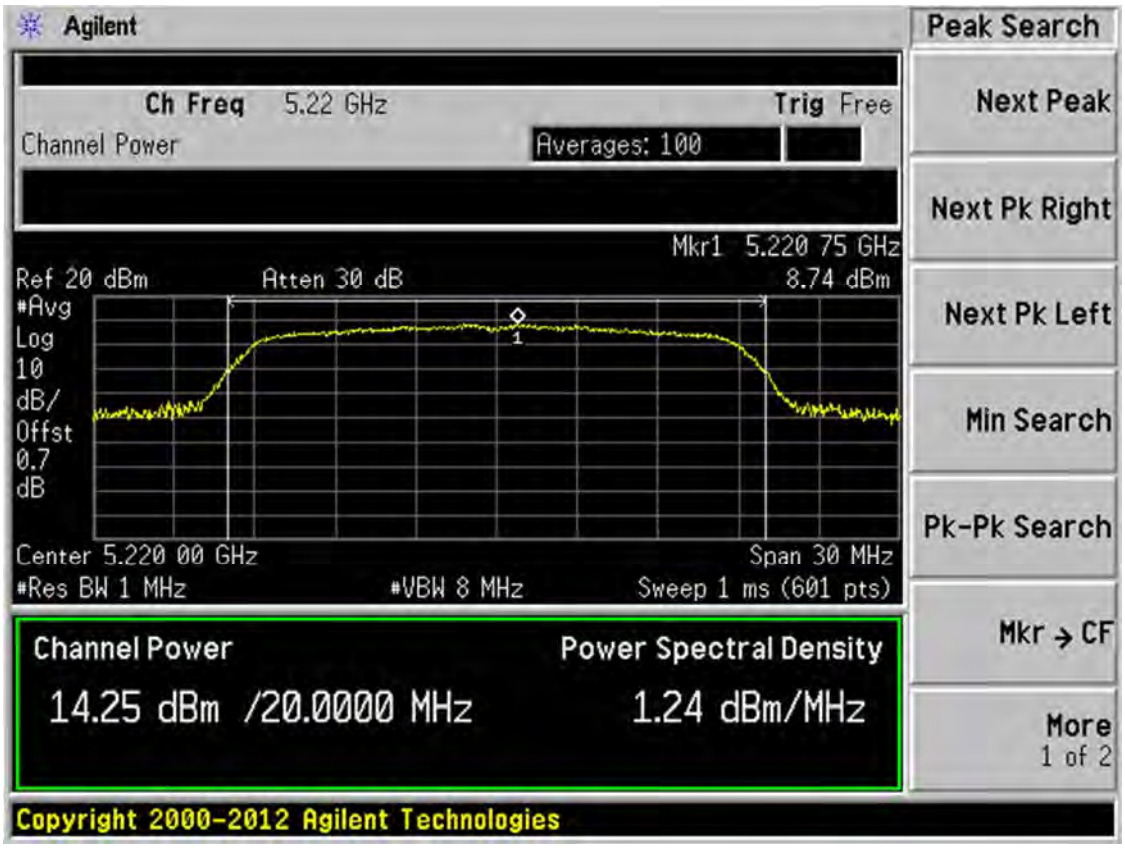
Band I 11n(HT40) CH46



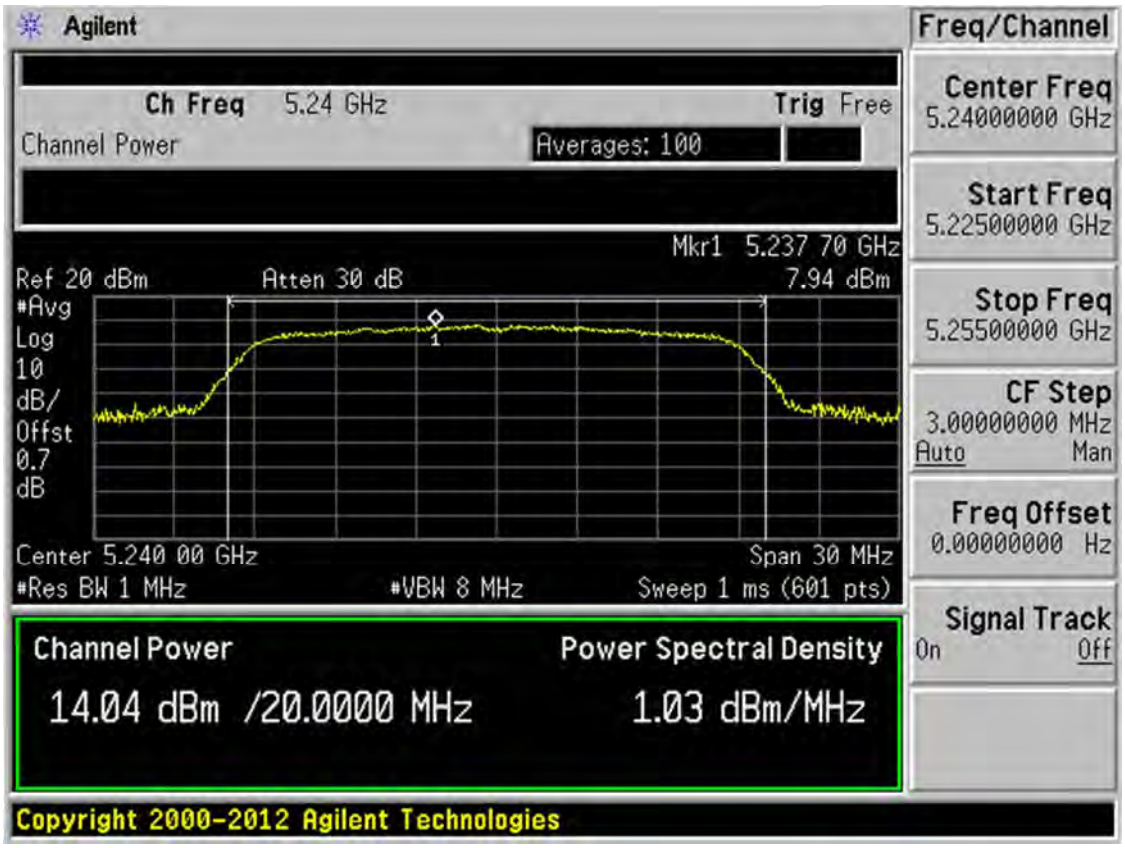
Band I 11ac(HT20) CH36



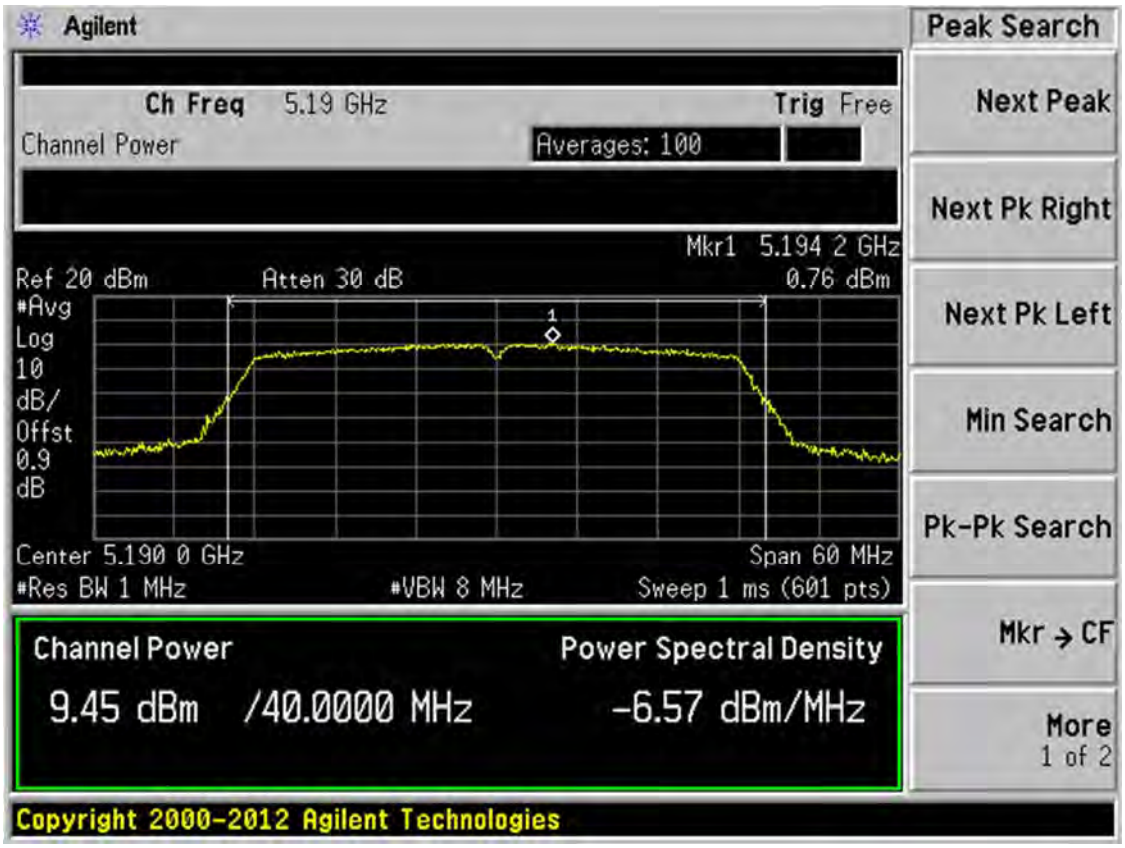
Band I 11ac(HT20) CH44



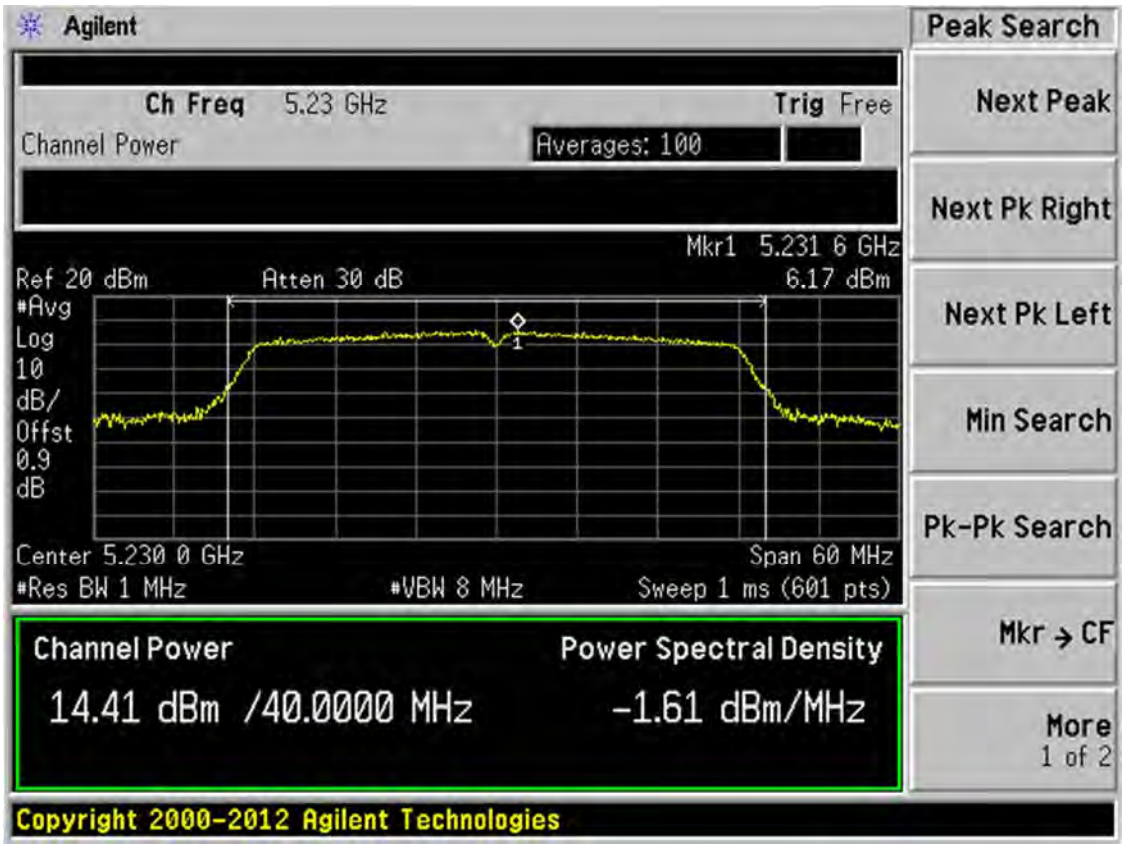
Band I 11ac(HT20) CH48



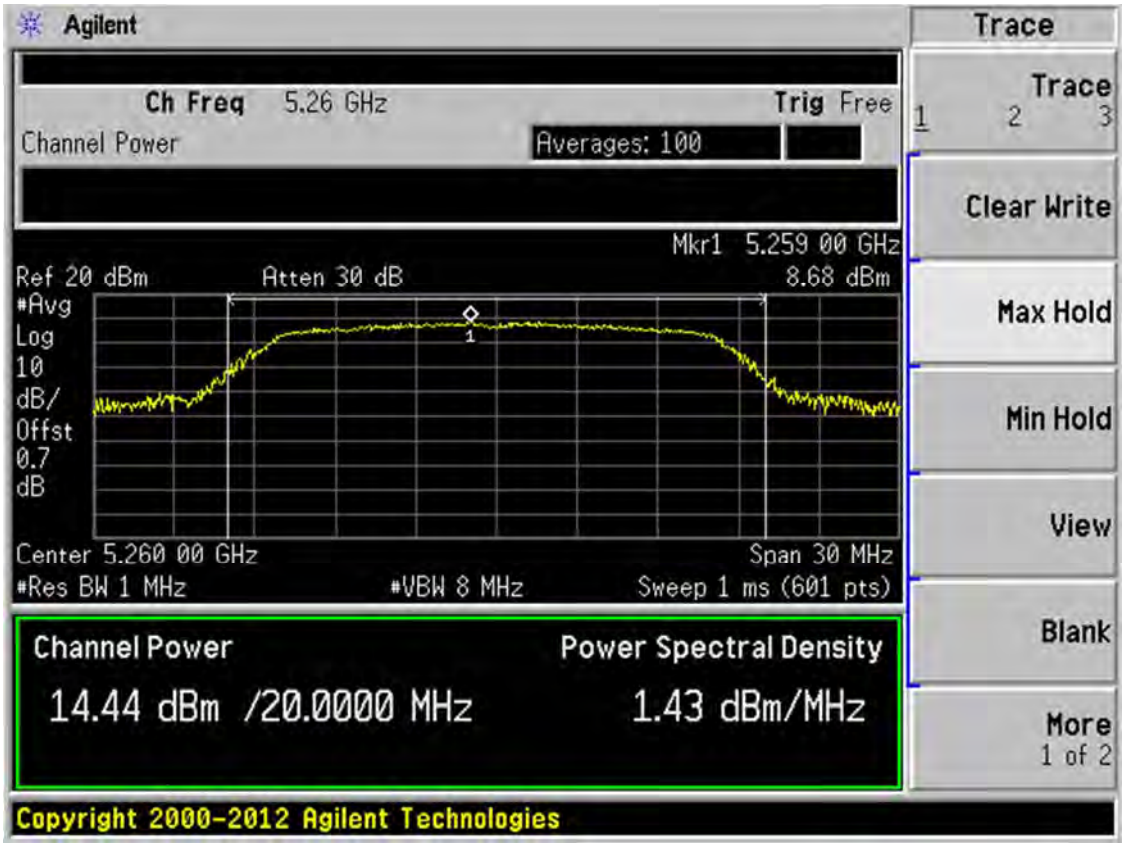
Band I 11ac(HT40) CH38



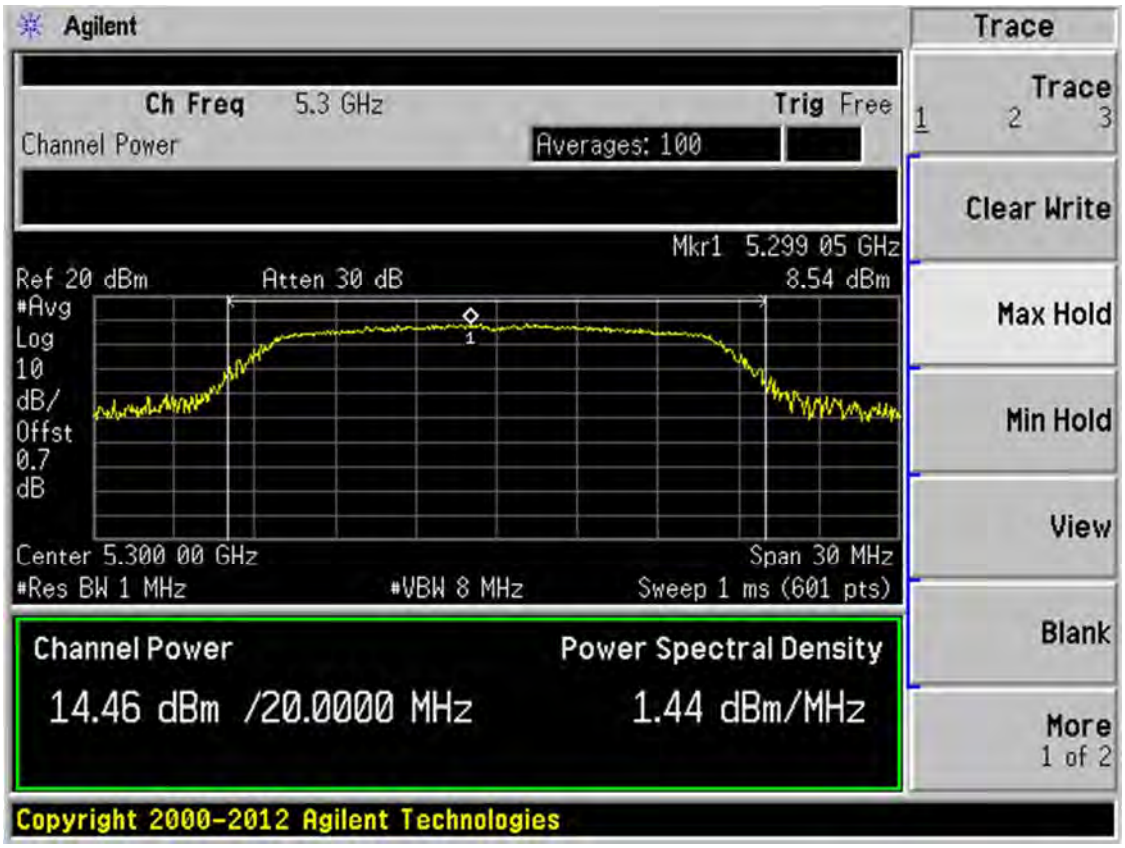
Band I 11ac(HT40) CH46



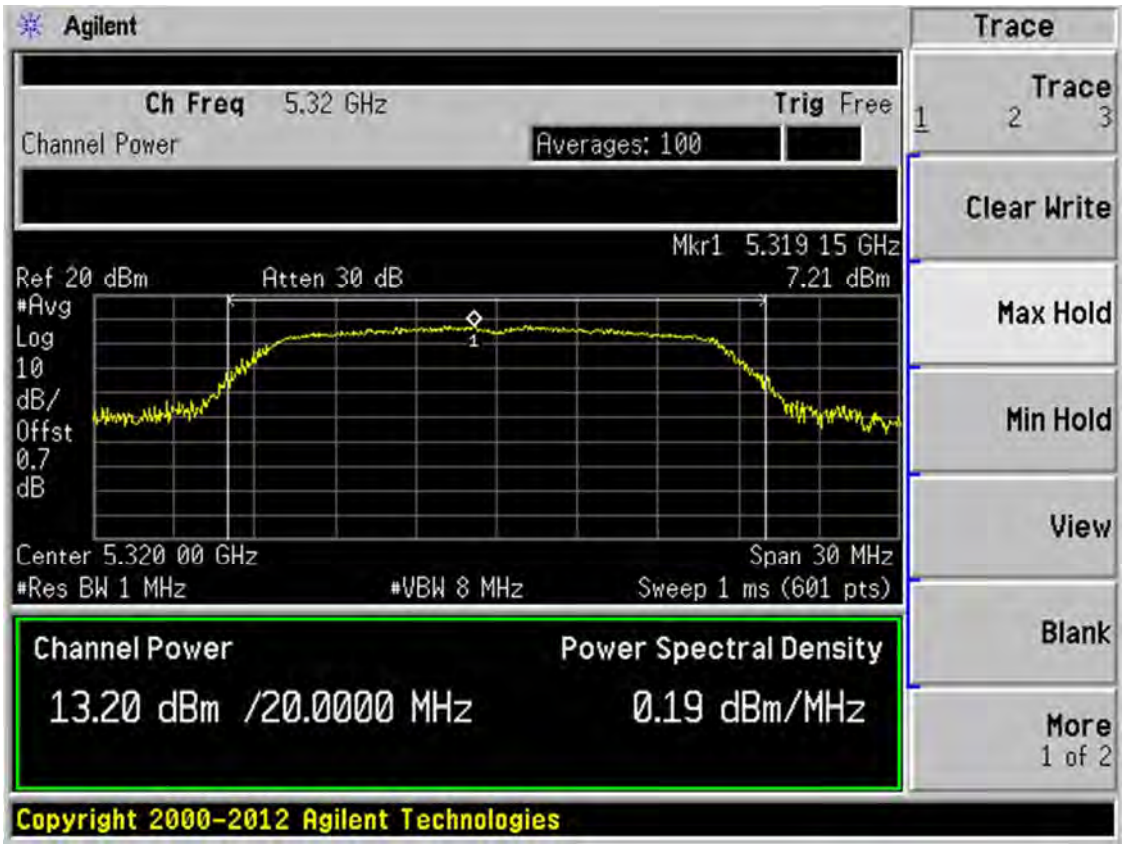
Band II 11a CH52



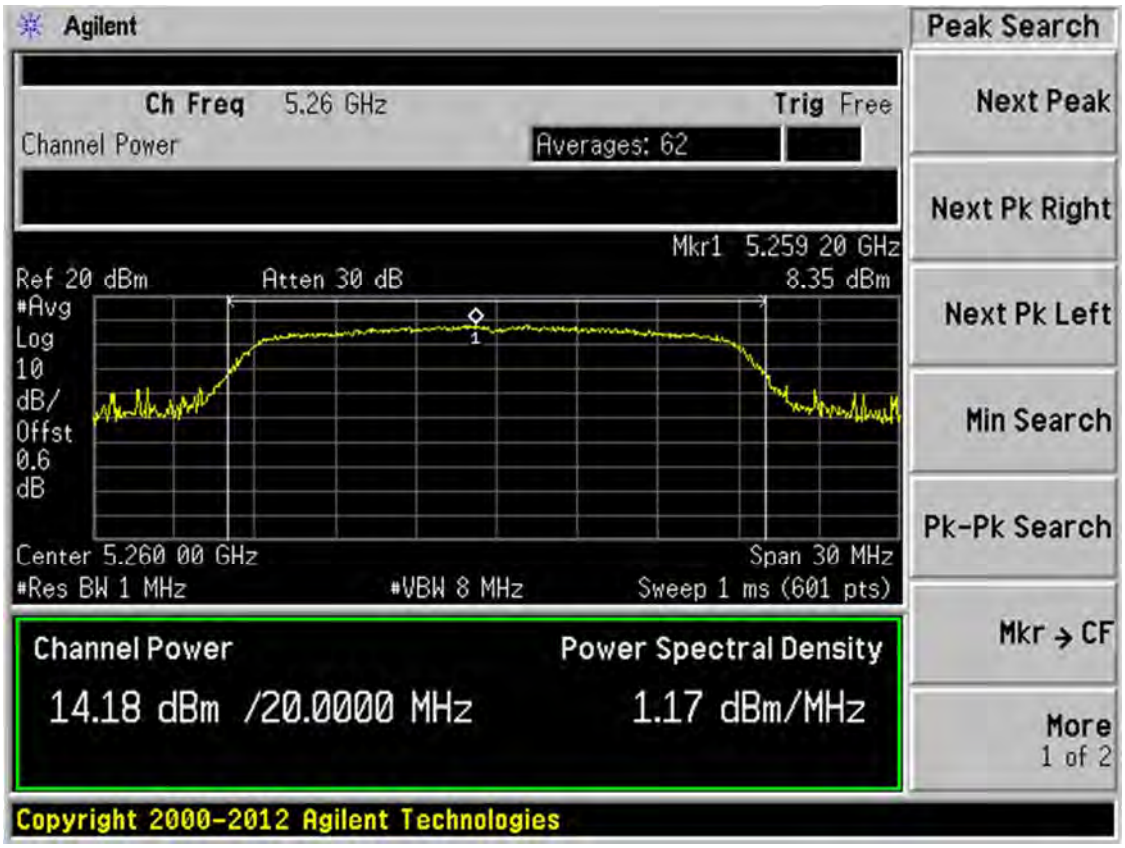
Band II 11a CH60



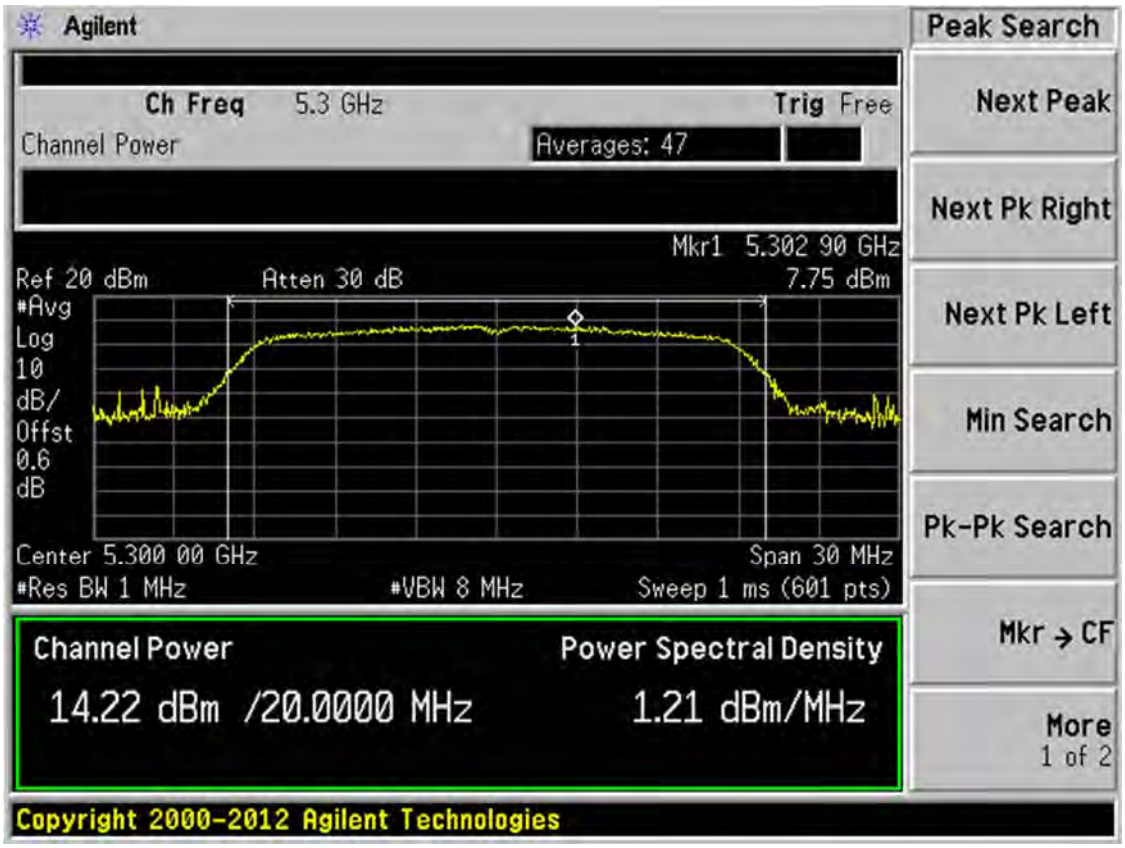
Band II 11a CH64



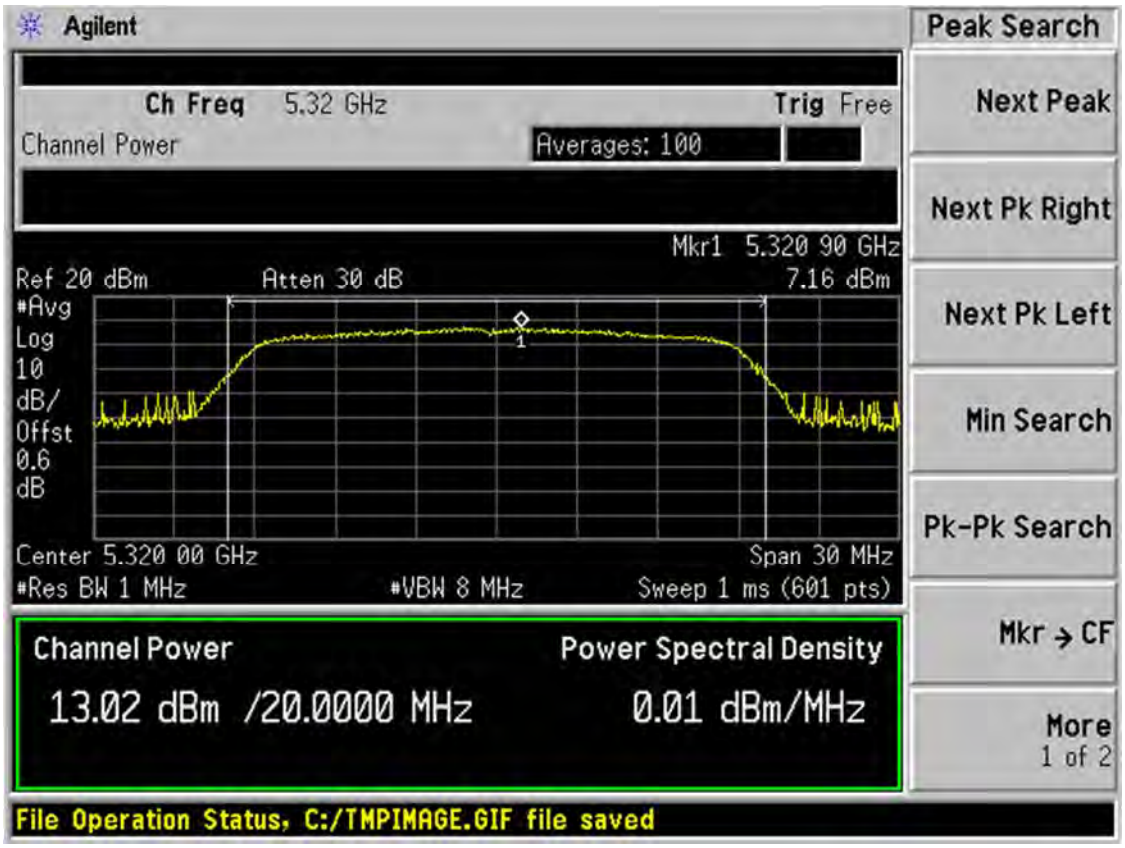
Band II 11n(HT20) CH52



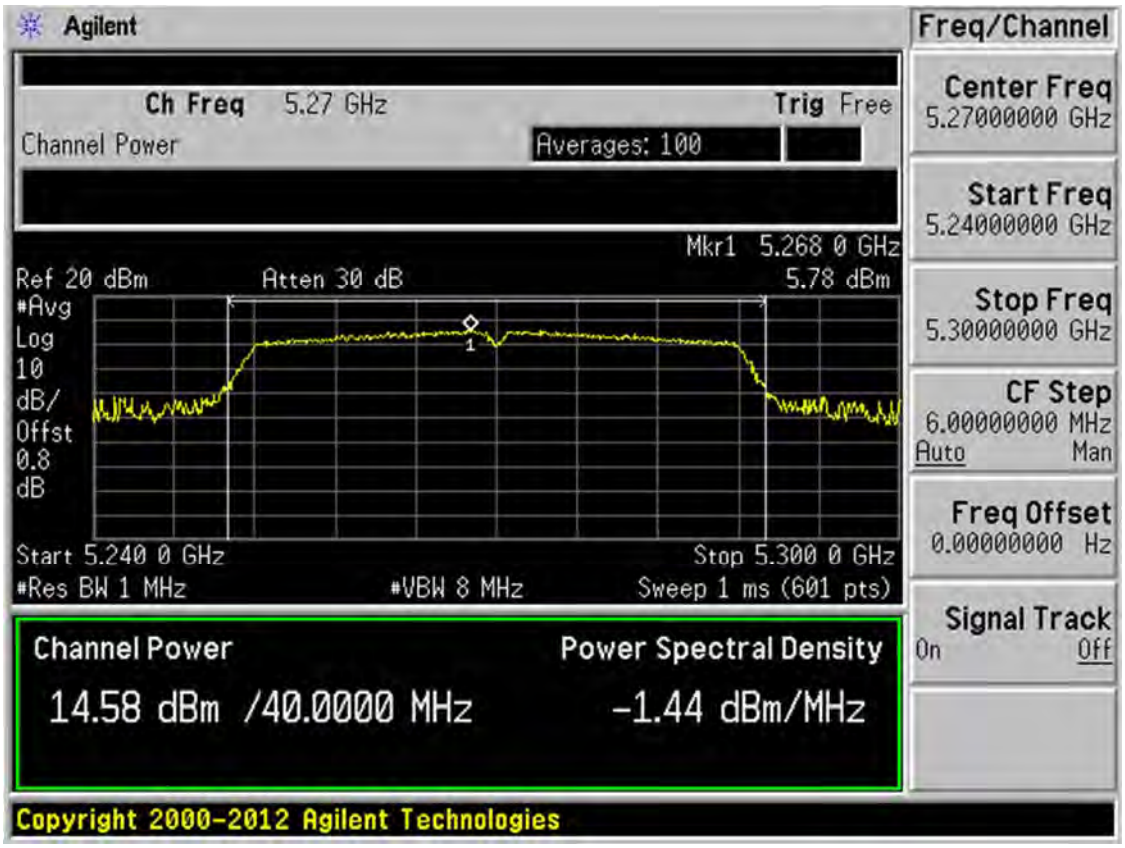
Band II 11n(HT20) CH60



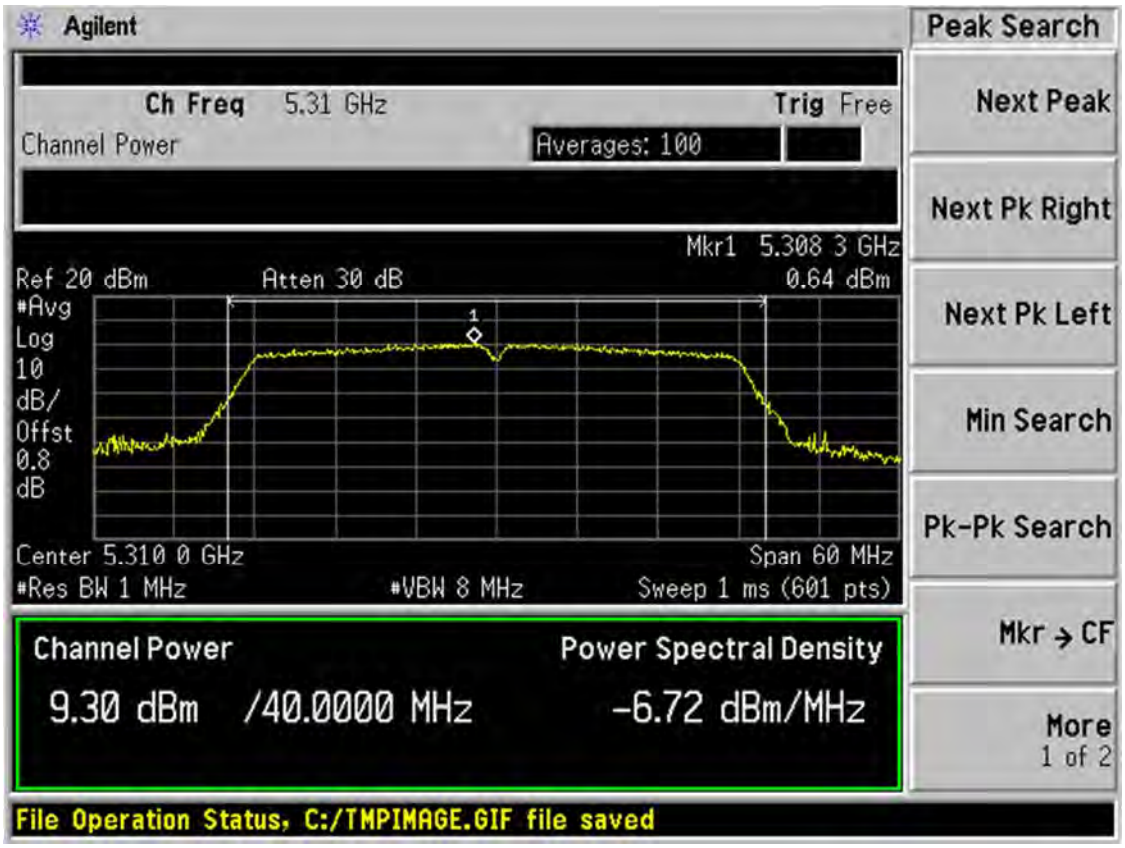
Band II 11n(HT20) CH64



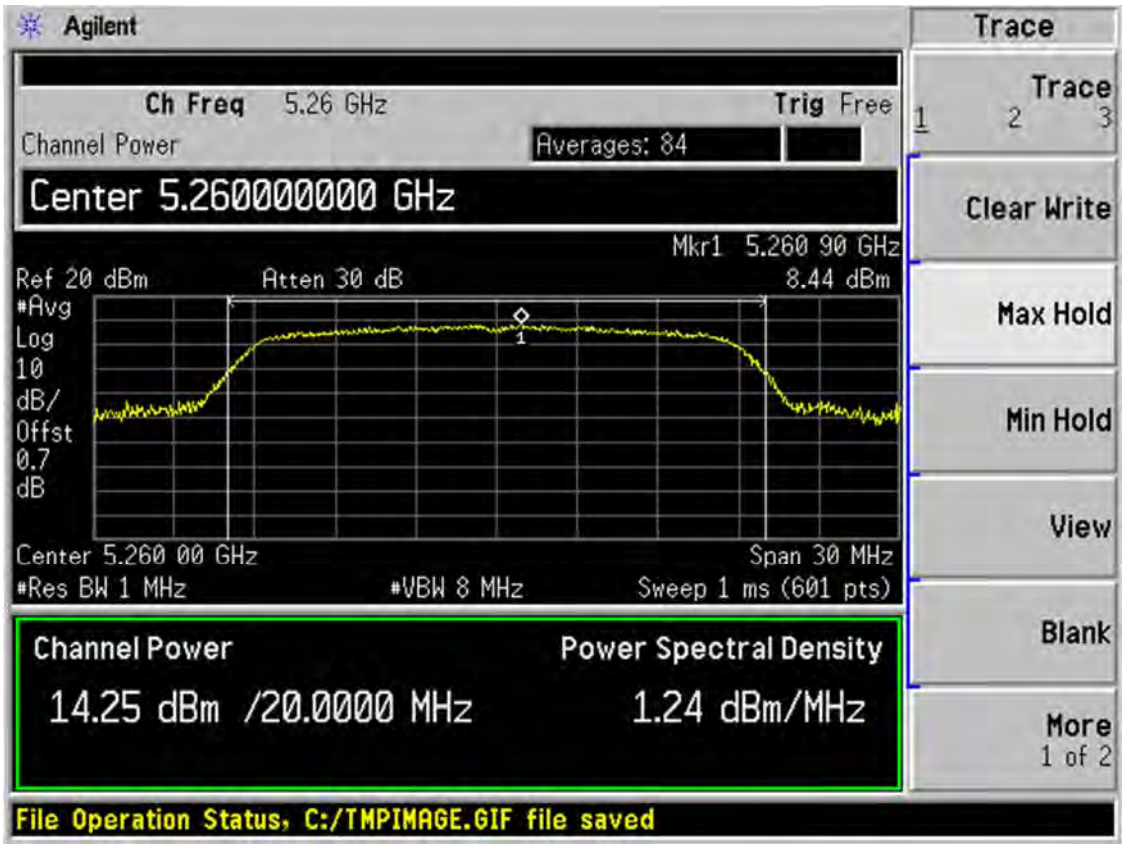
Band II 11n(HT40) CH54



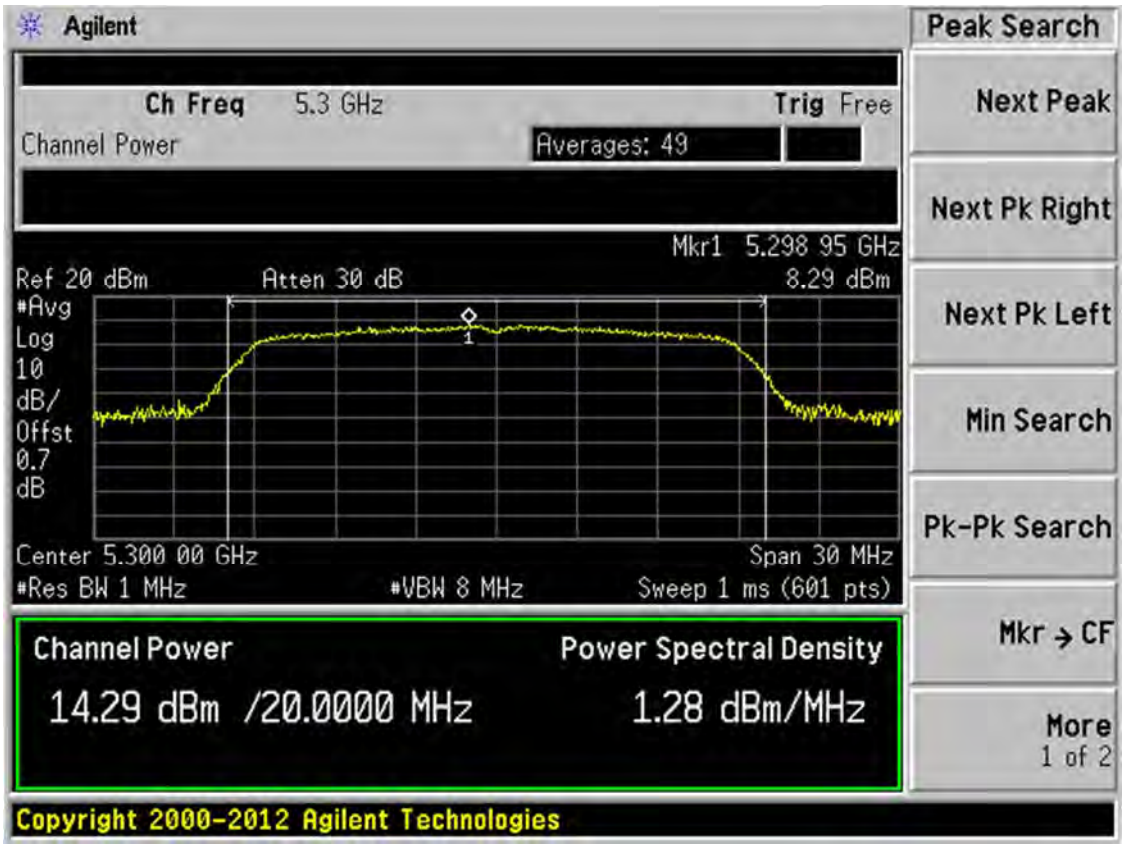
Band II 11n(HT40) CH62



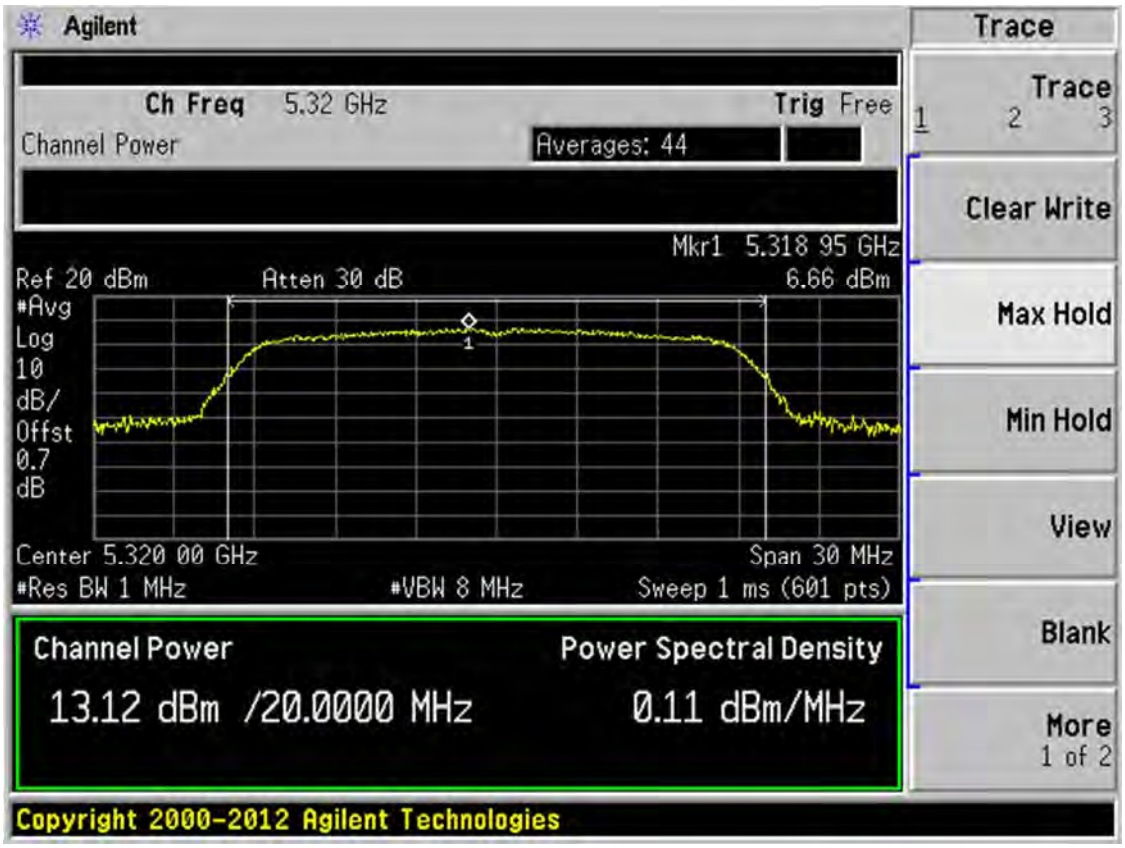
Band II 11ac(HT20) CH52



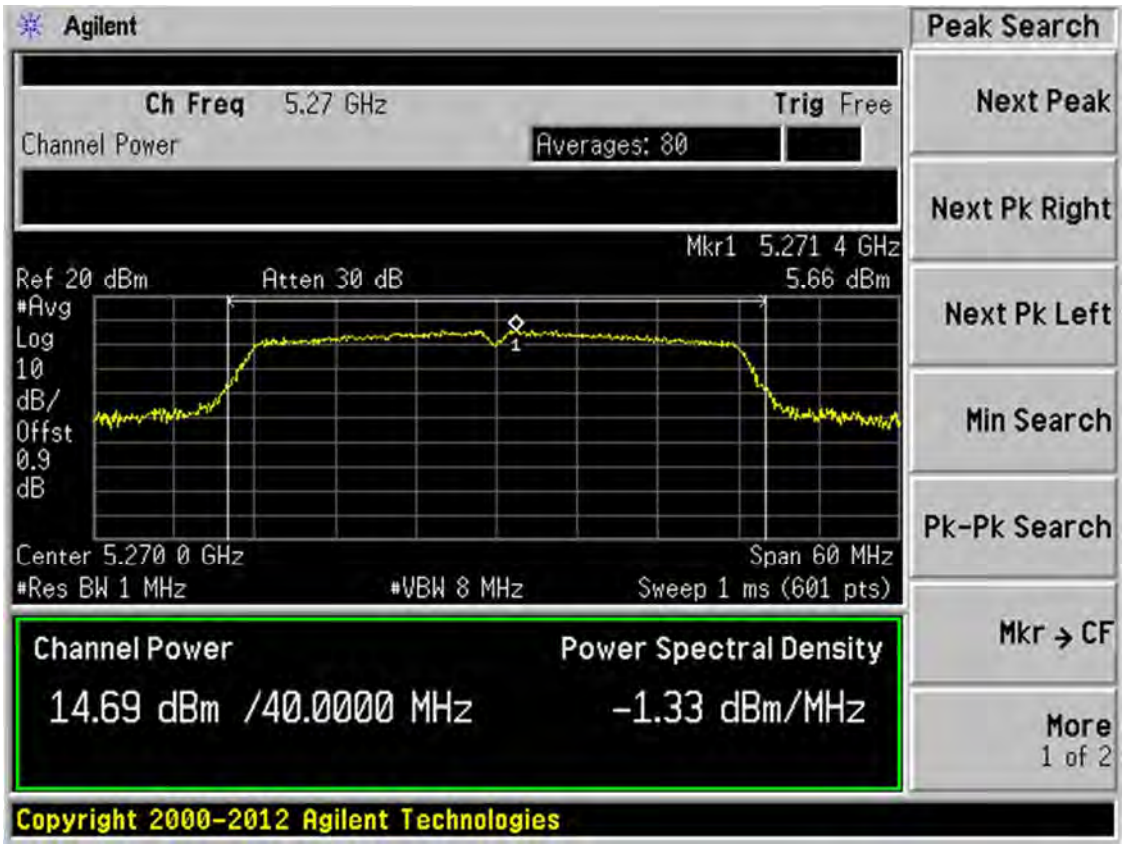
Band II 11ac(HT20) CH60



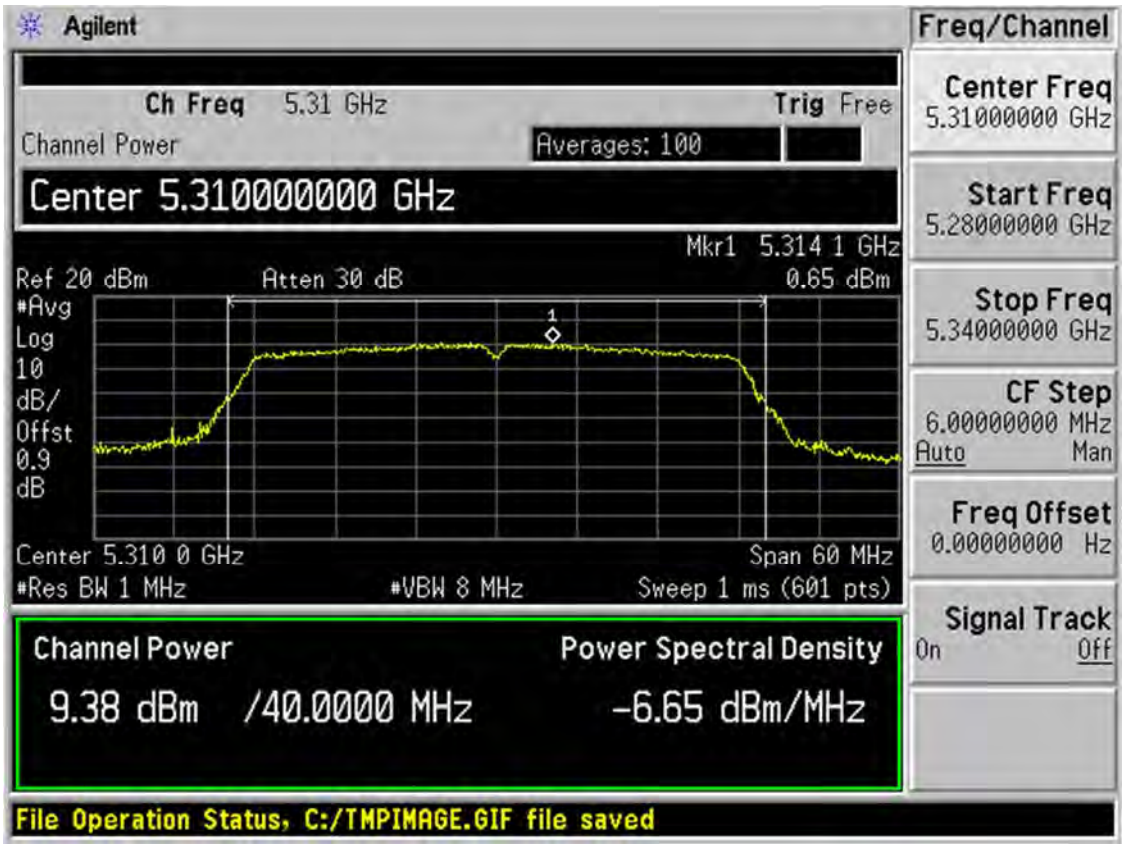
Band II 11ac(HT20) CH64



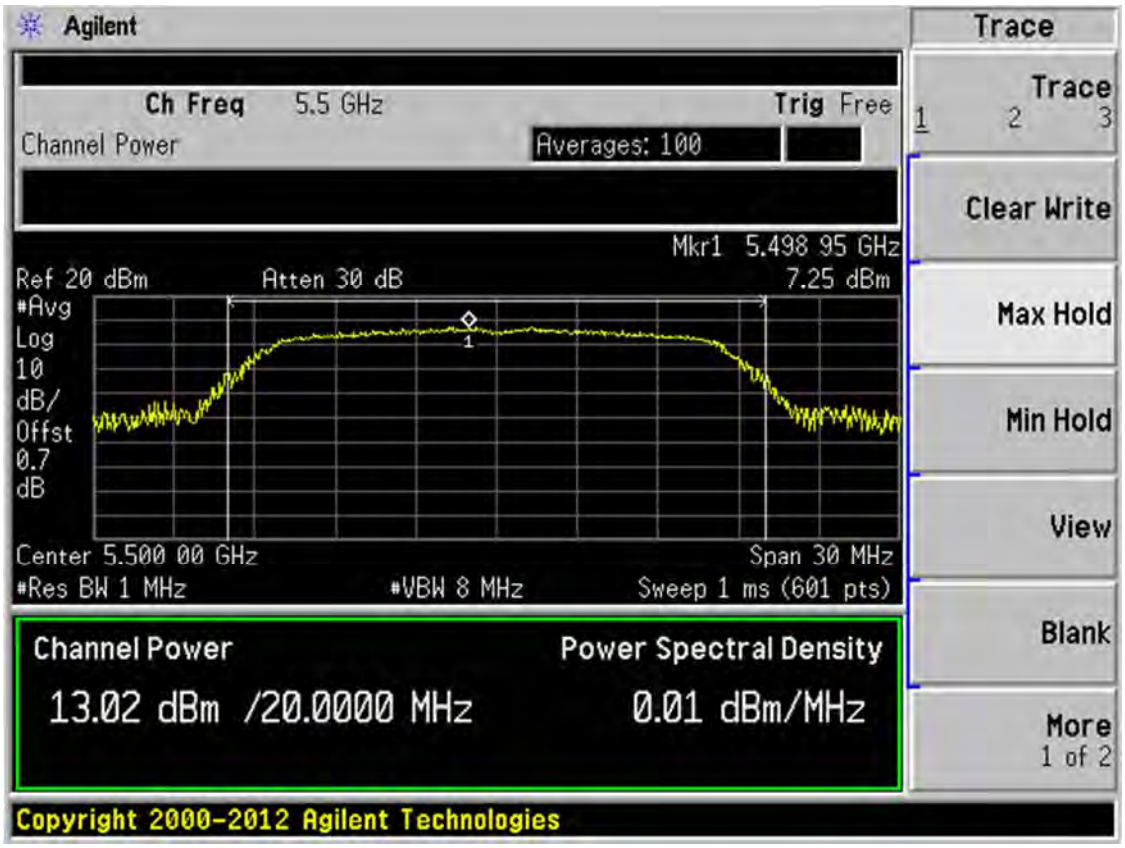
Band II 11ac(HT40) CH54



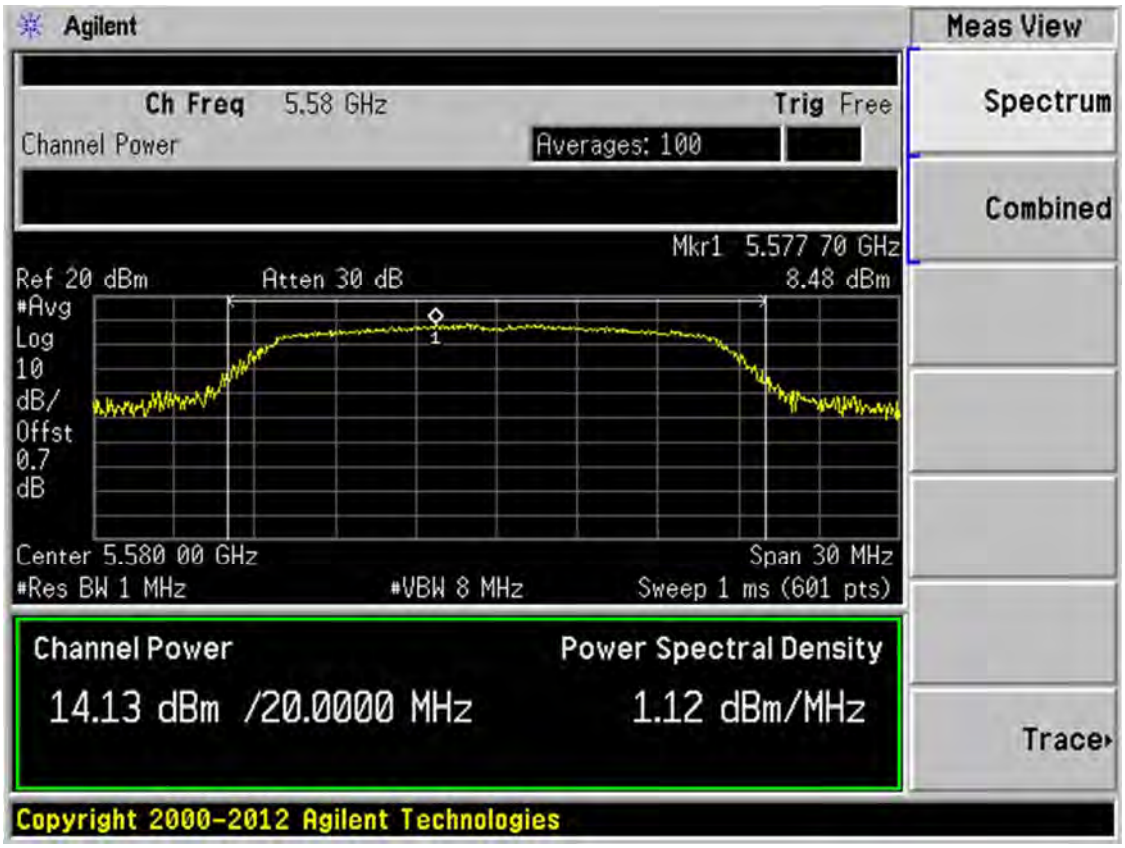
Band II 11ac(HT40) CH62



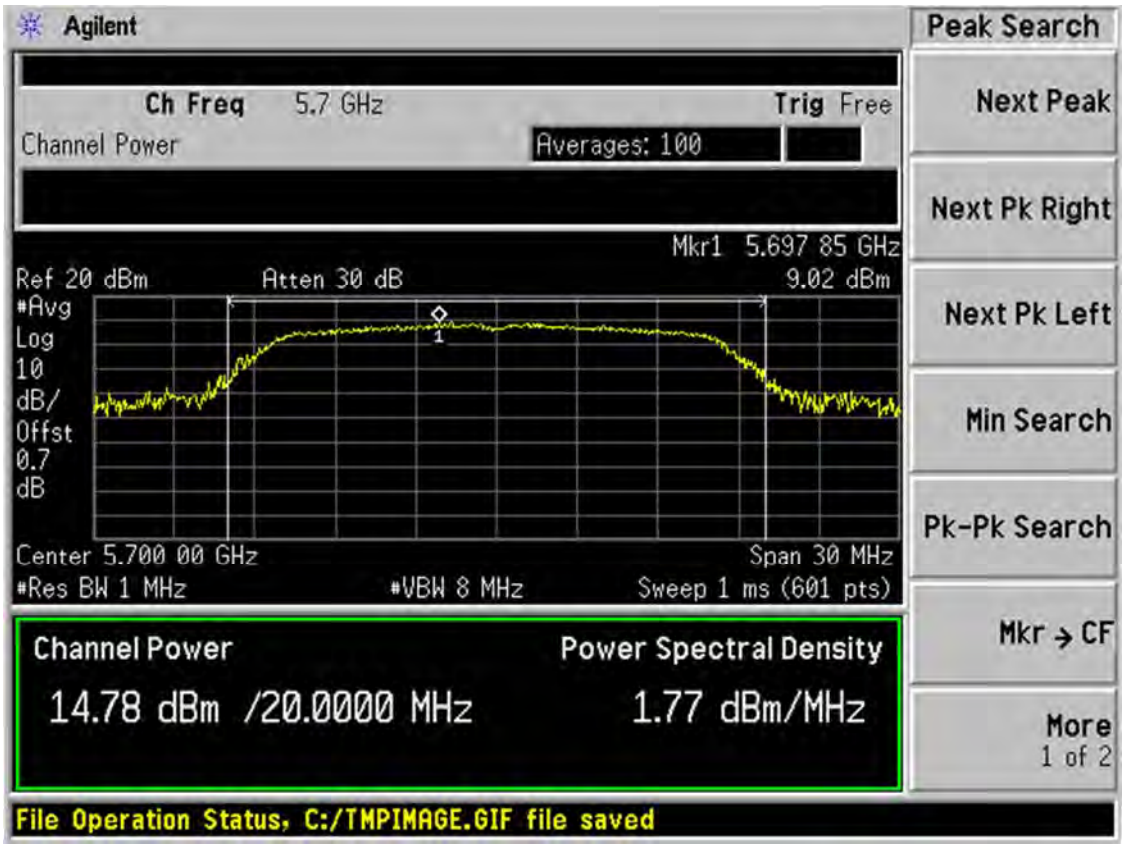
Band III 11a CH100



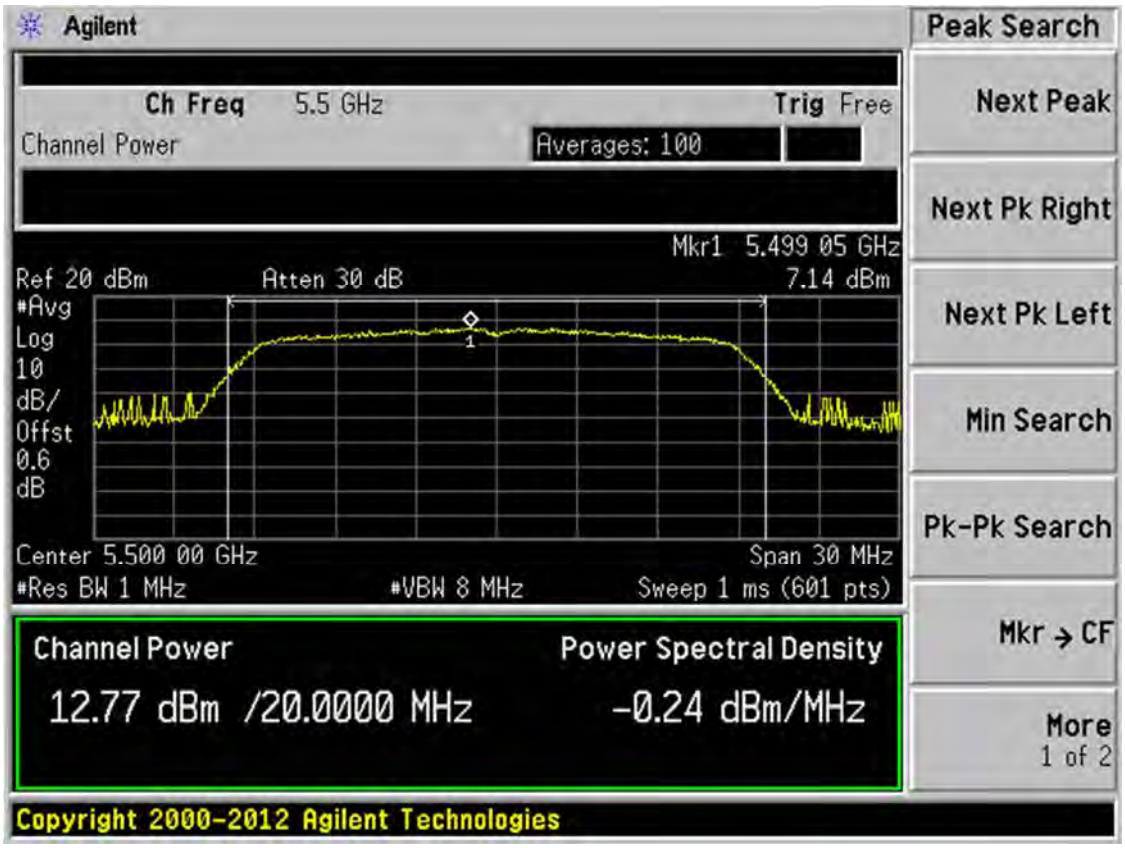
Band III 11a CH116



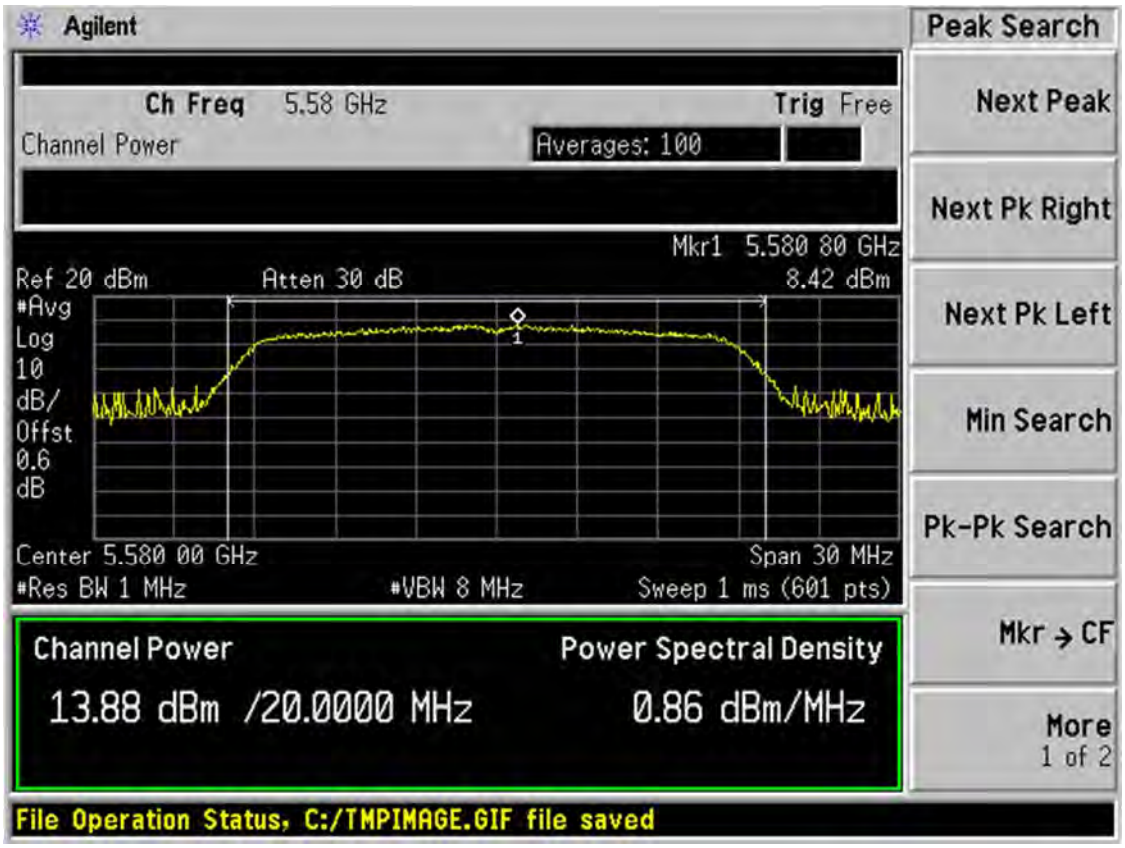
Band III 11a CH140



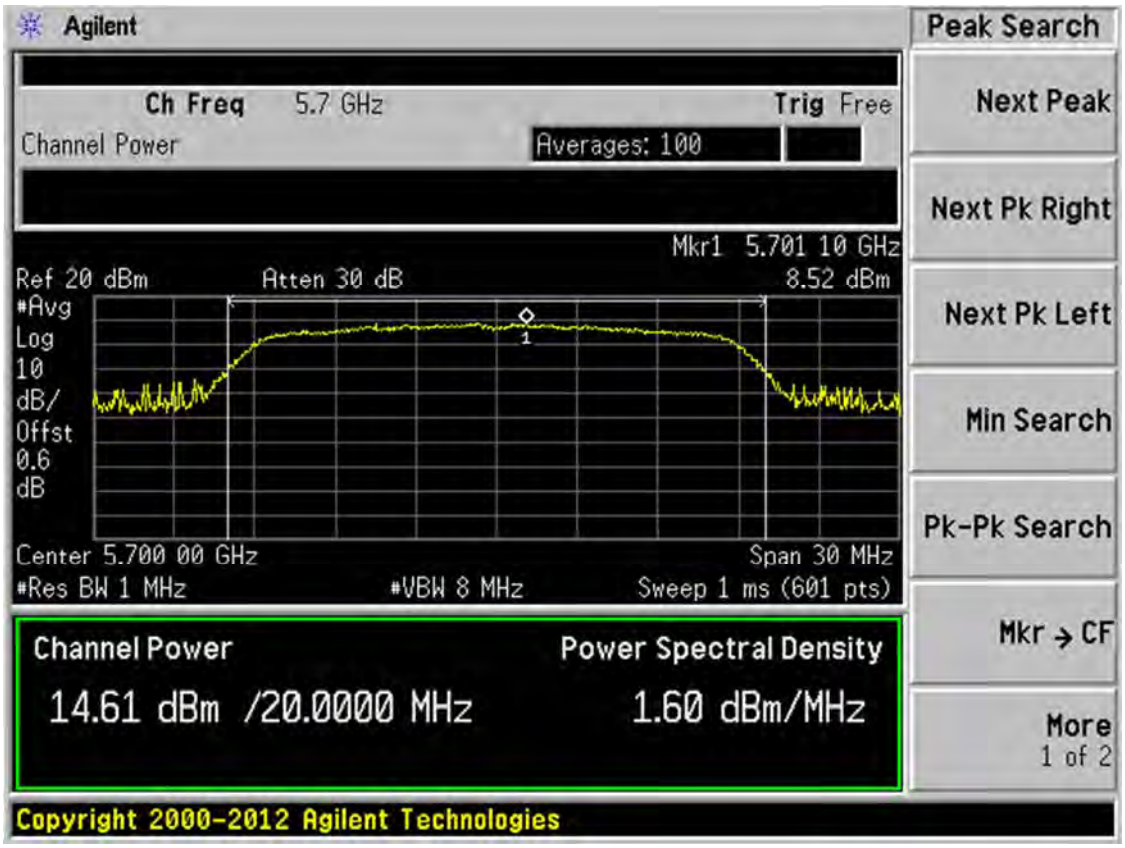
Band III 11n(HT20) CH100



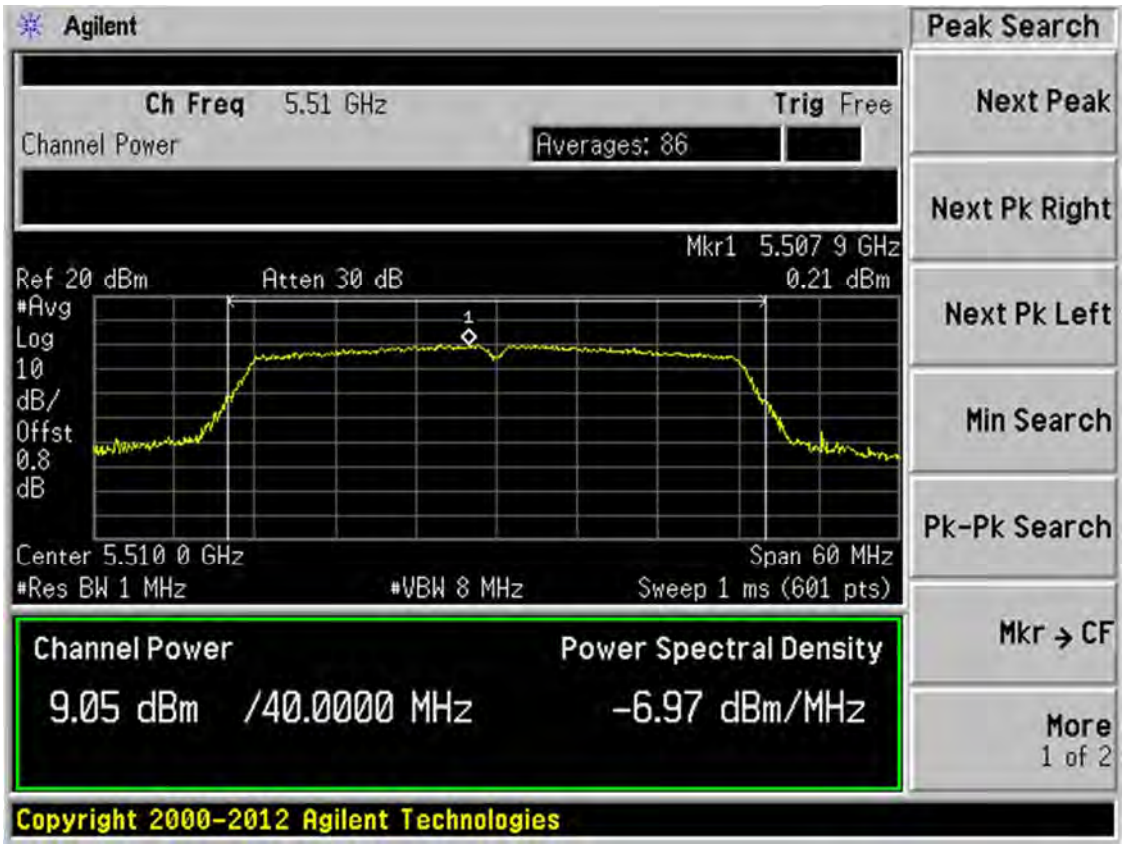
Band III 11n(HT20) CH116



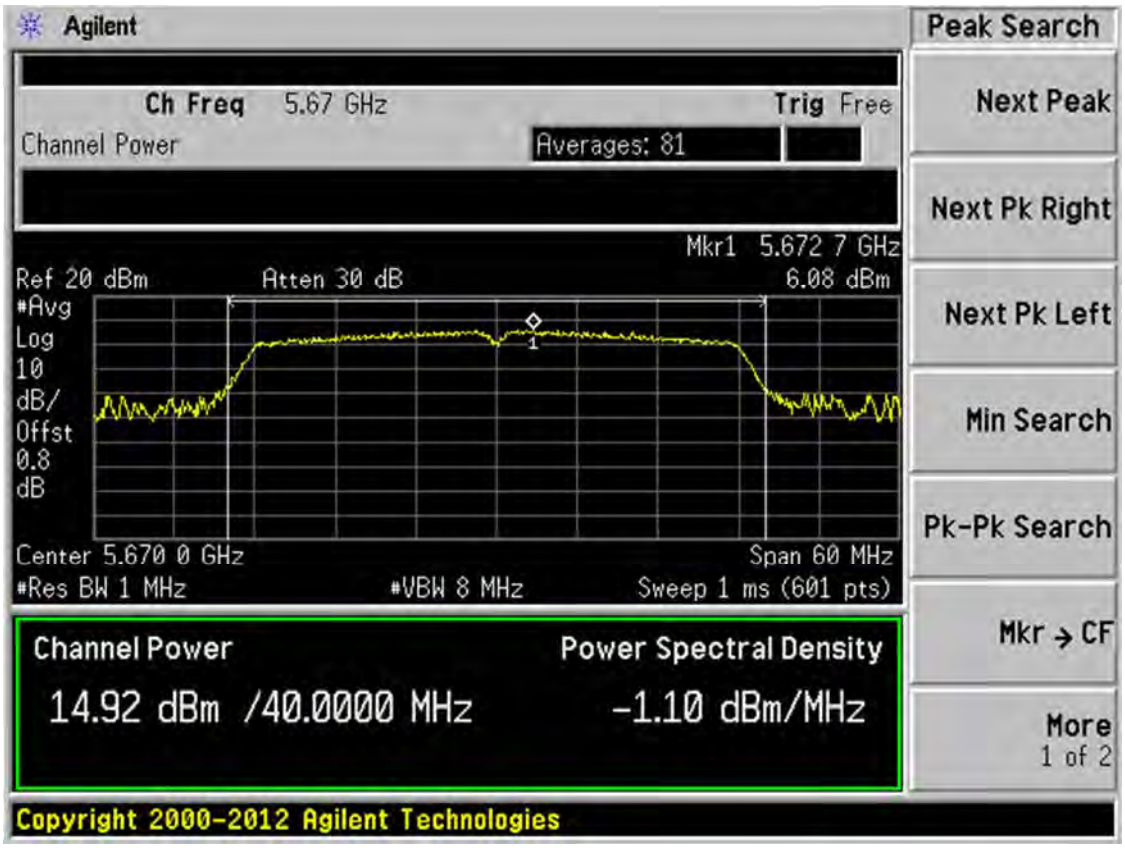
Band III 11n(HT20) CH140



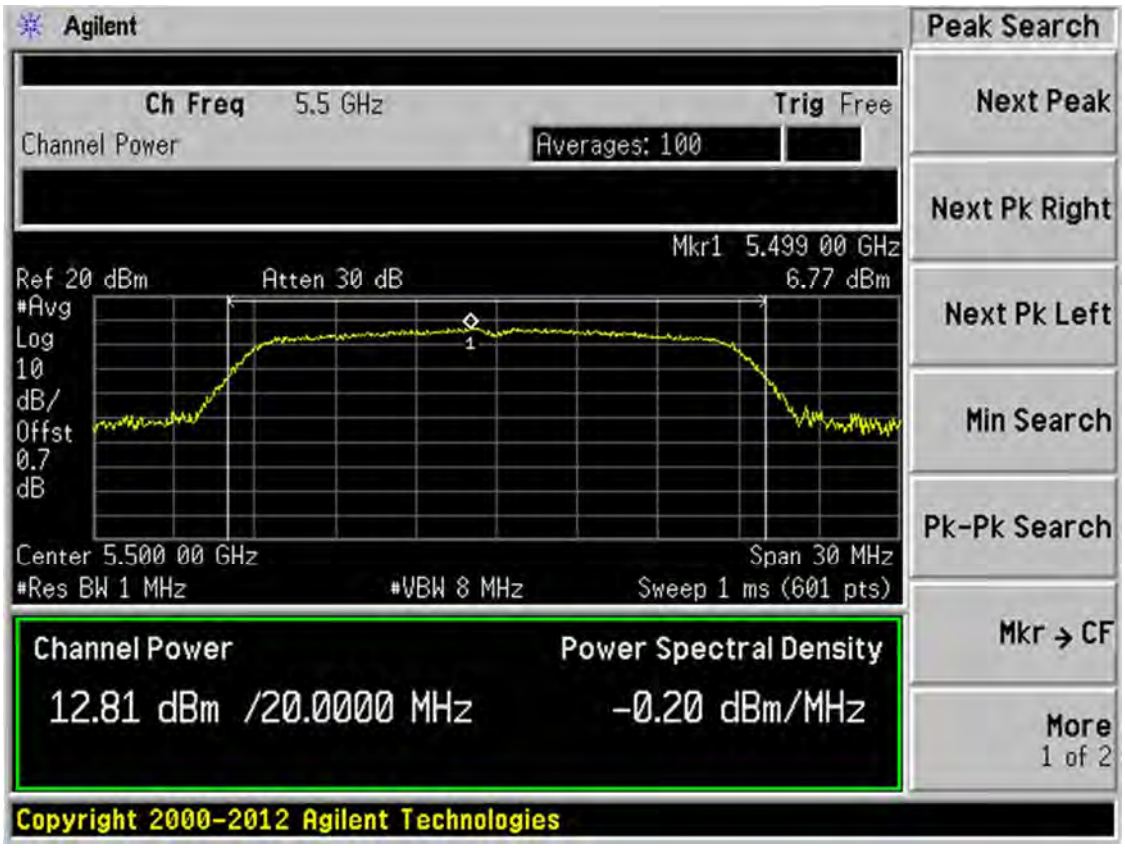
Band III 11n(HT40) CH102



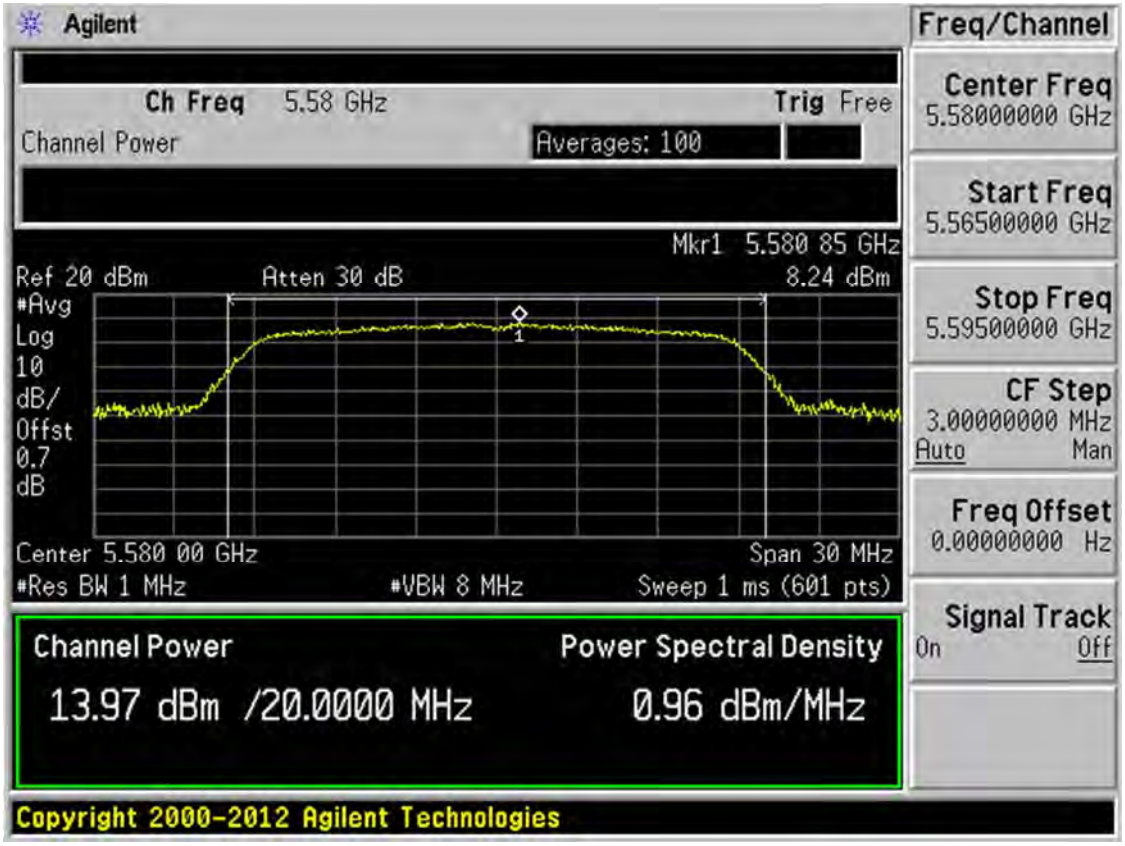
Band III 11n(HT40) CH134



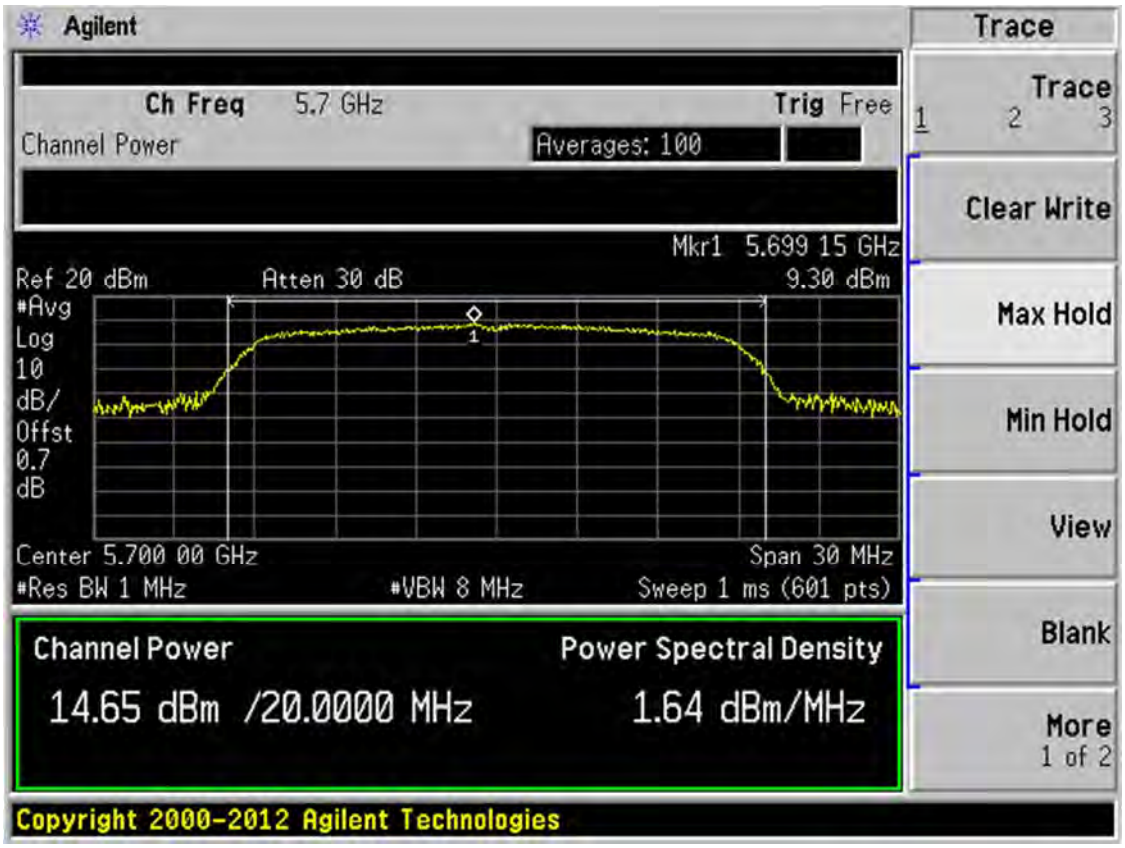
Band III 11ac(HT20) CH100



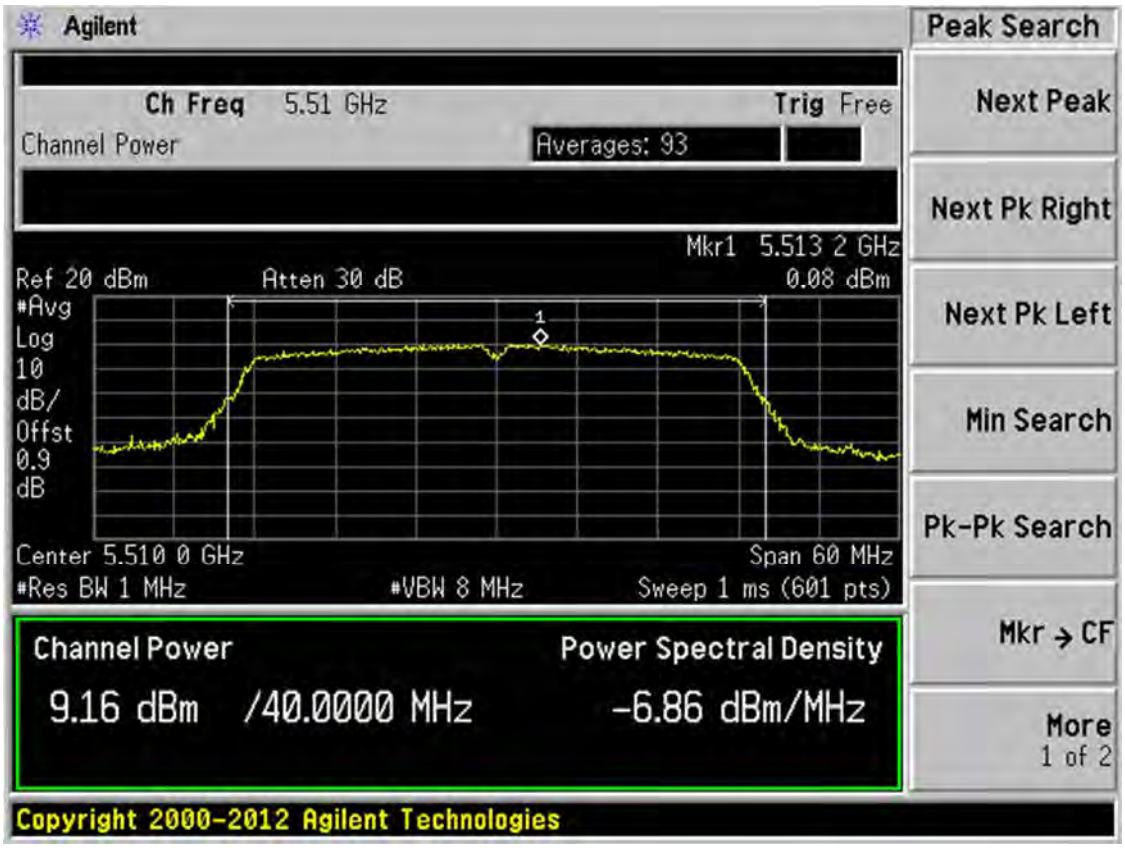
Band III 11ac(HT20) CH116



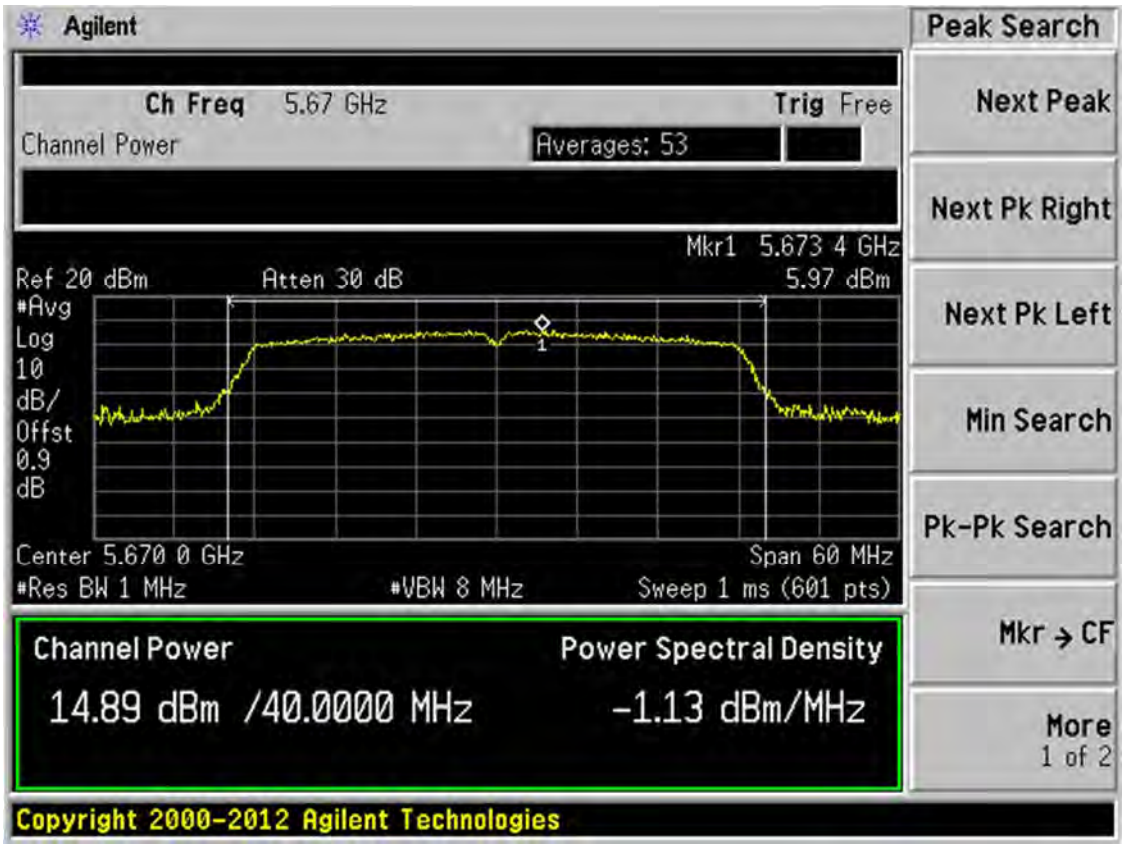
Band III 11ac(HT20) CH140



Band III 11ac(HT40) CH102



Band III 11ac(HT40) CH134



Band IV 11a CH149

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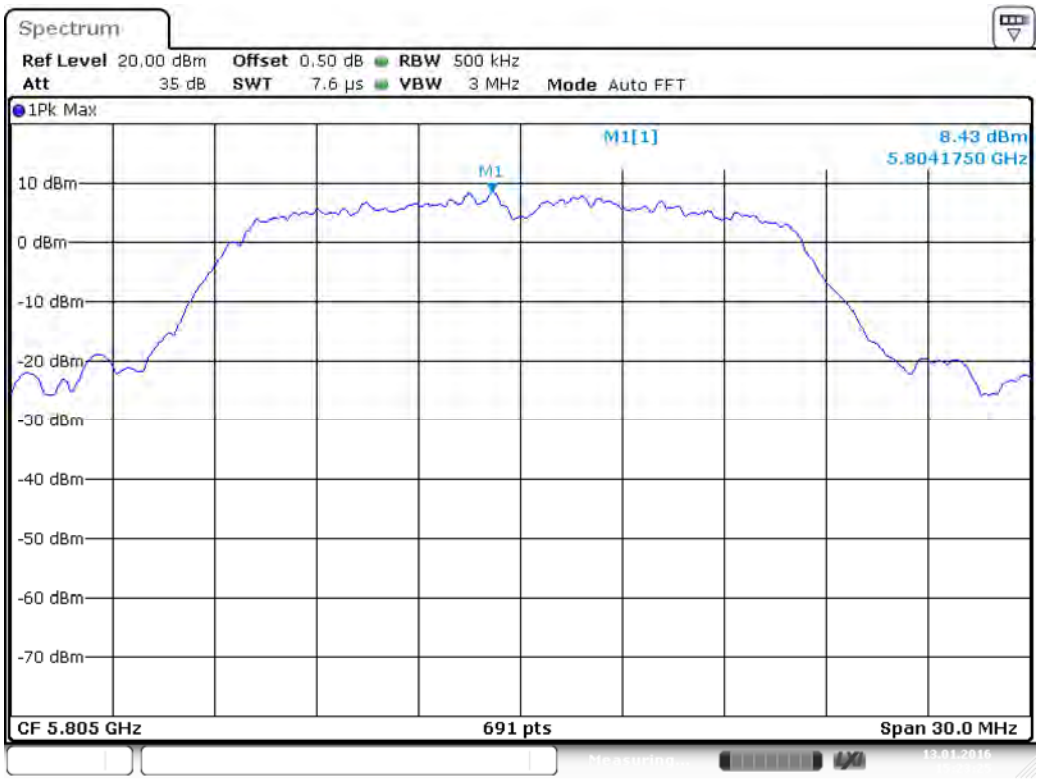
Band IV 11a CH157

Date: 13.JAN.2016 15:22:51

Band IV 11a CH161



Date: 13.JAN.2016 15:23:25