# FCC/IC RF TEST REPORT

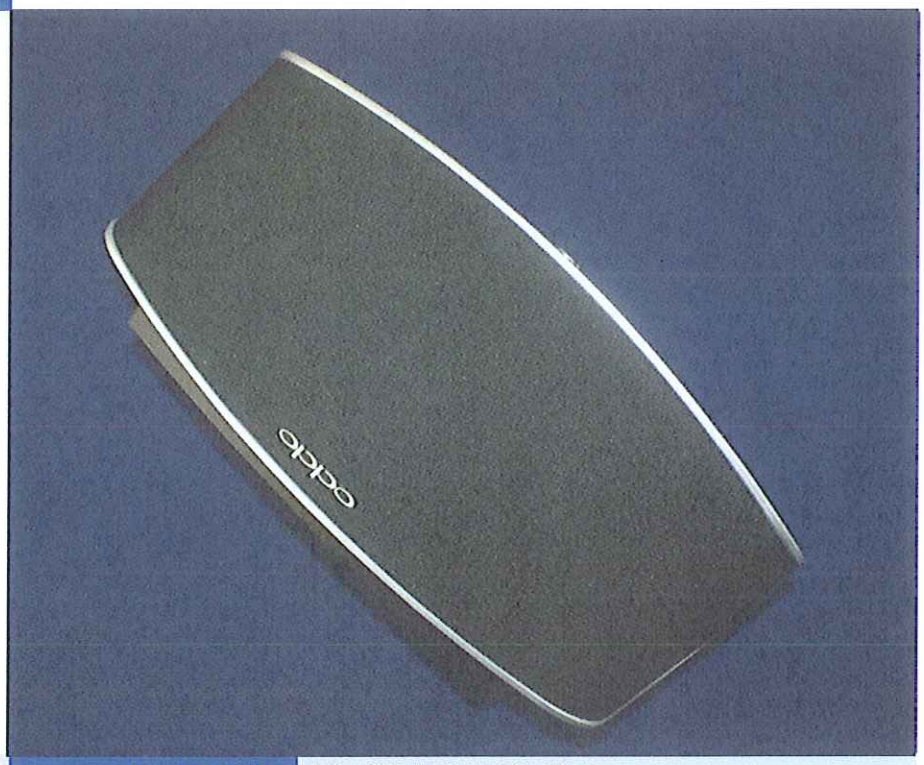
ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR

## Wi-Fi Speaker

ISSUED TO
Dongguan Digital AV Technology Corp., Ltd.

2nd floor F2-S3 district, No.18 Haibin road, Wusha, Changan, Dongguan, Guangdong




Prepared by: Cao Shaodong (Engineer)
Date Feb. 2. 2016

Approved by: Wei Yanquan (Chief Engineer)
Date Feb. 2, 2016

| | |
|---|---|
| Report No.: | BL-SZ15B0132-604 |
| EUT Type: | Wi-Fi Speaker |
| Model Name: | Sonica |
| Brand Name: | OPPO |
| Test Standard: | 47 CFR Part 15 Subpart E |
| | IC RSS-Gen (Issue 4, November 2014) |
| | IC RSS-247 (Issue 1, May 2015) |
| FCC ID: | 2AGM4-SONICA |
| IC Number: | 20960-SONICA |
| Test conclusion: | Pass |
| Test Date: | Nov. 15, 2015 ~ Jan. 31, 2016 |
| Date of Issue: | Feb. 2, 2016 |



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**Revision History**

| Version | Issue Date | Revisions |
|---|---|---|
| Rev. 01 | Dec. 17, 2015 | Initial Issue |
| Rev. 02 | Jan. 7, 2016 | Chapter 5.1, 5.3, A.1 and A.4 are updated |
| Rev. 03 | Feb. 2, 2016 | A.4 are updated. |

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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.<br>The laboratory has been listed by US Federal Communications Commission to perform electromagnetic emission measurements. The recognition numbers of test site are 832625.<br>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.<br>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 | Dongguan Digital AV Technology Corp., Ltd. |
| Address | 2nd floor F2-S3 district, No.18 Haibin road, Wusha, Changan, Dongguan, Guangdong |

## 2.2 Manufacturer

| | |
|---|---|
| Manufacturer | Dongguan Digital AV Technology Corp., Ltd. |
| Address | 2nd floor F2-S3 district, No.18 Haibin road, Wusha, Changan, Dongguan, Guangdong |

## 2.3 Factory

| | |
|---|---|
| Factory | Dongguan Digital AV Technology Corp., Ltd. |
| Address | 2nd floor F2-S3 district, No.18 Haibin road, Wusha, Changan, Dongguan, Guangdong |

## 2.4 General Description for Equipment under Test (EUT)

| | |
|---|---|
| EUT Type | Wi-Fi Speaker |
| Model Name | Sonica |
| Hardware Version | 1.0 |
| Software Version | Linux 3.10.26 |
| Network and Wireless connectivity | Bluetooth 3.0, Bluetooth 4.0 Low Energy (BLE)<br>WIFI 802.11a, 802.11b, 802.11g, 802.11n(HT20/40) and 802.11ac |

## 2.5 Ancillary Equipment

| | | |
|---|---|---|
| Ancillary Equipment 1 | Power Cable | |
| | Brand Name | N/A |
| | Model No. | N/A |
| | Length(Approx.) | 1.7 m |

## 2.6 Technical Information

| | | |
|---|---|---|
| Frequency Range | | Band I: 5150 MHz to 5250 MHz,<br>Band II: 5250 MHz to 5350 MHz,<br>Band III: 5470 MHz to 5725 MHz<br>Band IV: 5725 MHz to 5850 MHz |
| Modulation technology | | OFDM |
| Modulation Type | | 256QAM, 64QAM, 16QAM, BPSK, QPSK |
| Product Type | | Indoor |
| Transfer Rate (Mbps) | | 802.11a: 54/ 48/ 36 / 24 / 18 / 9/ 6 Mbps<br>802.11n: up to 135 Mbps<br>802.11ac: up to V9 |
| Channel Bandwidth | | 802.11a: 20 MHz<br>802.11n: 20 MHz, 40 MHz<br>802.11ac: 20 MHz, 40 MHz, 80 MHz |
| Maximum Output Power | | Band I: 17.35 dBm<br>Band II: 19.15 dBm<br>Band III: 19.38 dBm<br>Band IV: 19.34 dBm |
| Antenna System (eg., MIMO, Smart Antenna) | | Cyclic Delay Diversity (CDD) |
| Antenna Type | Antenna 0 (ANT 0) | PCB Antenna |
| | Antenna 1 (ANT 1) | |
| Antenna Gain | Antenna 0 (ANT 0) | Band I: 5150 MHz to 5250 MHz: 6.3 dBi<br>Band II: 5250 MHz to 5350 MHz: 6.4 dBi<br>Band III: 5470 MHz to 5725 MHz: 5.3 dBi<br>Band IV: 5725 MHz to 5850 MHz: 3.7 dBi |
| | Antenna 1 (ANT 1) | Band I: 5150 MHz to 5250 MHz: 3.4 dBi<br>Band II: 5250 MHz to 5350 MHz: 3.2 dBi<br>Band III: 5470 MHz to 5725 MHz: 3.3 dBi<br>Band IV: 5725 MHz to 5850 MHz: 3.7 dBi |
| Total directional gain | For power spectral density(PSD) measurements | Band I: 5150 MHz to 5250 MHz: 6.3 dBi<br>Band II: 5250 MHz to 5350 MHz: 6.4dBi<br>Band III: 5470 MHz to 5725 MHz: 5.3 dBi<br>Band IV: 5725 MHz to 5850 MHz: 3.7 dBi<br>Formulas: Directional gain = $G_{ANT}$ + Array Gain, *Array Gain = 10 log($N_{ANT}/N_{SS}$) dB*. $N_{SS}$ =2, $G_{ANT}$ set equal to the gain of the antenna having the highest gain. |
| | For power measurements | Band I: 5150 MHz to 5250 MHz: 6.3 dBi<br>Band II: 5250 MHz to 5350 MHz: 6.4 dBi<br>Band III: 5470 MHz to 5725 MHz: 5.3 dBi<br>Band IV: 5725 MHz to 5850 MHz: 3.7 dBi<br>Formulas: Directional gain = $G_{ANT}$ + Array Gain, *Array Gain* = 0. |
| | For Conducted Out-of-Band and Spurious | Band I: 5150 MHz to 5250 MHz: 6.3 dBi<br>Band II: 5250 MHz to 5350 MHz: 6.4dBi<br>Band III: 5470 MHz to 5725 MHz: 5.3 dBi |

| | | |
|---|---|---|
| | Measurements | Band IV: 5725 MHz to 5850 MHz: 3.7 dBi<br>Formulas: Directional gain = $G_{ANT}$ + Array Gain, *Array Gain = 10 log($N_{ANT}/N_{SS}$) dB*. $N_{SS}$ =2, $G_{ANT}$ set equal to the gain of the antenna having the highest gain. |
| About the Product | | The equipment is Wi-Fi Speaker, intended for used with information technology equipment. |

| Band I (5150 - 5250 MHz ) Power level setup in software | | | | |
|---|---|---|---|---|
| Mode | Channel | Frequency (MHz) | Soft Set | |
| 11a | CH36 | 5180 | 1a | 1a |
| 11a | CH44 | 5220 | 1a | 1a |
| 11a | CH48 | 5240 | 1a | 1a |
| 11n (HT20) | CH36 | 5180 | 1e | 1e |
| 11n (HT20) | CH44 | 5220 | 1e | 1e |
| 11n (HT20) | CH48 | 5240 | 1e | 1e |
| 11n (HT40) | CH38 | 5190 | 1b | 1b |
| 11n (HT40) | CH46 | 5230 | 1f | 1f |
| 11ac (HT20) | CH36 | 5180 | 19 | 19 |
| 11ac (HT20) | CH44 | 5220 | 19 | 19 |
| 11ac (HT20) | CH48 | 5240 | 19 | 19 |
| 11ac (HT40) | CH38 | 5190 | 1a | 1a |
| 11ac (HT40) | CH46 | 5230 | 1c | 1c |
| 11ac (HT80) | CH42 | 5210 | 1a | 1a |

| Band II (5250 - 5350 MHz ) Power level setup in software | | | | |
|---|---|---|---|---|
| Mode | Channel | Frequency (MHz) | Soft Set | |
| 11a | CH52 | 5260 | 1a | 1a |
| 11a | CH56 | 5280 | 1a | 1a |
| 11a | CH64 | 5320 | 1a | 1a |
| 11n (HT20) | CH52 | 5260 | 1e | 1e |
| 11n (HT20) | CH56 | 5280 | 1e | 1e |
| 11n (HT20) | CH64 | 5320 | 1e | 1e |
| 11n (HT40) | CH54 | 5270 | 1f | 1f |
| 11n (HT40) | CH62 | 5310 | 1c | 1c |
| 11ac (HT20) | CH52 | 5260 | 19 | 19 |
| 11ac (HT20) | CH56 | 5280 | 19 | 19 |
| 11ac (HT20) | CH64 | 5320 | 19 | 19 |
| 11ac (HT40) | CH52 | 5260 | 1c | 1c |
| 11ac (HT40) | CH56 | 5280 | 1b | 1b |
| 11ac (HT80) | CH58 | 5290 | 1b | 1b |

| Band III (5470 - 5725 MHz ) Power level setup in software | | | | |
|---|---|---|---|---|
| Mode | Channel | Frequency (MHz) | Soft Set | |
| 11a | CH100 | 5500 | 1a | 1a |
| 11a | CH116 | 5580 | 1a | 1a |
| 11a | CH140 | 5700 | 1a | 1a |
| 11n (HT20) | CH100 | 5500 | 1e | 1e |
| 11n (HT20) | CH116 | 5580 | 1e | 1e |
| 11n (HT20) | CH140 | 5700 | 1e | 1e |
| 11n (HT40) | CH102 | 5510 | 1c | 1c |
| 11n (HT40) | CH134 | 5670 | 1f | 1f |
| 11ac (HT20) | CH100 | 5500 | 19 | 19 |
| 11ac (HT20) | CH116 | 5580 | 19 | 19 |
| 11ac (HT20) | CH140 | 5700 | 19 | 19 |
| 11ac (HT40) | CH102 | 5510 | 1b | 1b |
| 11ac (HT40) | CH134 | 5670 | 1c | 1c |
| 11ac (HT80) | CH106 | 5530 | 1b | 1b |

| Band IV (5725 - 5850 MHz ) Power level setup in software | | | | |
|---|---|---|---|---|
| Mode | Channel | Frequency (MHz) | Soft Set | |
| 11a | CH149 | 5745 | 1a | 1a |
| 11a | CH157 | 5785 | 1a | 1a |
| 11a | CH161 | 5825 | 1a | 1a |
| 11n (HT20) | CH149 | 5745 | 1e | 1e |
| 11n (HT20) | CH157 | 5785 | 1e | 1e |
| 11n (HT20) | CH161 | 5825 | 1e | 1e |
| 11n (HT40) | CH151 | 5755 | 1b | 1b |
| 11n (HT40) | CH159 | 5795 | 1f | 1f |
| 11ac (HT20) | CH149 | 5745 | 19 | 19 |
| 11ac (HT20) | CH157 | 5785 | 19 | 19 |
| 11ac (HT20) | CH161 | 5805 | 19 | 19 |
| 11ac (HT40) | CH151 | 5755 | 1c | 1c |
| 11ac (HT40) | CH159 | 5795 | 1c | 1c |
| 11ac (HT80) | CH155 | 5775 | 1b | 1b |

## 2.7 Channel List

| 20 MHz | | 40 MHz | | 80 MHz | |
|---|---|---|---|---|---|
| Channel Number | Frequency (MHz) | Channel Number | Frequency (MHz) | Channel Number | Frequency (MHz) |
| 36 | 5180 | 38 | 5190 | 42 | 5210 |
| 40 | 5200 | 46 | 5230 | 58 | 5290 |
| 44 | 5220 | 54 | 5270 | 106 | 5530 |
| 48 | 5240 | 62 | 5310 | 155 | 5775 |
| 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 |

For 802.11ac(HT80)

| Band I (5150 - 5250 MHz) | | | Band II (5250 - 5350 MHz) | | |
|---|---|---|---|---|---|
| Channel Number | Channel | Frequency (MHz) | Channel Number | Channel | Frequency (MHz) |
| 42 | Low | 5210 | 58 | Low | 5290 |

| Band III (5150 - 5250 MHz) | | | Band IV (5470 - 5725 MHz) | | |
|---|---|---|---|---|---|
| Channel Number | Channel | Frequency (MHz) | Channel Number | Channel | Frequency (MHz) |
| 106 | Low | 5530 | 155 | Low | 5775 |

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 |
| | 11ac(80 MHz) | V0 | OFDM | BPSK | 42 | 58 | 106 | 155 |
| Emission | 11a | 6 | OFDM | BPSK | 48/44/36 | 64/60/52 | 144/140/116/100 | 161/157/149/144 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Band width & 99% Occupied Bandwidth | 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 |
| | 11ac(80 MHz) | V0 | OFDM | BPSK | 42 | 58 | 106 | 155 |
| 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 MHz) | 13.5 | OFDM | BPSK | N/A | N/A | N/A | 159/151 |
| | 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 |
| | 11ac(80 MHz) | V0 | OFDM | BPSK | N/A | N/A | N/A | 155 |
| 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 |
| | 11ac(80 MHz) | V0 | OFDM | BPSK | 42 | 58 | 106 | 155 |
| 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 |
| | 11ac(80 MHz) | V0 | OFDM | BPSK | 42 | 58 | 106 | 155 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 |
| | 11ac(80 MHz) | V0 | OFDM | BPSK | 42 | 58 | 106 | 155 |
| 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 |
| | 11ac(80 MHz) | V0 | OFDM | BPSK | 42 | 58 | 106 | 155 |
| Band Edge | 11a | 6 | OFDM | BPSK | 36 | -- | 64 | 100 |
| | 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 |
| | 11ac(80 MHz) | V0 | OFDM | BPSK | -- | -- | 58 | 106 |

# 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 | KDB Publication 662911 D01v02r01 | Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc) |
| 4 | IC RSS-Gen (Issue 4, Nov. 2014) | General Requirements for Compliance of Radio Apparatus |
| 5 | IC RSS-247 (Issue 1, May 2015) | Digital Transmission Systems (DTSs), Frequency Hopping Systems(FHSs) and Licence-Exemp Local Area Network (LE-LAN) Devices |
| 6 | 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 |
| 7 | 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) | -20℃ |
| | HT (High Temperature) | +55℃ |
| Working Voltage of the EUT | NV (Normal Voltage) | 120 V |
| | LV (Low Voltage) | 100 V |
| | HV (High Voltage) | 240 V |

## 4. 2 Test Equipment List

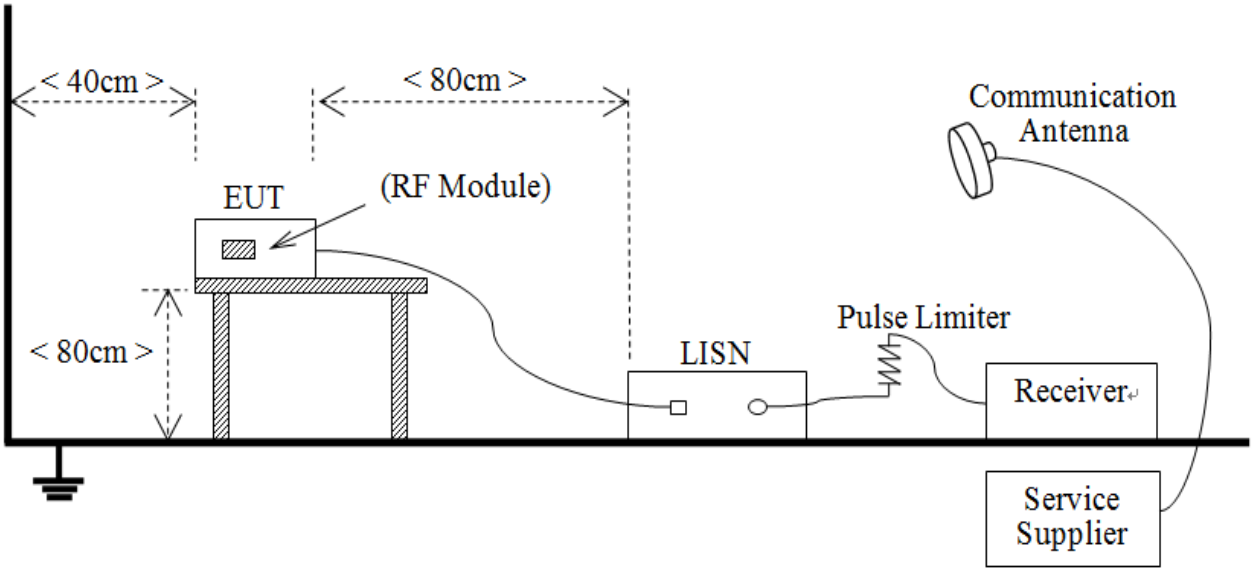
| Description | Manufacturer | Model | Serial No. | Cal. Date | Cal. Due |
|---|---|---|---|---|---|
| Spectrum Analyzer | ROHDE&SCHWARZ | FSV-30 | 103118 | 2015.07.16 | 2016.07.15 |
| Vector Signal Generator | ROHDE&SCHWARZ | SMBV100A | 177746 | 2015.07.16 | 2016.07.15 |
| Signal Generator | ROHDE&SCHWARZ | 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 | 2015.10.18 | 2016.10.17 |
| 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

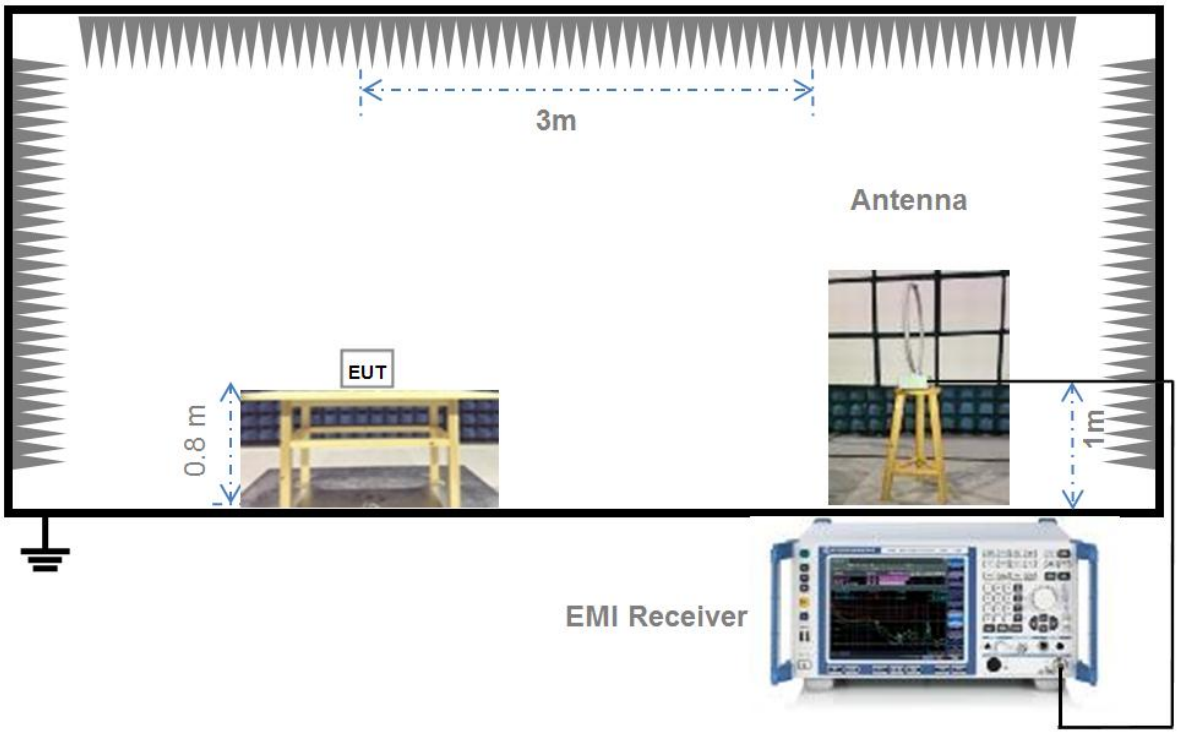

**(Diagram 1)**

### 4.3.2 For AC Power Supply Port Test



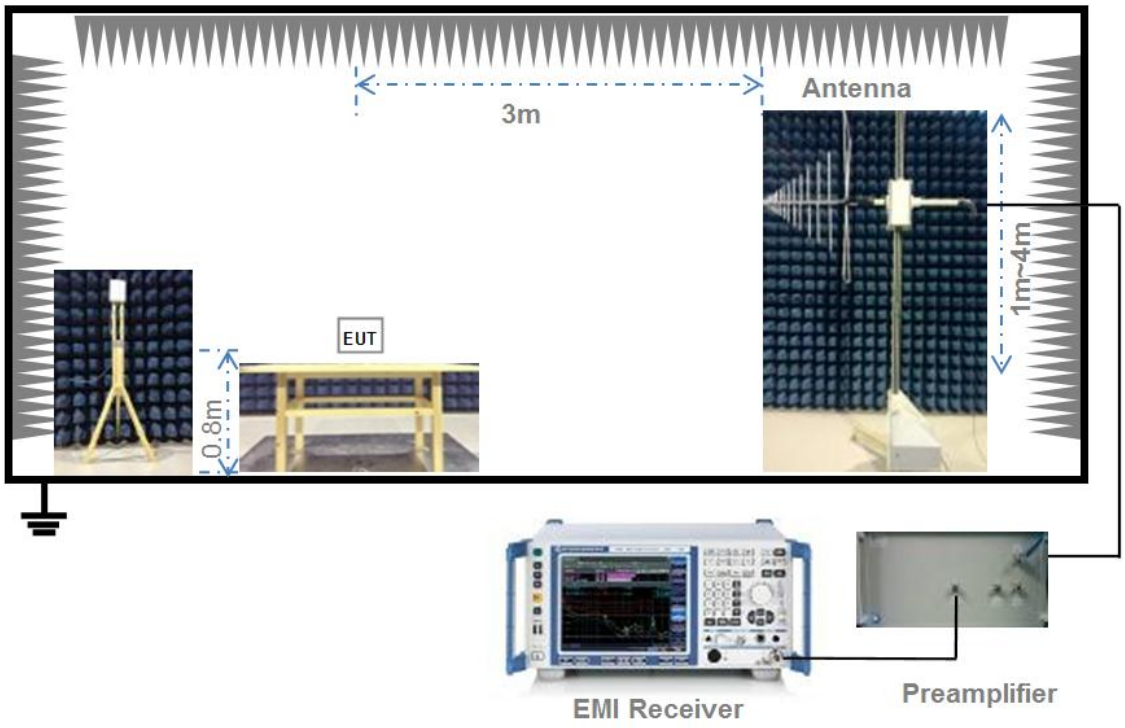

**(Diagram 2)**

4.3.3 For Radiated Test (Below 30 MHz)



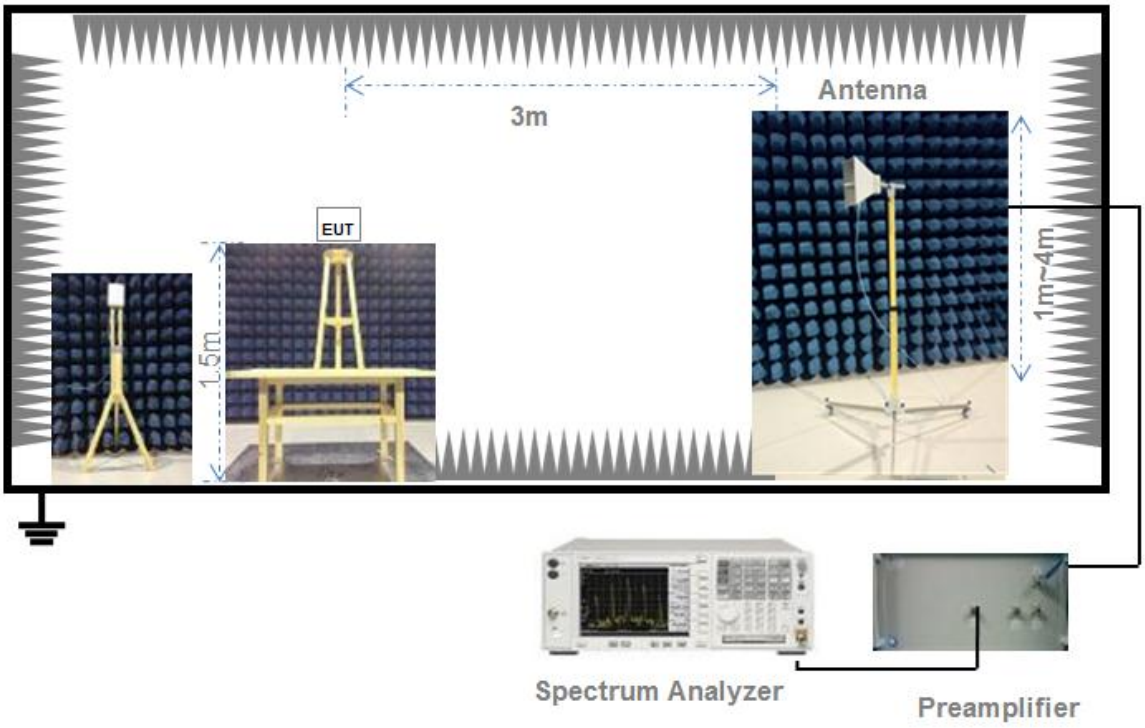

**(Diagram 3)**

4.3.4 For Radiated Test (30 MHz-1 GHz)



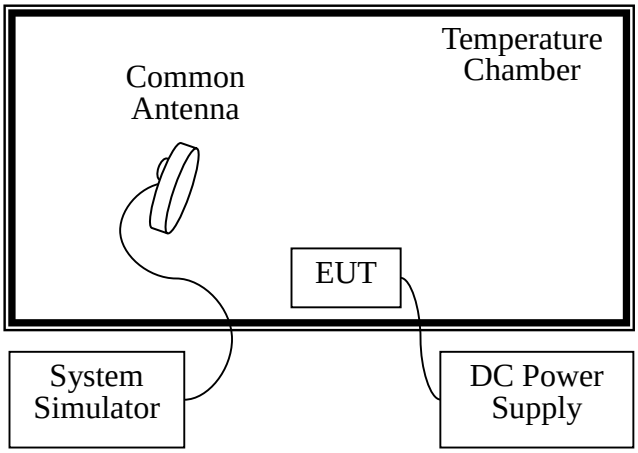

**(Diagram 4)**

### 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.

The E.I.R.P used radiated test method. At a test site that has been validated using the procedures of ANSI C63.4 or the latest CISPR 16-1-4 for measurements above 1 GHz, so as to simulate a near free-space environment.

### 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 |

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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

Set the spectrum analyzer or EMI receiver span to view the entire emission bandwidth.

1. Set RBW = 510 kHz/1 MHz, VBW ≥ 3*RBW, Sweep time = Auto, Detector = RMS.
2. Allow the sweeps to continue until the trace stabilizes.
3. Use the peak marker function to determine the maximum amplitude level.
4. The E.I.R.P spectral density used radiated test method. At a test site that has been validated using the procedures of ANSI C63.4 or the latest CISPR 16-1-4 for measurements above 1 GHz, so as to simulate a near free-space environment.

### 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<br>5850 -5860 MHz: e.i.r.p. -17 dBm<br>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<br>5850 -5860 MHz: e.i.r.p. -17 dBm<br>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 Radiated Spurious Emissions 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)<br>5850 -5860 MHz: e.i.r.p. -17 dBm (78.2 dBuV/m@3m)<br>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 ) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Note: Transmitting antennas of directional gain in Band I( 5150 MHz to 5250 MHz) is 6.3 dBi<br>Formulas: Directional gain = $G_{ANT}$ + Array Gain, *Array Gain* = 0. | | | | | | | | | |
| Mode | Channel | Frequency (MHz) | Conducted Power 0 (dBm) | Conducted Power 1 (dBm) | Conducted Power Total (dBm) | Conducted Power Total (mW) | FCC Limit (mW) | IC Limit (mW) | Verdict |
| 11a | CH36 | 5180 | 13.55 | 12.75 | 16.18 | 41.48 | 234 | N/A | Pass |
| 11a | CH44 | 5220 | 12.68 | 13.12 | 15.92 | 39.05 | 234 | N/A | Pass |
| 11a | CH48 | 5240 | 12.93 | 13.01 | 15.98 | 39.63 | 234 | N/A | Pass |
| 11n (HT20) | CH36 | 5180 | 13.20 | 12.94 | 13.20 | 40.57 | 234 | N/A | Pass |
| 11n (HT20) | CH44 | 5220 | 12.98 | 13.15 | 12.98 | 40.51 | 234 | N/A | Pass |
| 11n (HT20) | CH48 | 5240 | 13.10 | 13.25 | 13.10 | 41.55 | 234 | N/A | Pass |
| 11n (HT40) | CH38 | 5190 | 12.24 | 11.92 | 15.09 | 32.31 | 234 | N/A | Pass |
| 11n (HT40) | CH46 | 5230 | 14.32 | 14.35 | 17.35 | 54.27 | 234 | N/A | Pass |
| 11ac (HT20) | CH36 | 5180 | 13.26 | 13.82 | 16.56 | 45.28 | 234 | N/A | Pass |
| 11ac (HT20) | CH44 | 5220 | 13.74 | 14.03 | 16.90 | 48.95 | 234 | N/A | Pass |
| 11ac (HT20) | CH48 | 5240 | 13.63 | 13.61 | 16.63 | 46.03 | 234 | N/A | Pass |
| 11ac (HT40) | CH38 | 5190 | 14.51 | 14.47 | 17.50 | 56.24 | 234 | N/A | Pass |
| 11ac (HT40) | CH46 | 5230 | 14.89 | 14.83 | 17.87 | 61.24 | 234 | N/A | Pass |
| 11ac (HT80) | CH42 | 5210 | 9.87 | 9.88 | 12.89 | 19.43 | 234 | N/A | Pass |

| Band II (5250 - 5350 MHz ) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Note1: Transmitting antennas of directional gain in Band II( 5250 MHz to 5350 MHz) is 6.4 dBi<br>Formulas: Directional gain = $G_{ANT}$ + Array Gain, *Array Gain* = 0.<br>Note2: 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 | Conducted Power 0 (dBm) | Conducted Power 1 (dBm) | Conducted Power Total (dBm) | Conducted Power Total (mW) | FCC: 11 dBm + 10log B (mW) | IC: 11 dBm + 10log B (mW) | FCC Limit (mW) | IC Limit (mW) | Verdict |
| 11a | CH52 | 12.90 | 13.36 | 16.15 | 41.18 | 271 | 194 | 229 | 194 | Pass |
| 11a | CH56 | 13.31 | 12.96 | 16.15 | 41.20 | 257 | 193 | 229 | 193 | Pass |
| 11a | CH64 | 12.94 | 12.90 | 15.93 | 39.18 | 397 | 195 | 229 | 195 | Pass |
| 11n (HT20) | CH52 | 13.50 | 13.53 | 16.53 | 44.93 | 259 | 204 | 229 | 204 | Pass |
| 11n (HT20) | CH60 | 13.51 | 13.37 | 16.45 | 44.17 | 244 | 204 | 229 | 204 | Pass |
| 11n (HT20) | CH64 | 13.56 | 13.52 | 16.55 | 45.19 | 307 | 205 | 229 | 205 | Pass |
| 11n (HT40) | CH54 | 14.40 | 14.46 | 17.44 | 32.31 | 470 | 414 | 229 | 250 | Pass |
| 11n (HT40) | CH62 | 12.60 | 12.58 | 15.60 | 54.27 | 468 | 414 | 229 | 250 | Pass |
| 11ac (HT20) | CH52 | 14.11 | 14.45 | 17.29 | 53.62 | 228 | 201 | 229 | 201 | Pass |
| 11ac (HT20) | CH56 | 14.10 | 13.90 | 17.01 | 50.25 | 244 | 204 | 229 | 204 | Pass |
| 11ac (HT20) | CH64 | 13.42 | 13.32 | 16.38 | 43.46 | 228 | 201 | 229 | 201 | Pass |
| 11ac (HT40) | CH54 | 16.21 | 16.07 | 19.15 | 82.24 | 460 | 414 | 229 | 250 | Pass |
| 11ac (HT40) | CH62 | 15.88 | 15.86 | 18.88 | 77.27 | 460 | 413 | 229 | 250 | Pass |
| 11ac (HT80) | CH58 | 10.84 | 10.71 | 13.79 | 23.91 | 924 | 859 | 229 | 250 | Pass |

| Band III (5470 - 5725 MHz ) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Note1: Transmitting antennas of directional gain in Band III (5470 MHz to 5725 MHz) is 5.3 dBi<br>Formulas: Directional gain = $G_{ANT}$ + Array Gain, *Array Gain* = 0.<br>Note2: 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 | Conducted Power 0 (dBm) | Conducted Power 1 (dBm) | Conducted Power Total (dBm) | Conducted Power Total (mW) | FCC: 11 dBm + 10log B (mW) | 11 dBm + 10log B (mW) | FCC Limit (mW) | IC Limit (mW) | Verdict |
| 11a | CH100 | 12.76 | 12.77 | 15.78 | 37.80 | 332 | 214 | 250 | 214 | Pass |
| 11a | CH116 | 13.54 | 13.31 | 16.44 | 44.02 | 377 | 216 | 250 | 216 | Pass |
| 11a | CH140 | 13.40 | 13.58 | 16.50 | 44.68 | 298 | 213 | 250 | 213 | Pass |
| 11n (HT20) | CH100 | 13.33 | 13.40 | 16.38 | 43.41 | 305 | 224 | 250 | 224 | Pass |
| 11n (HT20) | CH116 | 13.82 | 13.89 | 16.87 | 48.59 | 272 | 224 | 250 | 224 | Pass |
| 11n (HT20) | CH140 | 13.73 | 13.64 | 16.70 | 46.73 | 258 | 223 | 250 | 223 | Pass |
| 11n (HT40) | CH102 | 12.62 | 13.06 | 15.86 | 38.51 | 518 | 455 | 250 | 250 | Pass |
| 11n (HT40) | CH134 | 14.27 | 14.45 | 17.37 | 54.59 | 516 | 455 | 250 | 250 | Pass |
| 11ac (HT20) | CH100 | 13.91 | 13.73 | 16.83 | 48.21 | 252 | 220 | 250 | 220 | Pass |
| 11ac (HT20) | CH116 | 14.14 | 13.88 | 17.02 | 50.38 | 253 | 220 | 250 | 220 | Pass |
| 11ac (HT20) | CH140 | 13.79 | 13.84 | 16.83 | 48.14 | 252 | 220 | 250 | 220 | Pass |
| 11ac (HT40) | CH102 | 16.04 | 16.04 | 19.05 | 80.36 | 505 | 454 | 250 | 250 | Pass |
| 11ac (HT40) | CH134 | 16.18 | 16.55 | 19.38 | 86.68 | 506 | 454 | 250 | 250 | Pass |
| 11ac (HT80) | CH106 | 10.60 | 11.29 | 11.24 | 24.94 | 1013 | 943 | 250 | 250 | Pass |

| Band IV (5725 - 5850 MHz ) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Note: Transmitting antennas of directional gain in Band IV (5725 MHz to 5850 MHz) is 3.7 dBi<br>Formulas: Directional gain = $G_{ANT}$ + Array Gain, *Array Gain* = 0. | | | | | | | | |
| Mode | Channel | Frequency (MHz) | Conducted Power 0 (dBm) | Conducted Power 1 (dBm) | Conducted Power Total (dBm) | Conducted Power Total (mW) | FCC/IC Limit (W) | Verdict |
| 11a | CH149 | 5745 | 13.5 | 13.49 | 16.51 | 44.72 | 1.00 | Pass |
| 11a | CH157 | 5785 | 13.44 | 12.94 | 16.21 | 41.76 | 1.00 | Pass |
| 11a | CH161 | 5825 | 13.1 | 13.26 | 16.19 | 41.60 | 1.00 | Pass |
| 11n (HT20) | CH149 | 5745 | 13.88 | 13.91 | 16.91 | 49.04 | 1.00 | Pass |
| 11n (HT20) | CH157 | 5785 | 13.63 | 13.57 | 16.61 | 45.82 | 1.00 | Pass |
| 11n (HT20) | CH161 | 5825 | 13.32 | 14.07 | 16.72 | 47.01 | 1.00 | Pass |
| 11n (HT40) | CH151 | 5755 | 12.03 | 12.03 | 15.04 | 31.92 | 1.00 | Pass |
| 11n (HT40) | CH159 | 5795 | 11.78 | 12.25 | 15.03 | 31.85 | 1.00 | Pass |
| 11ac (HT20) | CH149 | 5745 | 14.08 | 14.17 | 17.14 | 51.71 | 1.00 | Pass |
| 11ac (HT20) | CH157 | 5785 | 13.95 | 14.43 | 17.21 | 52.56 | 1.00 | Pass |
| 11ac (HT20) | CH161 | 5805 | 14.11 | 14.03 | 17.08 | 51.06 | 1.00 | Pass |
| 11ac (HT40) | CH151 | 5755 | 16.13 | 16.53 | 19.34 | 86.00 | 1.00 | Pass |
| 11ac (HT40) | CH159 | 5795 | 16.21 | 15.92 | 19.08 | 80.87 | 1.00 | Pass |
| 11ac (HT80) | CH155 | 5775 | 10.64 | 10.69 | 13.68 | 23.31 | 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 Total (dBm) | EIRP Power Total (mW) | 99% EBW (MHz) | 10 dBm + 10log B (mW) | IC Limit (mW) | Verdict |
| 11a | CH36 | 5180 | 22.18 | 165.20 | 17.15 | 171 | 171 | Pass |
| 11a | CH44 | 5220 | 22.22 | 166.72 | 17.35 | 174 | 174 | Pass |
| 11a | CH48 | 5240 | 22.28 | 169.04 | 16.88 | 169 | 169 | Pass |
| 11n (HT20) | CH36 | 5180 | 19.5 | 89.13 | 17.76 | 178 | 178 | Pass |
| 11n (HT20) | CH44 | 5220 | 19.28 | 84.72 | 17.78 | 178 | 178 | Pass |
| 11n (HT20) | CH48 | 5240 | 19.4 | 87.10 | 17.76 | 178 | 178 | Pass |
| 11n (HT40) | CH38 | 5190 | 21.39 | 137.72 | 36.12 | 361 | 200 | Pass |
| 11n (HT40) | CH46 | 5230 | 22.65 | 184.08 | 36.09 | 361 | 200 | Pass |
| 11ac (HT20) | CH36 | 5180 | 21.86 | 153.46 | 17.49 | 175 | 175 | Pass |
| 11ac (HT20) | CH44 | 5220 | 21.2 | 131.83 | 17.50 | 175 | 175 | Pass |
| 11ac (HT20) | CH48 | 5240 | 21.93 | 155.96 | 17.47 | 175 | 175 | Pass |
| 11ac (HT40) | CH38 | 5190 | 22.8 | 190.55 | 36.02 | 360 | 200 | Pass |
| 11ac (HT40) | CH46 | 5230 | 22.17 | 164.82 | 36.07 | 361 | 200 | Pass |
| 11ac (HT80) | CH42 | 5210 | 19.19 | 82.99 | 74.84 | 748 | 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 Total (dBm) | EIRP Power Total (mW) | 99% EBW (MHz) | 17 dBm + 10log B (mW) | IC Limit (mW) | Verdict |
| 11a | CH52 | 5260 | 22.55 | 179.89 | 16.90 | 847 | 847 | Pass |
| 11a | CH56 | 5280 | 22.55 | 179.89 | 16.84 | 844 | 844 | Pass |
| 11a | CH64 | 5320 | 22.33 | 171.00 | 16.95 | 850 | 850 | Pass |
| 11n (HT20) | CH52 | 5260 | 22.93 | 196.34 | 17.79 | 891 | 891 | Pass |
| 11n (HT20) | CH60 | 5300 | 22.85 | 192.75 | 17.76 | 890 | 890 | Pass |
| 11n (HT20) | CH64 | 5320 | 22.95 | 197.24 | 17.83 | 893 | 893 | Pass |
| 11n (HT40) | CH54 | 5270 | 23.84 | 242.10 | 36.08 | 1808 | 1000 | Pass |
| 11n (HT40) | CH62 | 5310 | 22.00 | 158.49 | 36.07 | 1808 | 1000 | Pass |
| 11ac (HT20) | CH52 | 5260 | 23.69 | 233.88 | 17.49 | 877 | 877 | Pass |
| 11ac (HT20) | CH56 | 5280 | 23.41 | 219.28 | 17.76 | 890 | 890 | Pass |
| 11ac (HT20) | CH64 | 5320 | 22.78 | 189.67 | 17.50 | 877 | 877 | Pass |
| 11ac (HT40) | CH54 | 5270 | 25.55 | 358.92 | 36.05 | 1807 | 1000 | Pass |
| 11ac (HT40) | CH62 | 5310 | 25.28 | 337.29 | 36.01 | 1805 | 1000 | Pass |
| 11ac (HT80) | CH58 | 5290 | 20.19 | 104.47 | 74.79 | 3749 | 1000 | 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 Total (dBm) | EIRP Power Total (mW) | 99% EBW (MHz) | 17 dBm + 10log B (mW) | IC Limit (mW) | Verdict |
| 11a | CH100 | 5500 | 21.08 | 128.23 | 16.97 | 851 | 851 | Pass |
| 11a | CH116 | 5580 | 21.74 | 149.28 | 17.16 | 860 | 860 | Pass |
| 11a | CH140 | 5700 | 21.8 | 151.36 | 16.90 | 847 | 847 | Pass |
| 11n (HT20) | CH100 | 5500 | 21.68 | 147.23 | 17.80 | 892 | 892 | Pass |
| 11n (HT20) | CH116 | 5580 | 22.17 | 164.82 | 17.79 | 892 | 892 | Pass |
| 11n (HT20) | CH140 | 5700 | 22 | 158.49 | 17.71 | 887 | 887 | Pass |
| 11n (HT40) | CH102 | 5510 | 21.16 | 130.62 | 36.13 | 1811 | 1000 | Pass |
| 11n (HT40) | CH134 | 5670 | 22.67 | 184.93 | 36.15 | 1812 | 1000 | Pass |
| 11ac (HT20) | CH100 | 5500 | 22.13 | 163.31 | 17.49 | 877 | 877 | Pass |
| 11ac (HT20) | CH116 | 5580 | 22.32 | 170.61 | 17.50 | 877 | 877 | Pass |
| 11ac (HT20) | CH140 | 5700 | 22.13 | 163.31 | 17.49 | 877 | 877 | Pass |
| 11ac (HT40) | CH102 | 5510 | 24.35 | 272.27 | 36.03 | 1806 | 1000 | Pass |
| 11ac (HT40) | CH134 | 5670 | 24.68 | 293.76 | 36.04 | 1806 | 1000 | Pass |
| 11ac (HT80) | CH106 | 5530 | 16.54 | 45.08 | 74.91 | 3754 | 1000 | Pass |

## A.2 Emission Bandwidth & 99% Bandwidth

Test Data

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| Band I (5150 - 5250 MHz ) | | | | |
|---|---|---|---|---|
| Mode | Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
| 11a | CH36 | 5180 | 29.718 | 17.1470 |
| 11a | CH44 | 5220 | 28.917 | 17.3522 |
| 11a | CH48 | 5240 | 22.761 | 16.8813 |
| 11n (HT20) | CH36 | 5180 | 20.687 | 17.7616 |
| 11n (HT20) | CH44 | 5220 | 22.557 | 17.7842 |
| 11n (HT20) | CH48 | 5240 | 22.427 | 17.7618 |
| 11n (HT40) | CH38 | 5190 | 40.998 | 36.1209 |
| 11n (HT40) | CH46 | 5230 | 40.825 | 36.0876 |
| 11ac (HT20) | CH36 | 5180 | 19.944 | 17.4907 |
| 11ac (HT20) | CH44 | 5220 | 20.001 | 17.5030 |
| 11ac (HT20) | CH48 | 5240 | 19.814 | 17.4690 |
| 11ac (HT40) | CH38 | 5190 | 40.299 | 36.0184 |
| 11ac (HT40) | CH46 | 5230 | 40.279 | 36.0725 |
| 11ac (HT80) | CH42 | 5210 | 80.138 | 74.8352 |

| Band II (5250 - 5350 MHz ) | | | | |
|---|---|---|---|---|
| Mode | Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
| 11a | CH52 | 5260 | 23.622 | 16.9006 |
| 11a | CH60 | 5300 | 22.388 | 16.8394 |
| 11a | CH64 | 5320 | 34.577 | 16.9499 |
| 11n (HT20) | CH52 | 5260 | 22.539 | 17.7859 |
| 11n (HT20) | CH60 | 5300 | 21.249 | 17.7623 |
| 11n (HT20) | CH64 | 5320 | 26.766 | 17.8274 |
| 11n (HT40) | CH54 | 5270 | 40.972 | 36.0792 |
| 11n (HT40) | CH62 | 5310 | 40.722 | 36.0692 |
| 11ac (HT20) | CH52 | 5260 | 19.894 | 17.4912 |
| 11ac (HT20) | CH60 | 5300 | 21.249 | 17.7623 |
| 11ac (HT20) | CH64 | 5320 | 19.861 | 17.4989 |
| 11ac (HT40) | CH54 | 5270 | 40.029 | 36.0493 |
| 11ac (HT40) | CH62 | 5310 | 40.076 | 36.0092 |
| 11ac (HT80) | CH58 | 5290 | 80.448 | 74.7937 |

| Band III (5470 - 5725 MHz ) | | | | |
|---|---|---|---|---|
| Mode | Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
| 11a | CH100 | 5500 | 26.352 | 16.9713 |
| 11a | CH116 | 5580 | 29.977 | 17.1641 |
| 11a | CH140 | 5700 | 23.663 | 16.9031 |
| 11n (HT20) | CH100 | 5500 | 24.192 | 17.7977 |
| 11n (HT20) | CH116 | 5580 | 21.586 | 17.7890 |
| 11n (HT20) | CH140 | 5700 | 20.528 | 17.7063 |
| 11n (HT40) | CH102 | 5510 | 41.133 | 36.1279 |
| 11n (HT40) | CH134 | 5670 | 41.027 | 36.1467 |
| 11ac (HT20) | CH100 | 5500 | 19.999 | 17.4898 |
| 11ac (HT20) | CH116 | 5580 | 20.069 | 17.4990 |
| 11ac (HT20) | CH140 | 5700 | 20.000 | 17.4929 |
| 11ac (HT40) | CH102 | 5510 | 40.135 | 36.0304 |
| 11ac (HT40) | CH134 | 5670 | 40.221 | 36.0378 |
| 11ac (HT80) | CH106 | 5530 | 80.505 | 74.9077 |

| Band IV (5725 - 5850 MHz ) | | | | |
|---|---|---|---|---|
| Mode | Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
| 11a | CH149 | 5745 | 27.883 | 17.0617 |
| 11a | CH157 | 5785 | 28.651 | 17.1535 |
| 11a | CH161 | 5825 | 29.680 | 17.3604 |
| 11n (HT20) | CH149 | 5745 | 22.289 | 17.7597 |
| 11n (HT20) | CH157 | 5785 | 24.269 | 17.8755 |
| 11n (HT20) | CH161 | 5825 | 25.392 | 17.8474 |
| 11n (HT40) | CH151 | 5755 | 40.915 | 36.0687 |
| 11n (HT40) | CH159 | 5795 | 40.799 | 36.0733 |
| 11ac (HT20) | CH149 | 5745 | 20.286 | 17.5572 |
| 11ac (HT20) | CH157 | 5785 | 19.892 | 17.5179 |
| 11ac (HT20) | CH161 | 5805 | 20.177 | 17.5383 |
| 11ac (HT40) | CH151 | 5755 | 40.216 | 36.0590 |
| 11ac (HT40) | CH159 | 5795 | 39.807 | 36.0572 |
| 11ac (HT80) | CH155 | 5775 | 80.524 | 74.8719 |

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| Band I Band I (5150 - 5250 MHz ) | | | | |
|---|---|---|---|---|
| Mode | Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
| 11a | CH36 | 5180 | 27.019 | 17.2677 |
| 11a | CH44 | 5220 | 28.716 | 17.2357 |
| 11a | CH48 | 5240 | 22.848 | 16.8858 |
| 11n (HT20) | CH36 | 5180 | 21.806 | 17.7689 |
| 11n (HT20) | CH44 | 5220 | 21.828 | 17.7441 |
| 11n (HT20) | CH48 | 5240 | 20.694 | 17.7568 |
| 11n (HT40) | CH38 | 5190 | 40.684 | 36.0754 |
| 11n (HT40) | CH46 | 5230 | 41.052 | 36.1216 |
| 11ac (HT20) | CH36 | 5180 | 19.942 | 17.5078 |
| 11ac (HT20) | CH44 | 5220 | 20.073 | 17.4980 |
| 11ac (HT20) | CH48 | 5240 | 20.022 | 17.4942 |
| 11ac (HT40) | CH38 | 5190 | 40.299 | 36.0754 |
| 11ac (HT40) | CH46 | 5230 | 40.116 | 36.0150 |
| 11ac (HT80) | CH42 | 5210 | 80.223 | 74.8732 |

| Band II (5250 - 5350 MHz ) | | | | |
|---|---|---|---|---|
| Mode | Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
| 11a | CH52 | 5260 | 24.068 | 16.8749 |
| 11a | CH60 | 5300 | 21.631 | 16.8793 |
| 11a | CH64 | 5320 | 23.008 | 16.9071 |
| 11n (HT20) | CH52 | 5260 | 22.383 | 17.7400 |
| 11n (HT20) | CH60 | 5300 | 21.054 | 17.7648 |
| 11n (HT20) | CH64 | 5320 | 23.104 | 17.8106 |
| 11n (HT40) | CH54 | 5270 | 41.122 | 36.1308 |
| 11n (HT40) | CH62 | 5310 | 40.901 | 36.0875 |
| 11ac (HT20) | CH52 | 5260 | 19.815 | 17.4613 |
| 11ac (HT20) | CH60 | 5300 | 19.756 | 17.5324 |
| 11ac (HT20) | CH64 | 5320 | 19.982 | 17.5172 |
| 11ac (HT40) | CH54 | 5270 | 40.089 | 36.0671 |
| 11ac (HT40) | CH62 | 5310 | 40.256 | 35.9716 |
| 11ac (HT80) | CH58 | 5290 | 80.151 | 74.7108 |

| Band III (5470 - 5725 MHz ) | | | | |
|---|---|---|---|---|
| Mode | Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
| 11a | CH100 | 5500 | 25.027 | 16.9876 |
| 11a | CH116 | 5580 | 28.966 | 17.1987 |
| 11a | CH140 | 5700 | 23.758 | 16.9568 |
| 11n (HT20) | CH100 | 5500 | 24.706 | 17.8142 |
| 11n (HT20) | CH116 | 5580 | 22.605 | 17.8019 |
| 11n (HT20) | CH140 | 5700 | 20.657 | 17.7127 |
| 11n (HT40) | CH102 | 5510 | 40.728 | 36.1583 |
| 11n (HT40) | CH134 | 5670 | 41.676 | 36.1324 |
| 11ac (HT20) | CH100 | 5500 | 19.853 | 17.5135 |
| 11ac (HT20) | CH116 | 5580 | 20.008 | 17.5186 |
| 11ac (HT20) | CH140 | 5700 | 20.004 | 17.4819 |
| 11ac (HT40) | CH102 | 5510 | 40.179 | 36.0300 |
| 11ac (HT40) | CH134 | 5670 | 40.228 | 36.0935 |
| 11ac (HT80) | CH106 | 5530 | 80.284 | 74.7792 |

| Band IV (5725 - 5850 MHz ) | | | | |
|---|---|---|---|---|
| Mode | Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
| 11a | CH149 | 5745 | 20.185 | 17.5341 |
| 11a | CH157 | 5785 | 19.955 | 17.5154 |
| 11a | CH161 | 5825 | 19.954 | 17.5563 |
| 11n (HT20) | CH149 | 5745 | 23.846 | 17.7980 |
| 11n (HT20) | CH157 | 5785 | 26.273 | 17.8651 |
| 11n (HT20) | CH161 | 5825 | 26.772 | 17.8099 |
| 11n (HT40) | CH151 | 5755 | 41.266 | 36.0680 |
| 11n (HT40) | CH159 | 5795 | 40.730 | 36.0833 |
| 11ac (HT20) | CH149 | 5745 | 20.185 | 17.5341 |
| 11ac (HT20) | CH157 | 5785 | 19.955 | 17.5154 |
| 11ac (HT20) | CH161 | 5805 | 19.954 | 17.5563 |
| 11ac (HT40) | CH151 | 5755 | 40.187 | 36.0359 |
| 11ac (HT40) | CH159 | 5795 | 40.155 | 36.0084 |
| 11ac (HT80) | CH155 | 5775 | 80.690 | 74.8172 |

Test Plots

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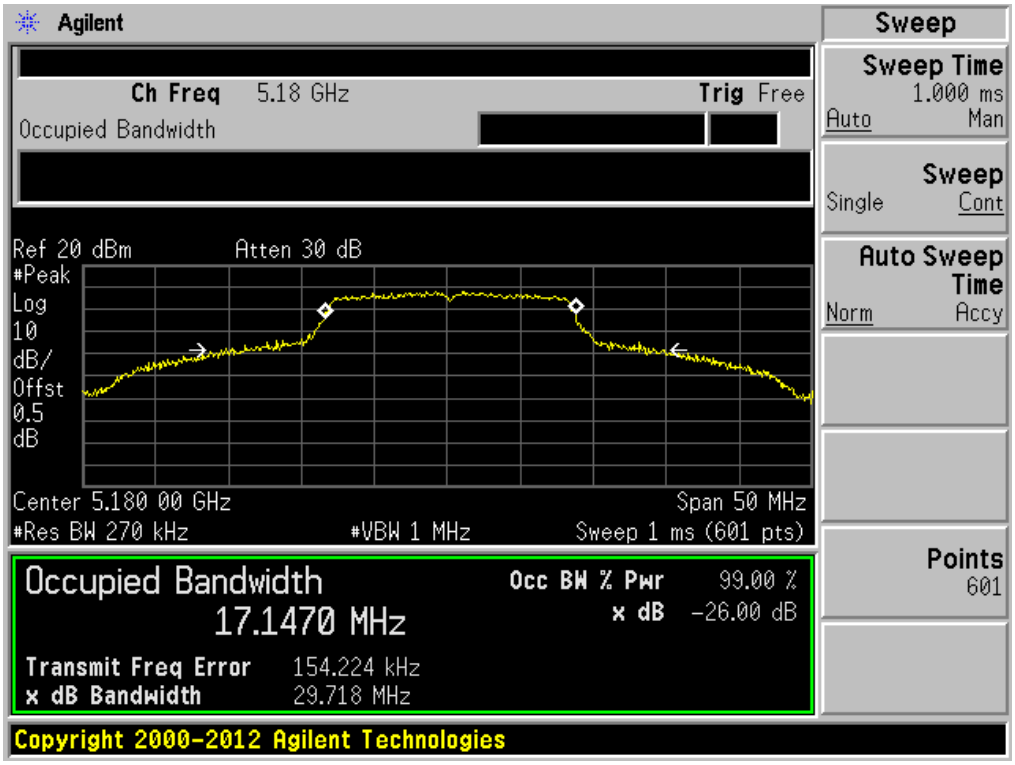
## Band I 11a CH36

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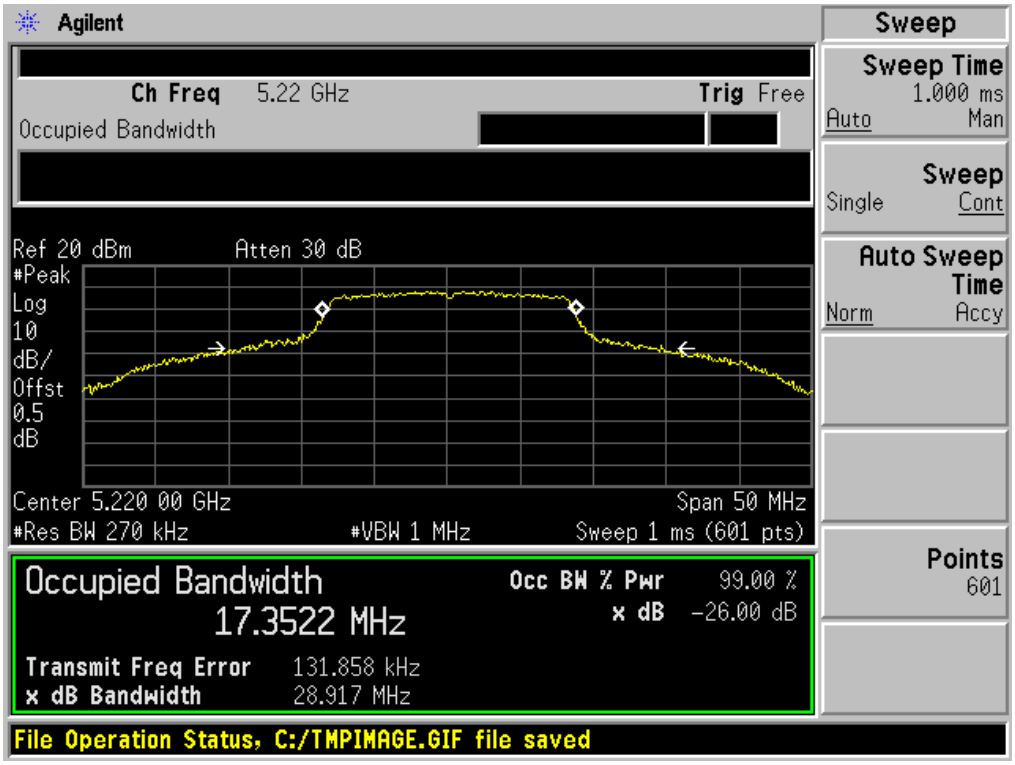
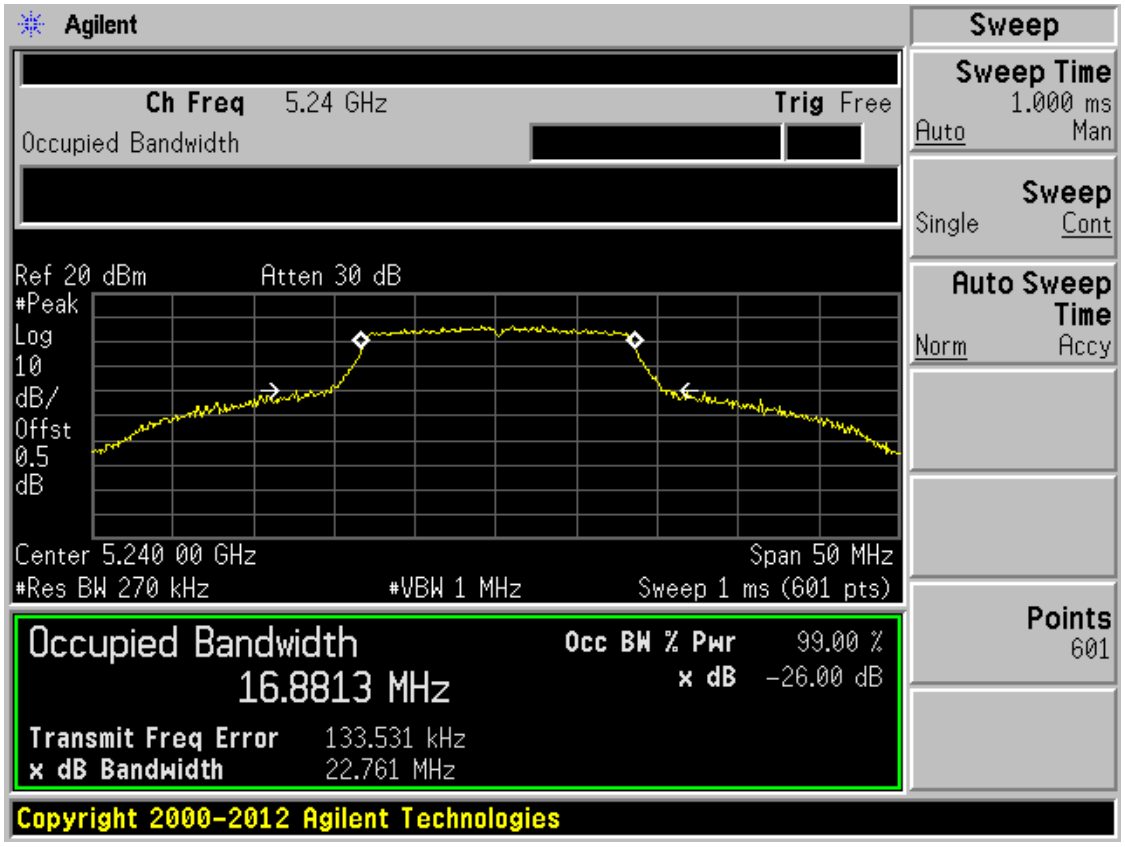
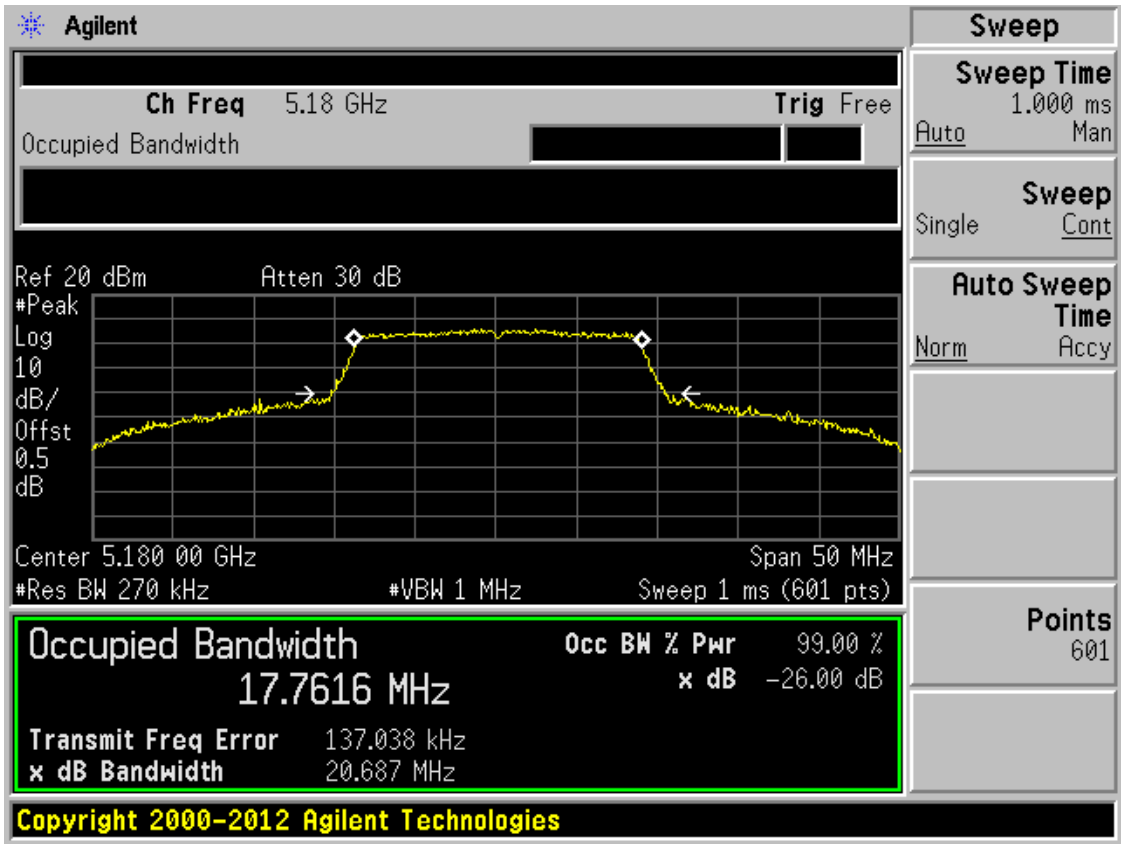


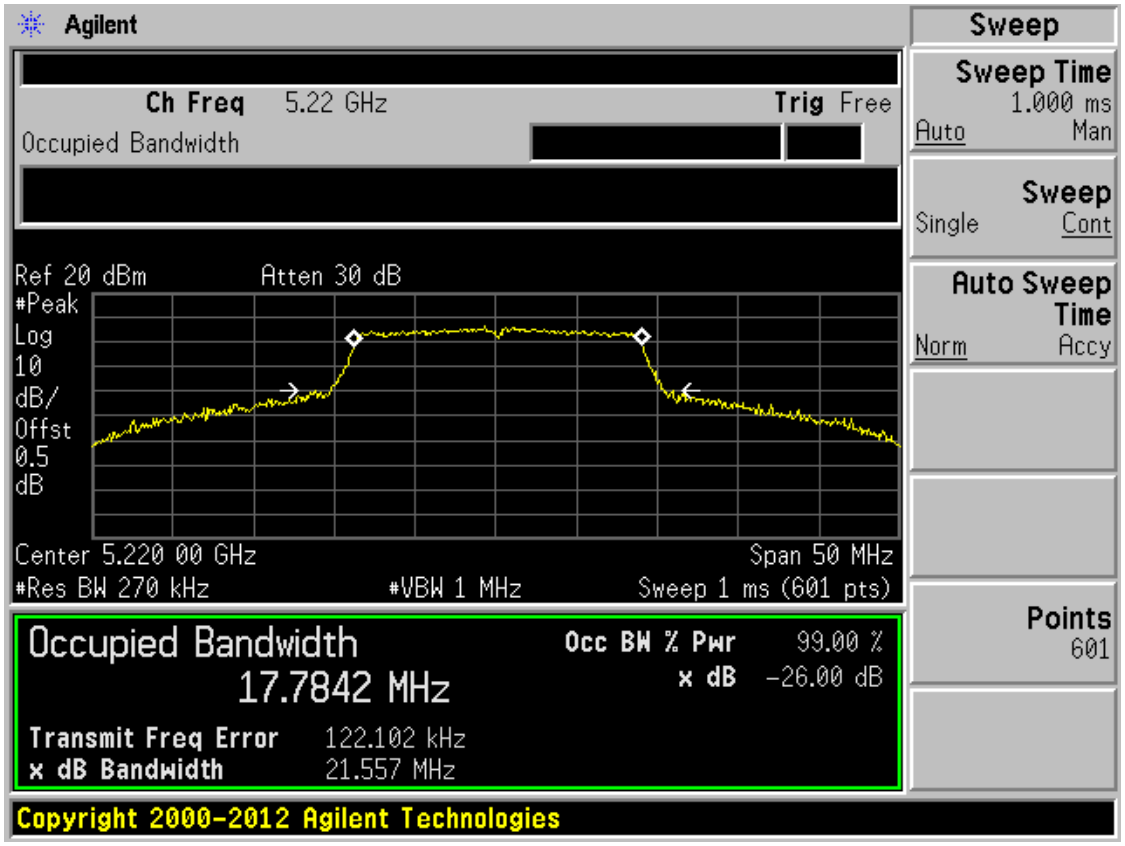
Band I 11a CH48



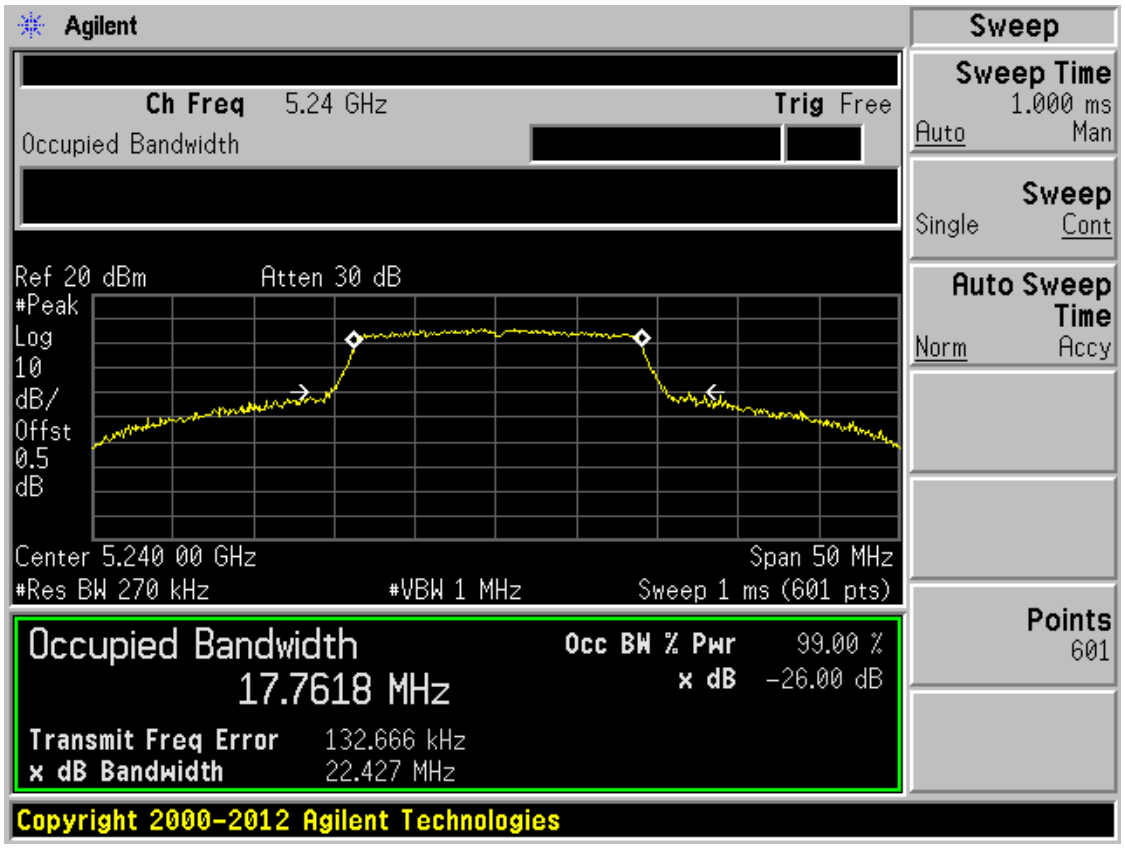

Band I 11n(HT20) CH36



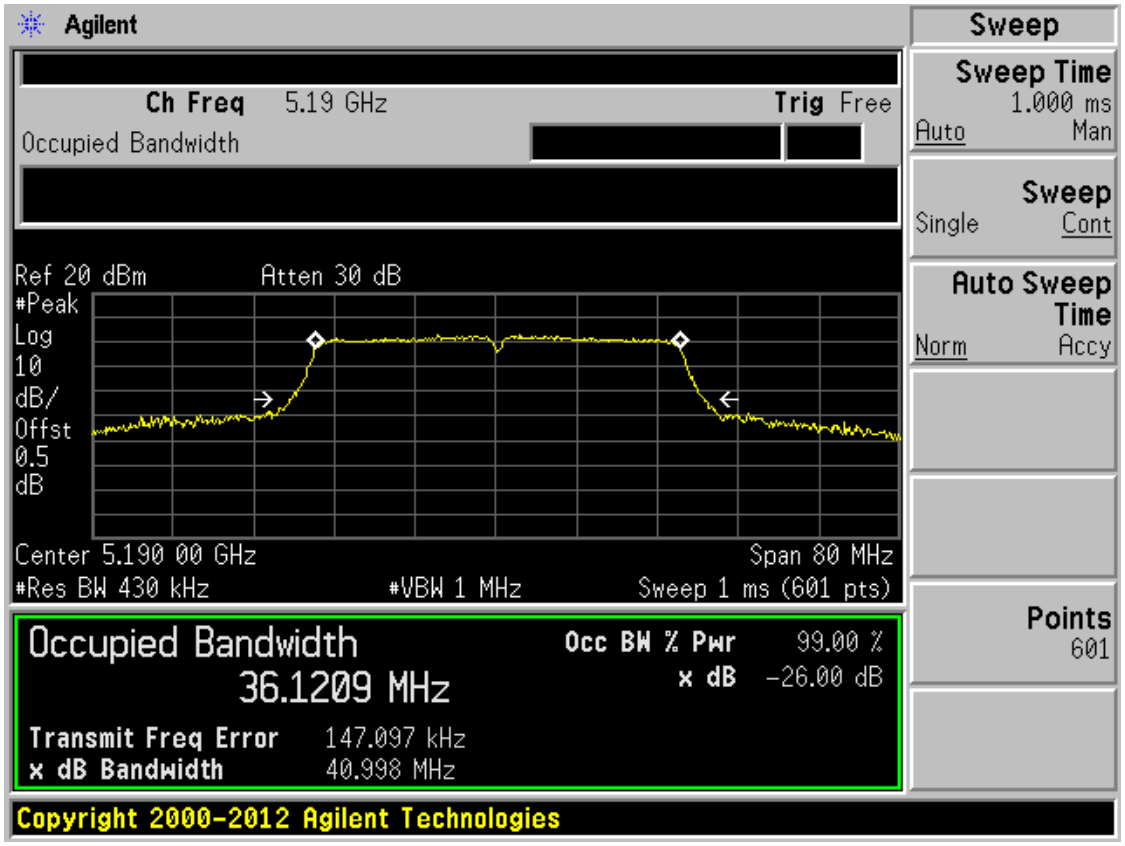
Band I 11n(HT20) CH44



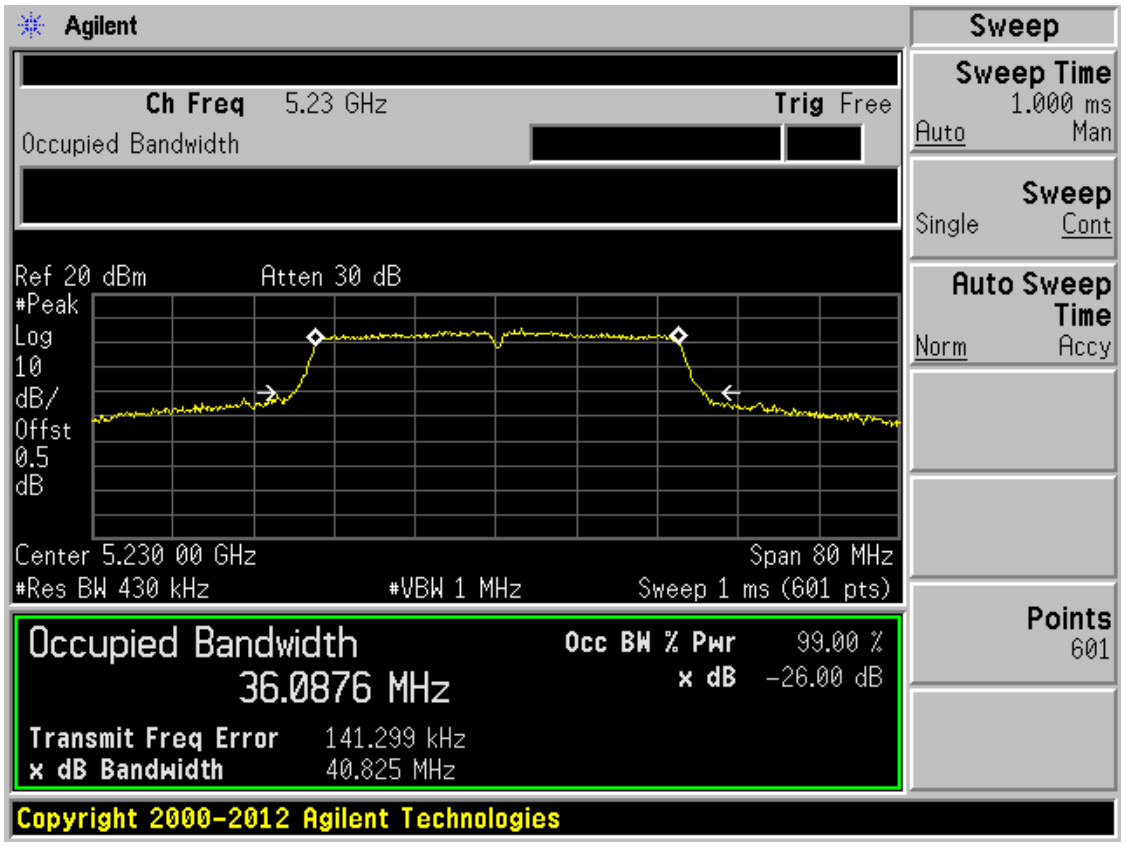

Band I 11n(HT20) CH48



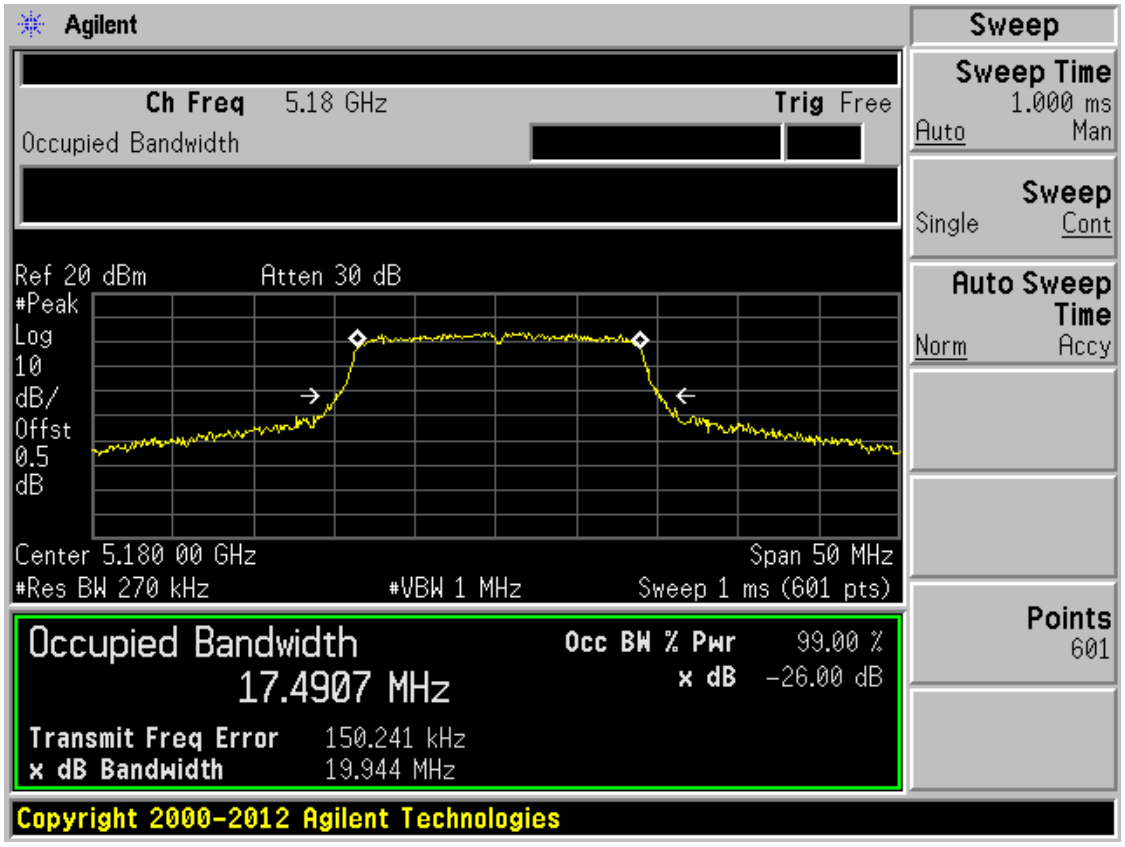
Band I 11n(HT40) CH38



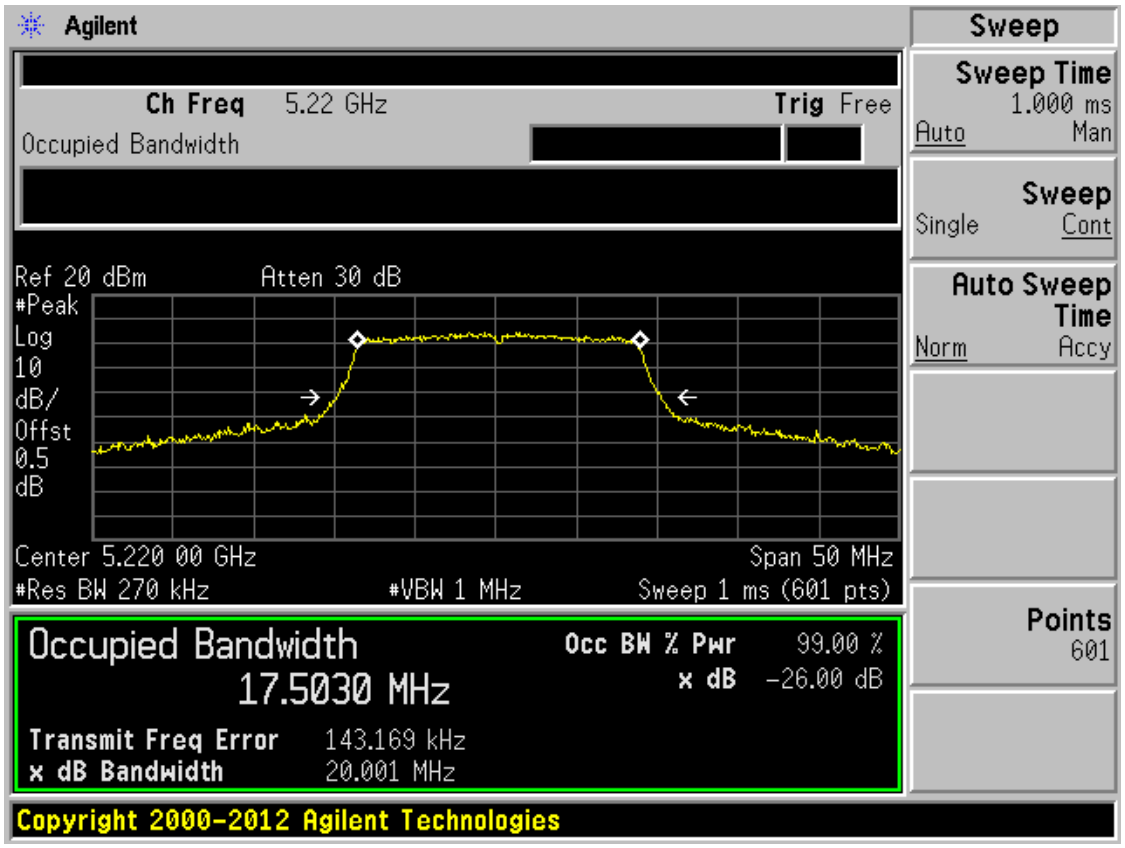

Band I 11n(HT40) CH46



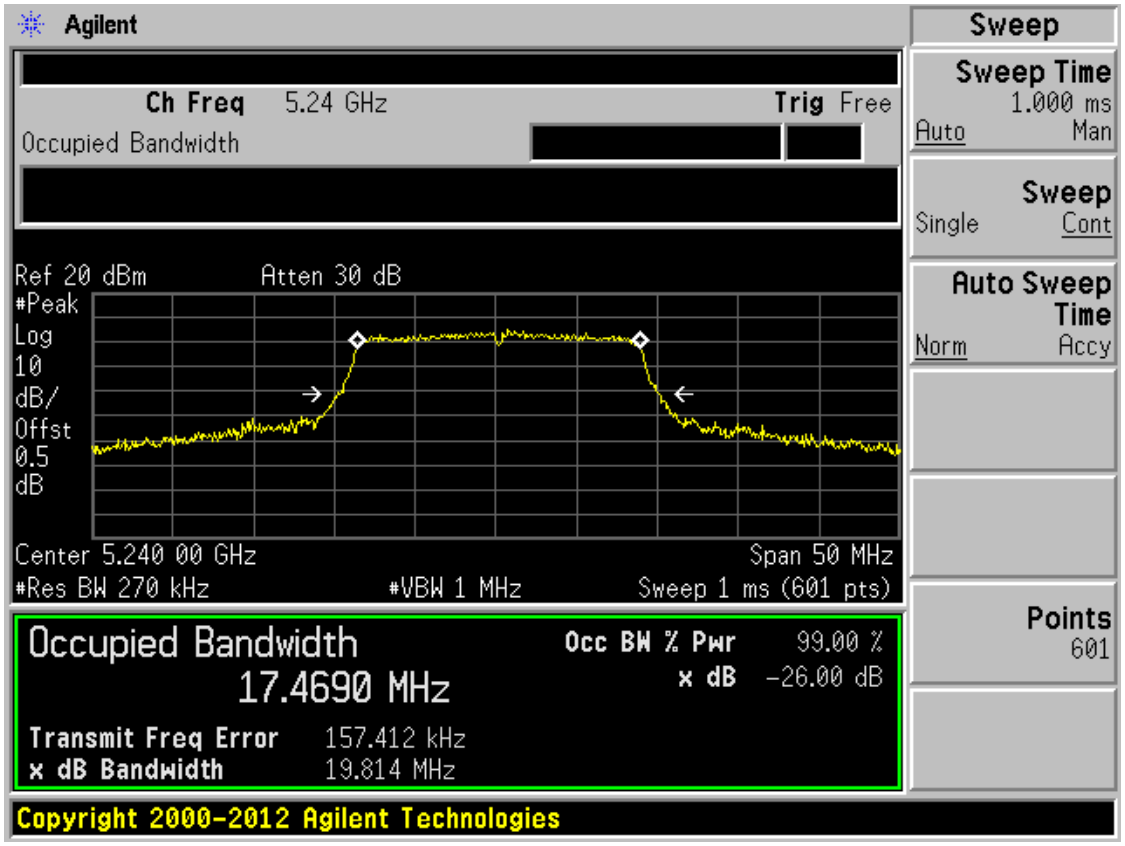
Band I 11ac(HT20) CH36



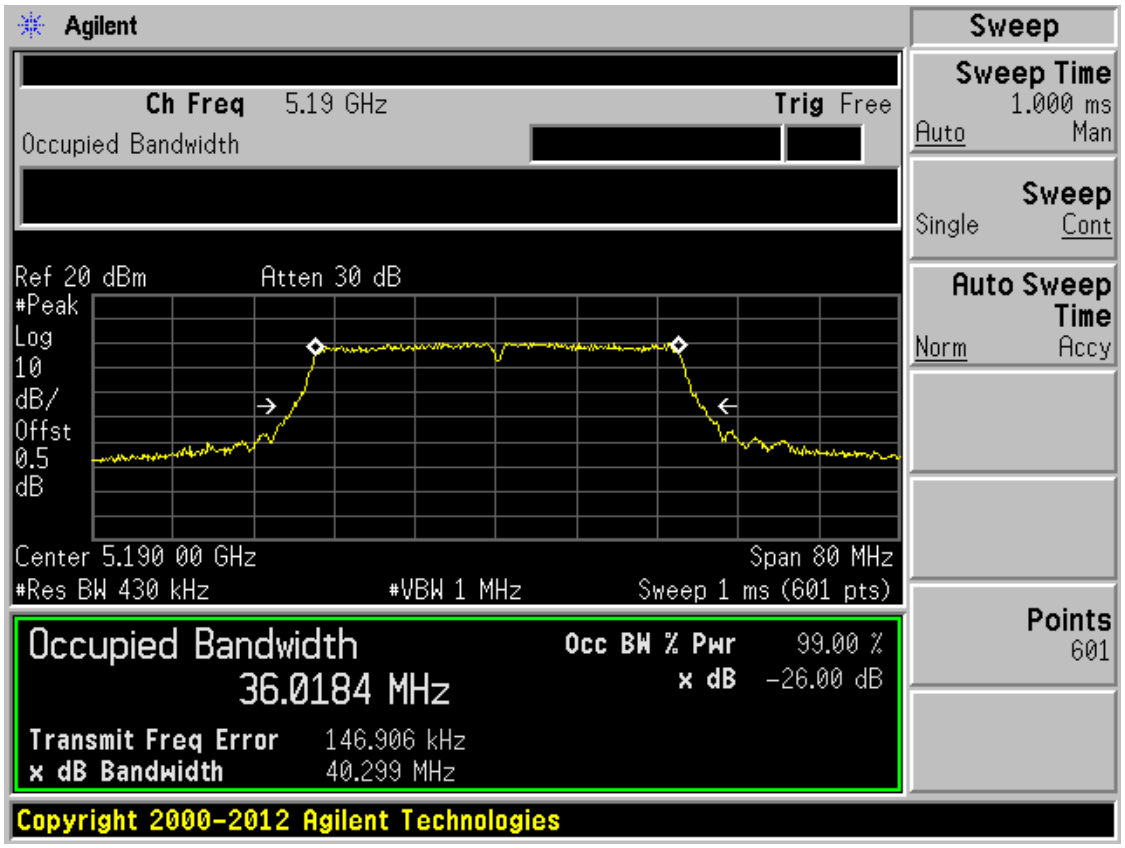

Band I 11ac(HT20) CH44



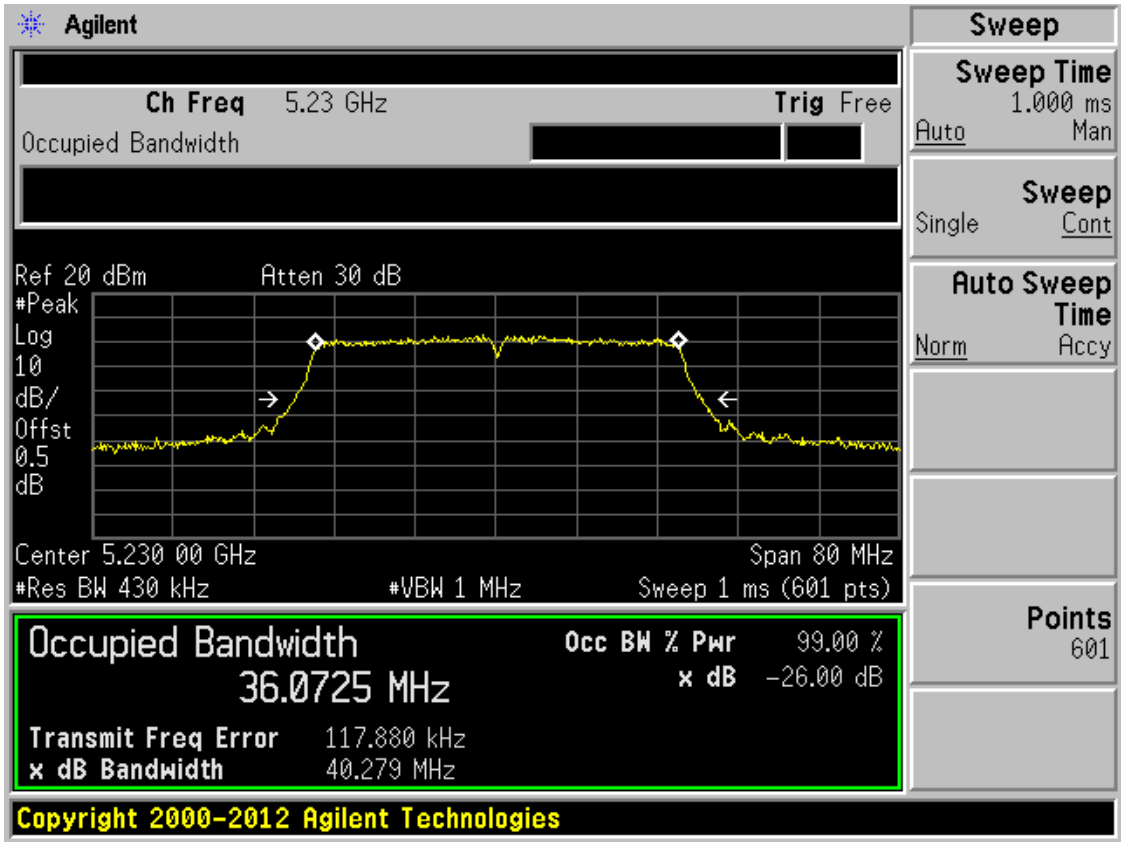
Band I 11ac(HT20) CH48



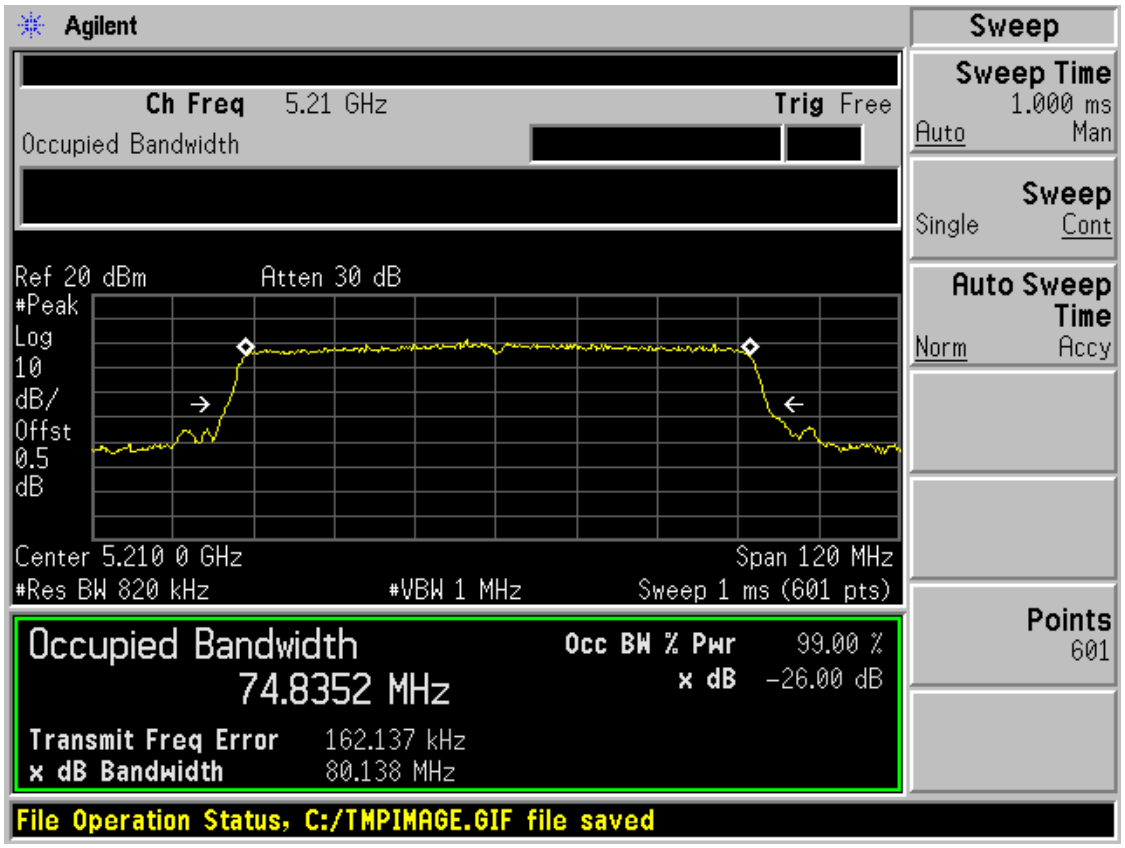

Band I 11ac(HT40) CH38



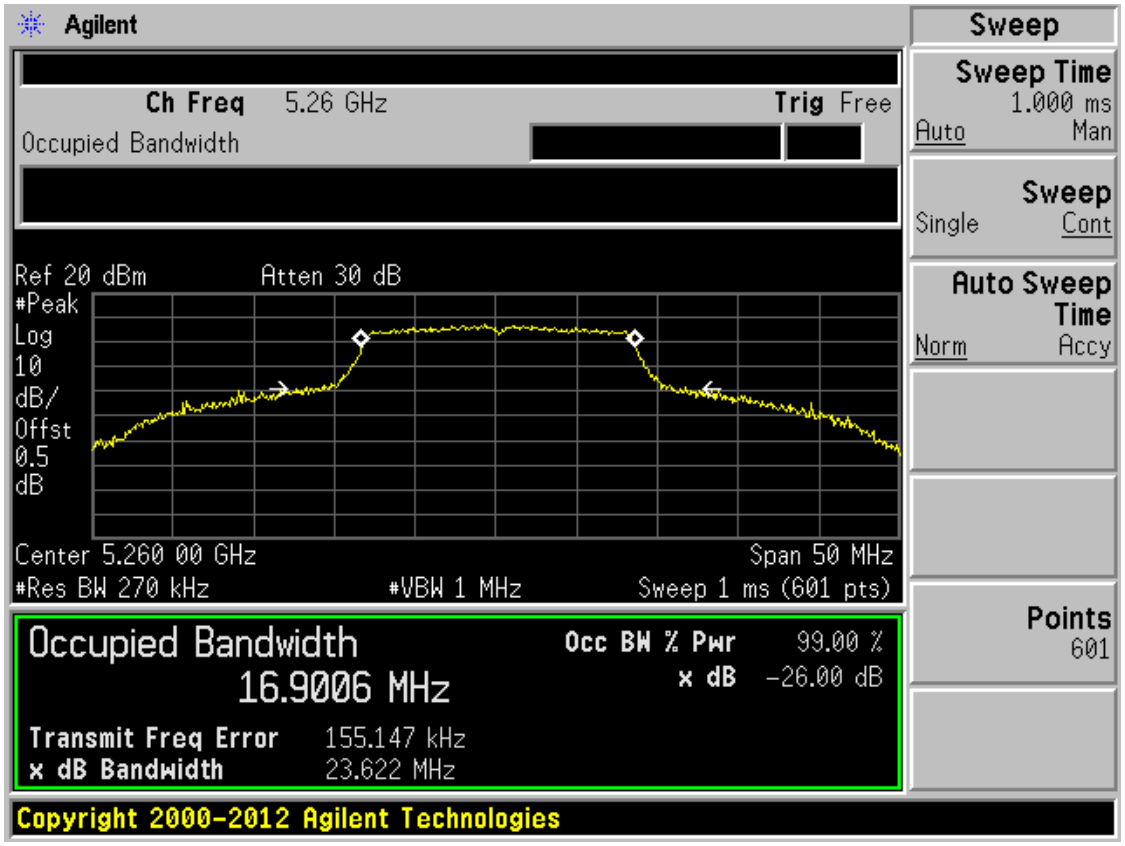
Band I 11ac(HT40) CH46



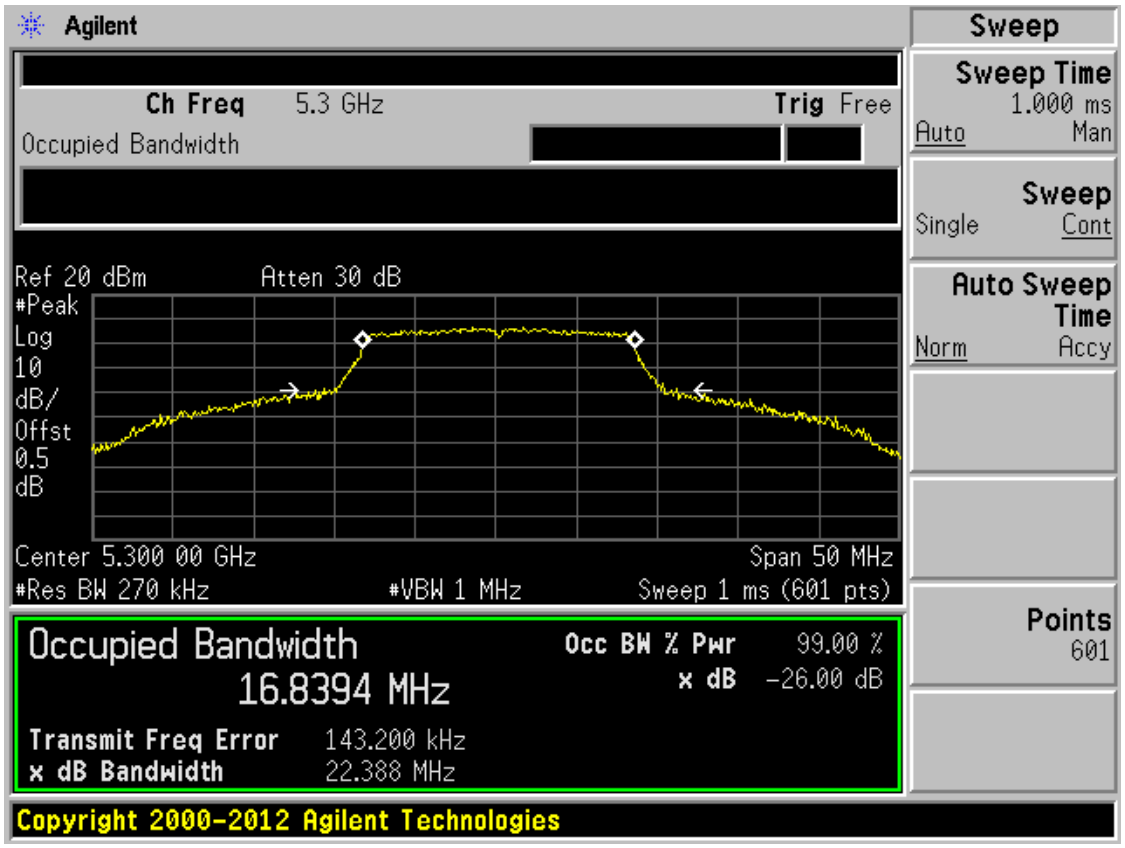

Band I 11ac(HT80) CH42



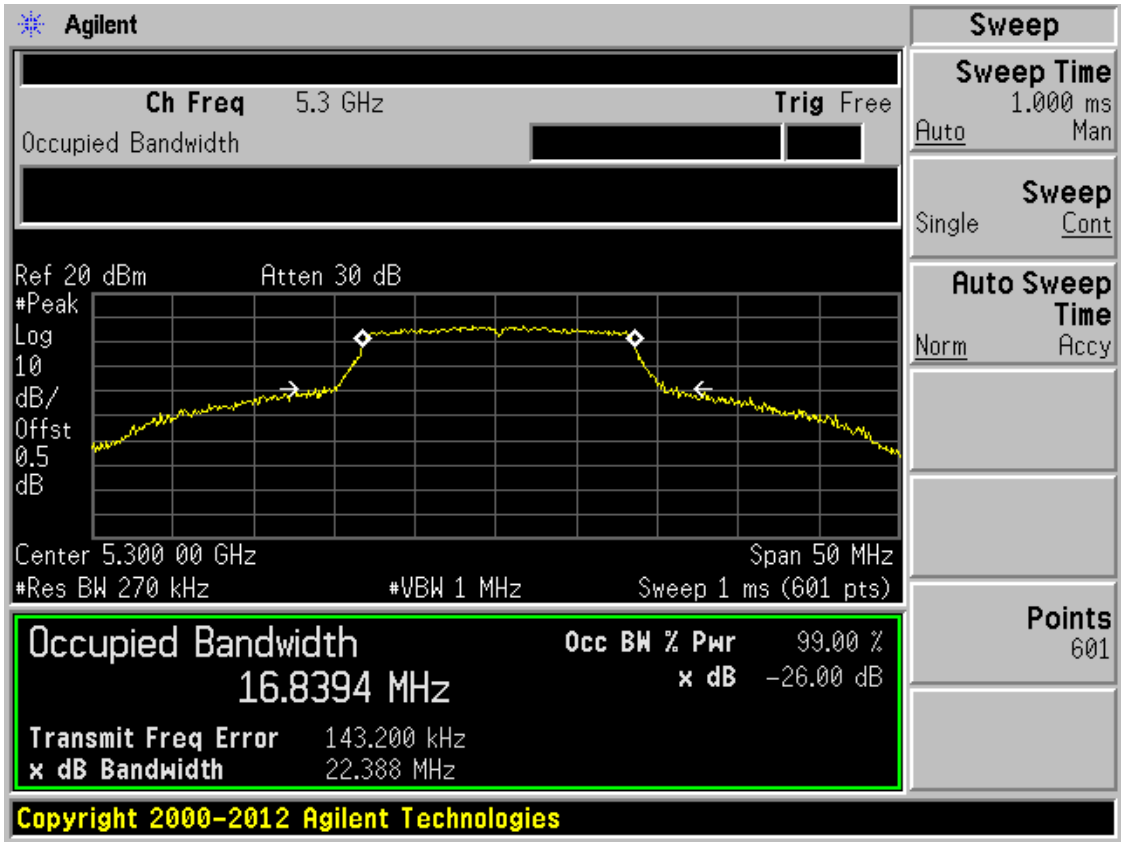
## Band II 11a CH52



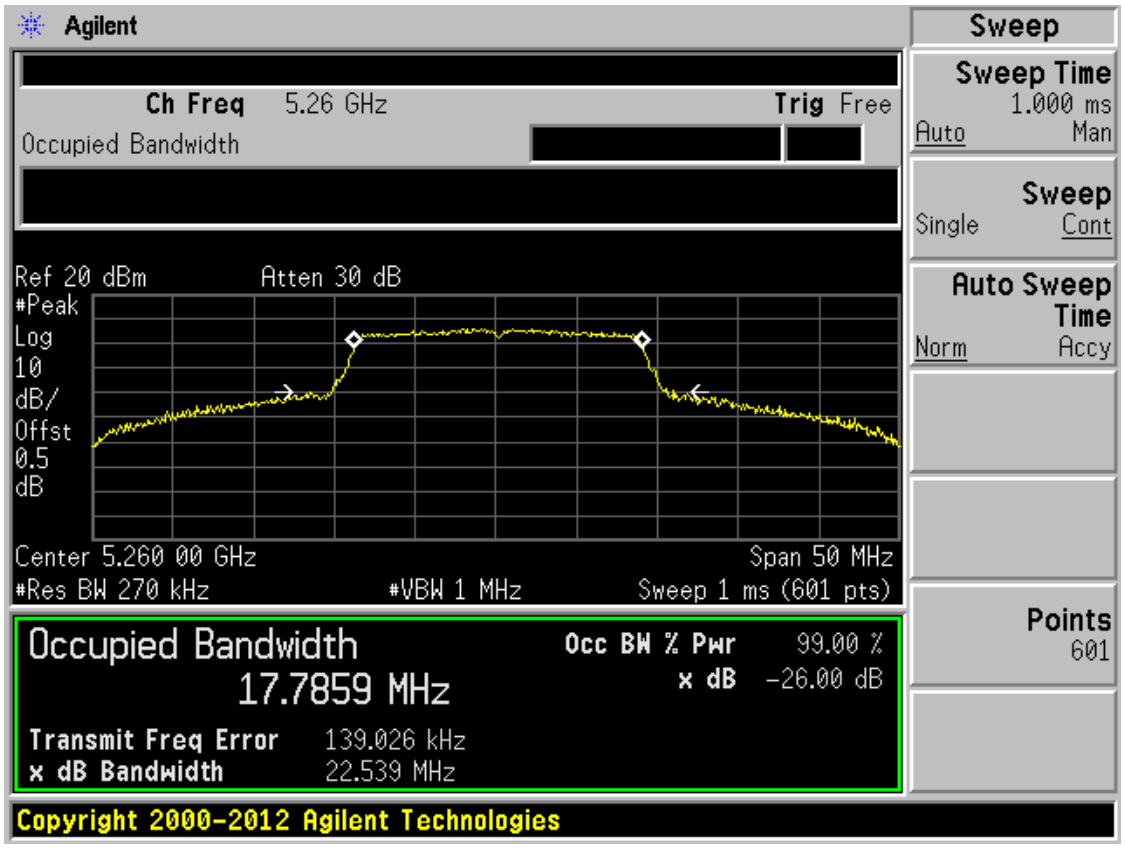

## Band II 11a CH60



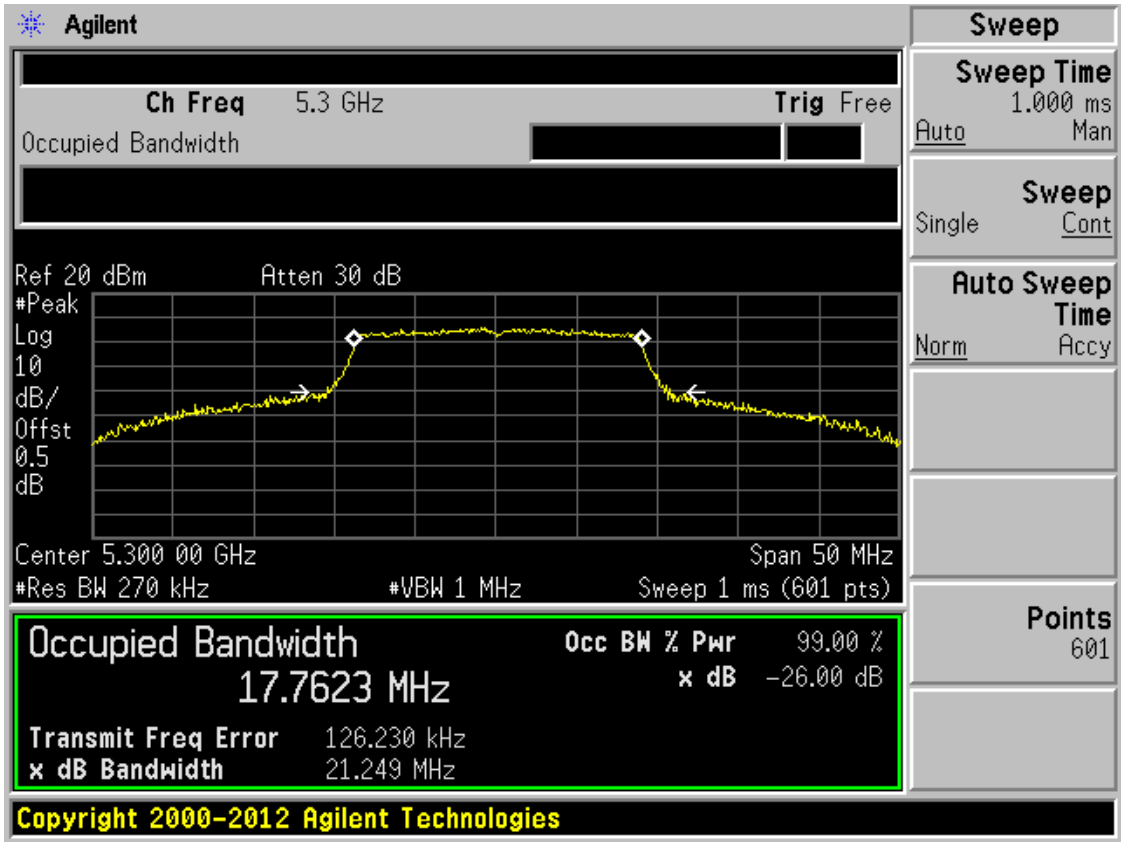
Band II 11a CH64



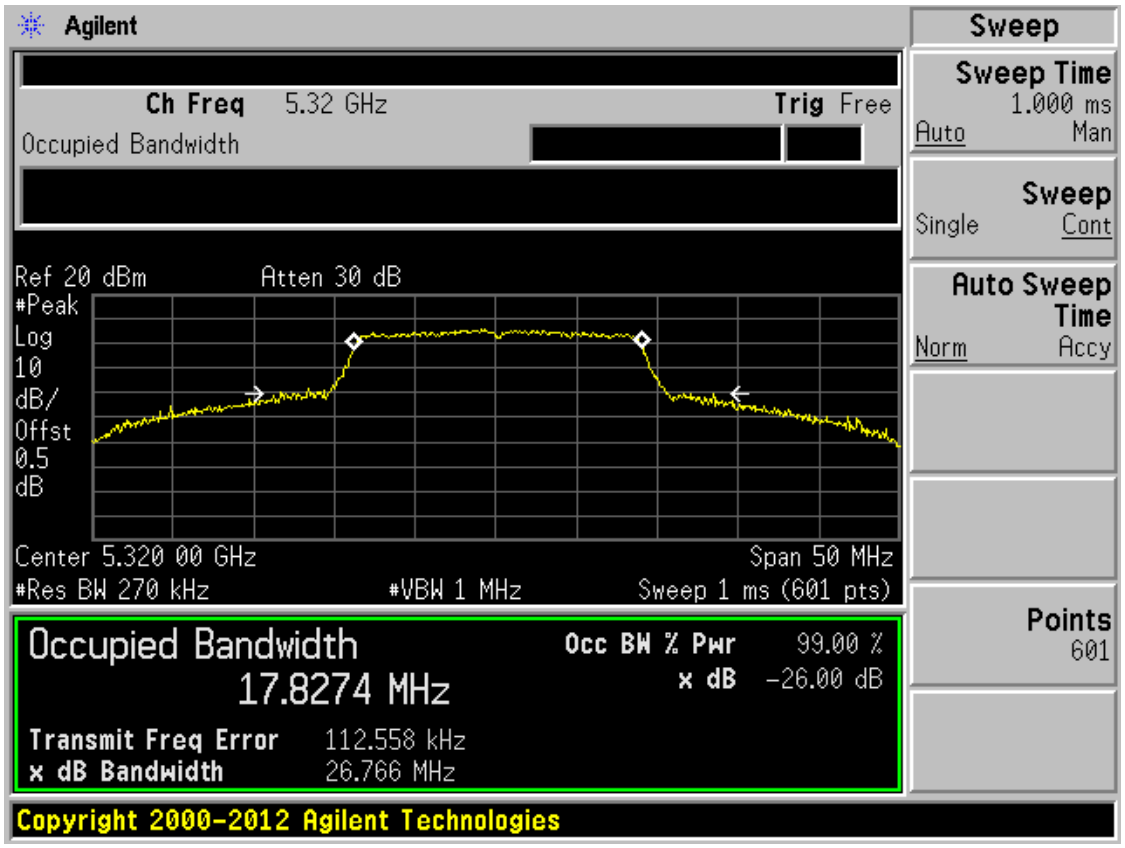

Band II 11n(HT20) CH52



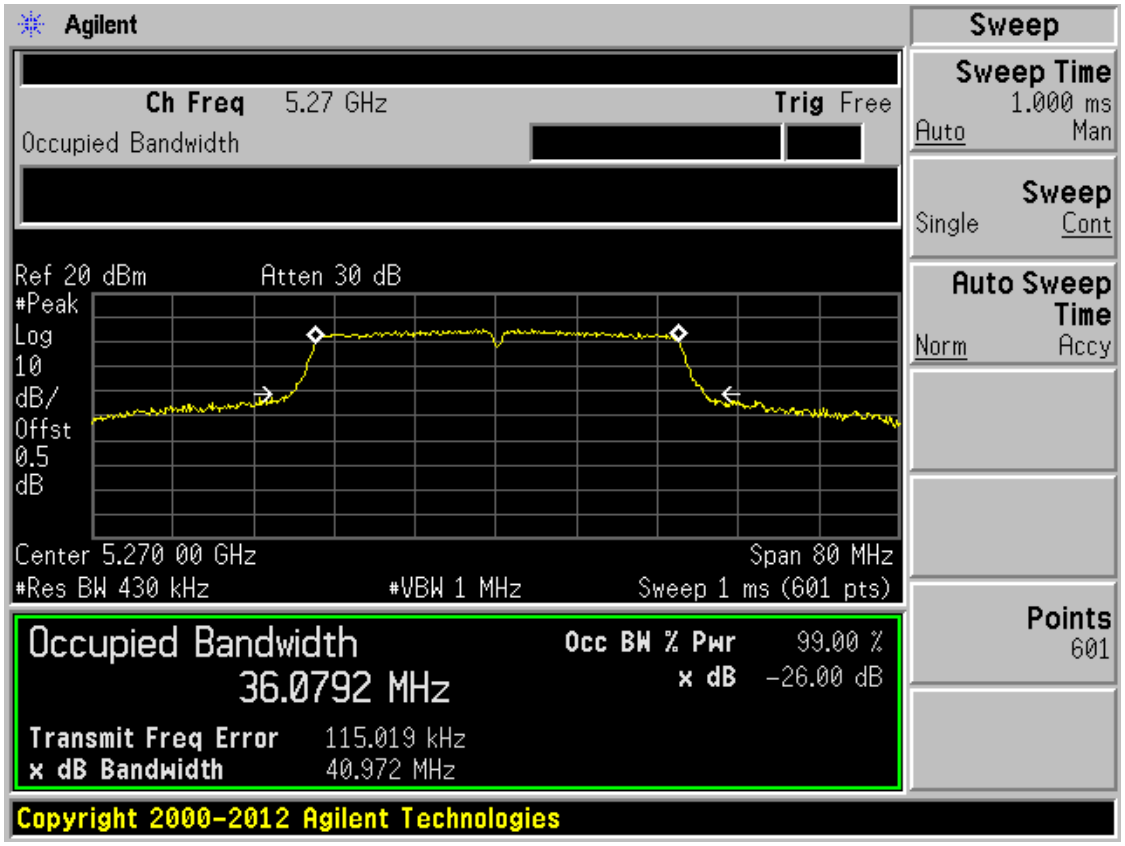
Band II 11n(HT20) CH60



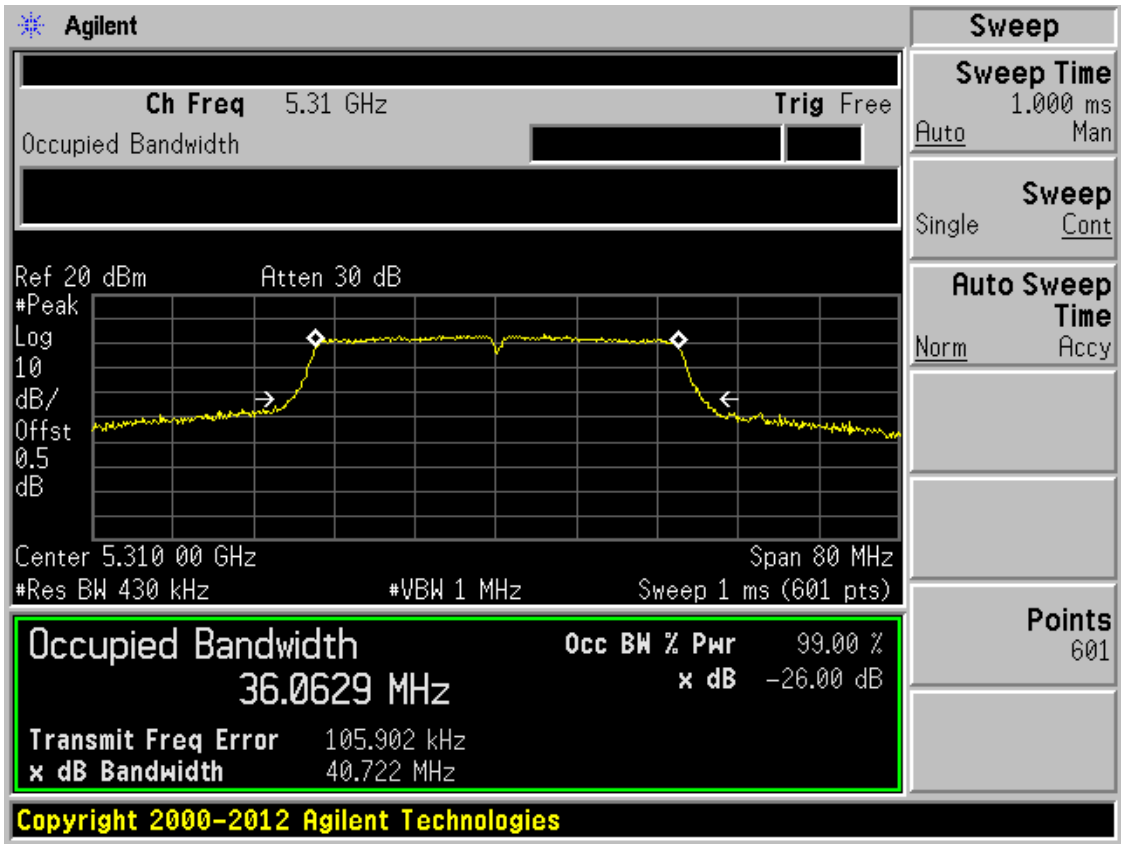

Band II 11n(HT20) CH64



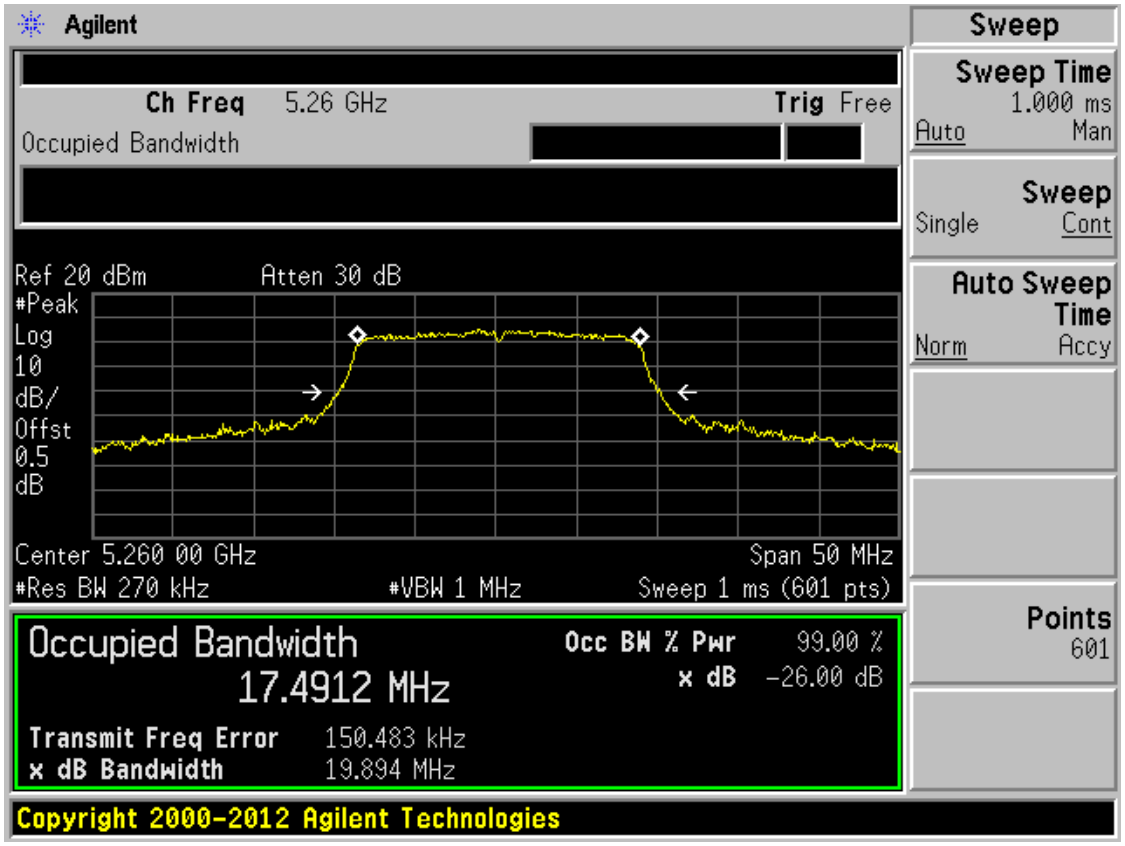
Band II 11n(HT40) CH54



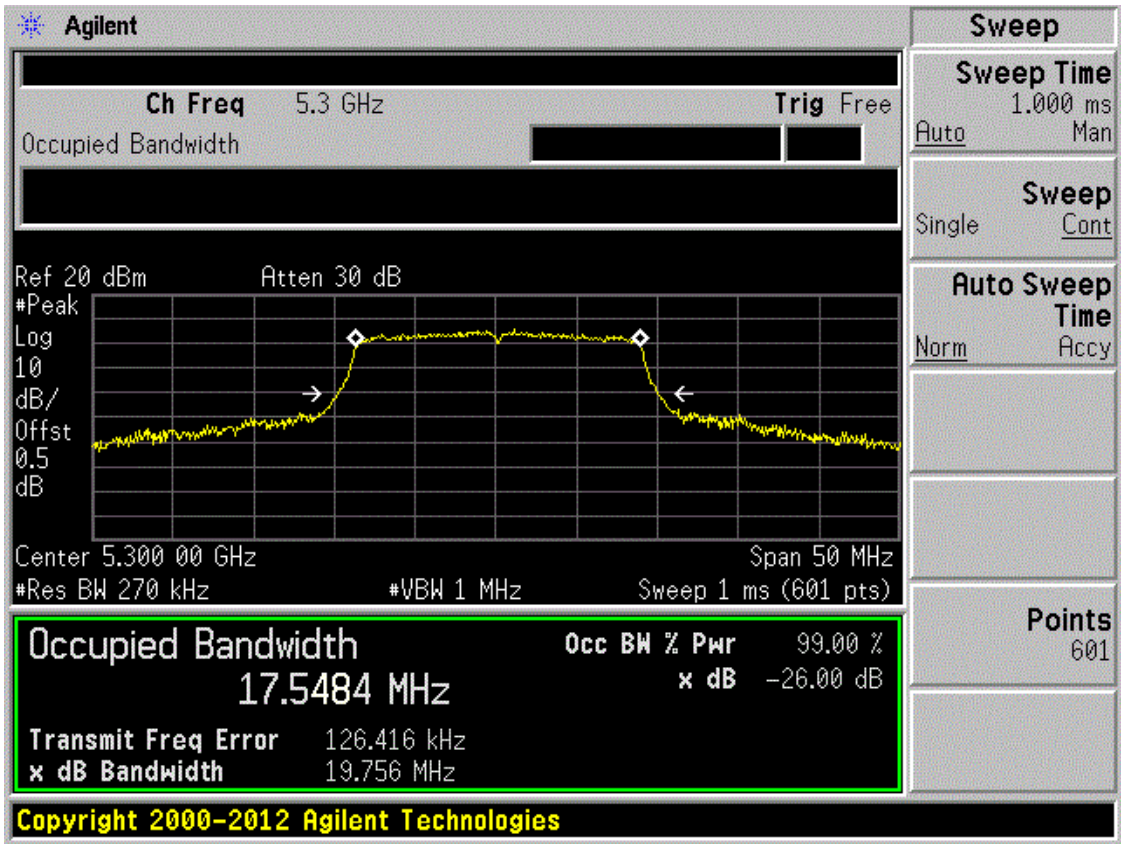

Band II 11n(HT40) CH62



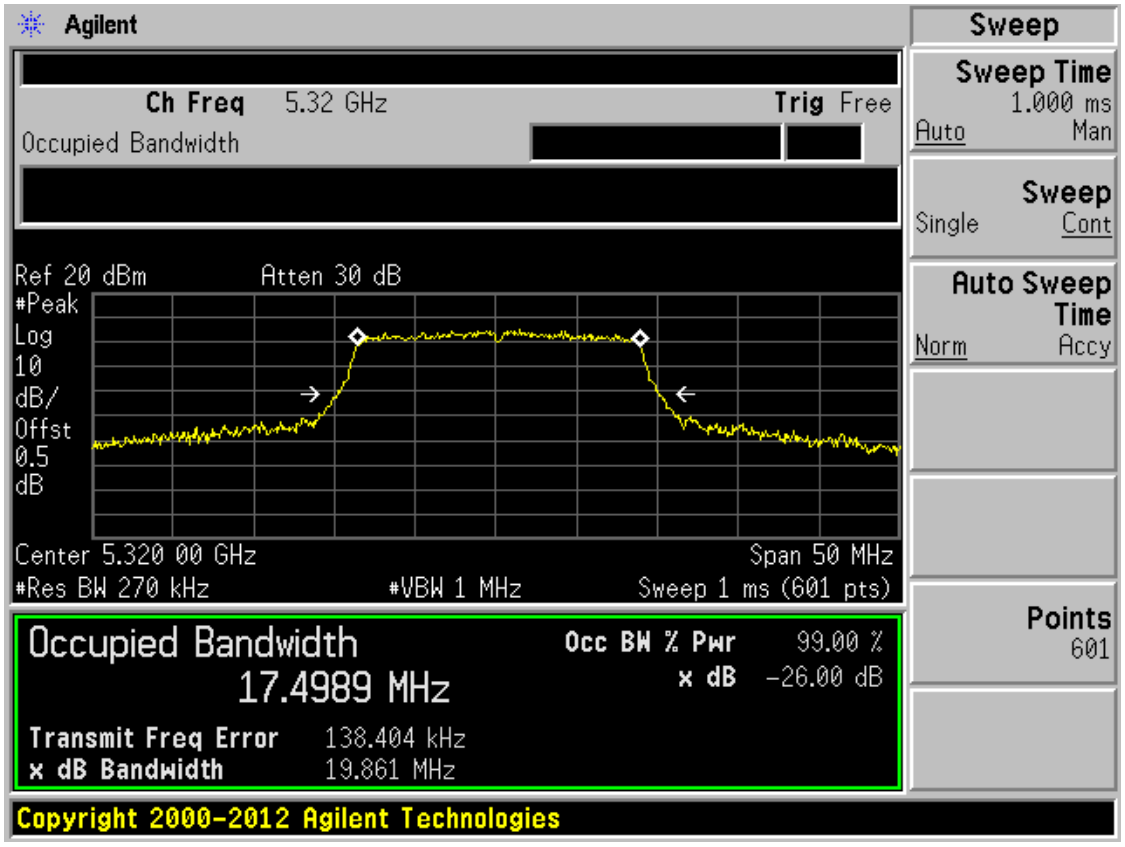
Band II 11ac(HT20) CH52



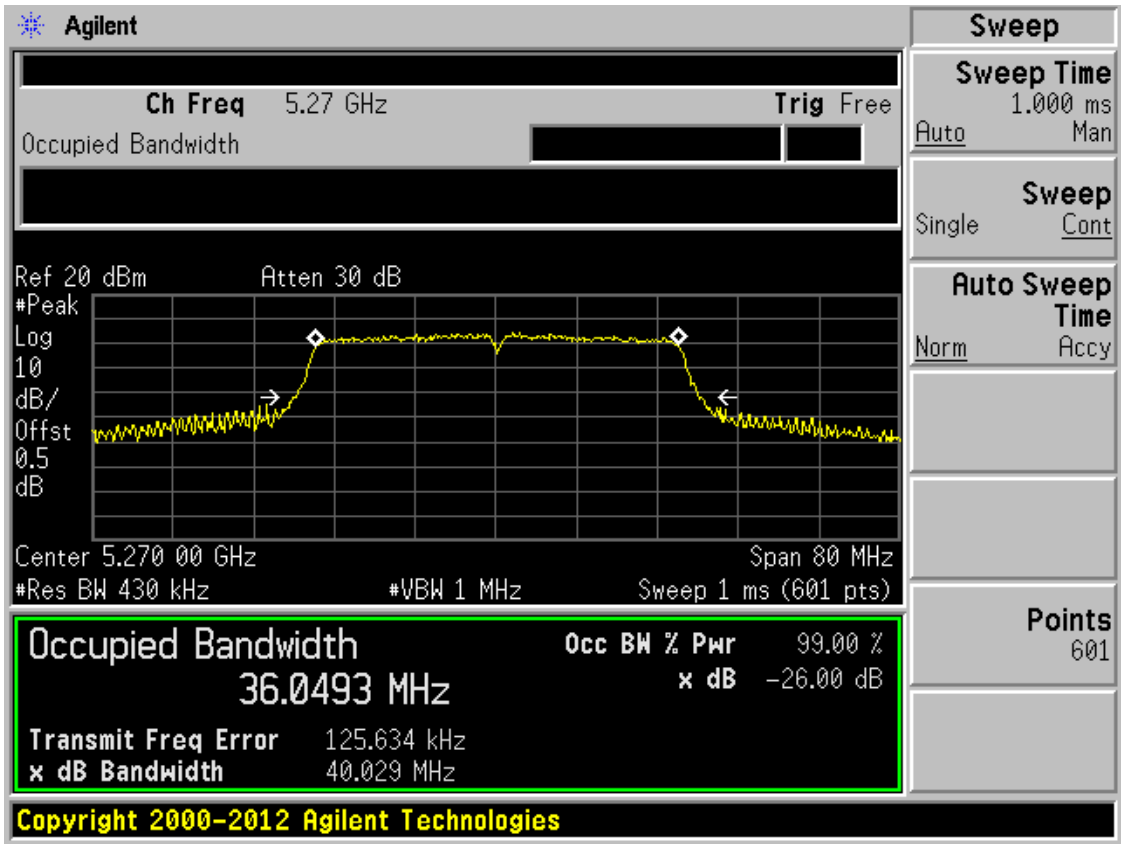

Band II 11ac(HT20) CH60



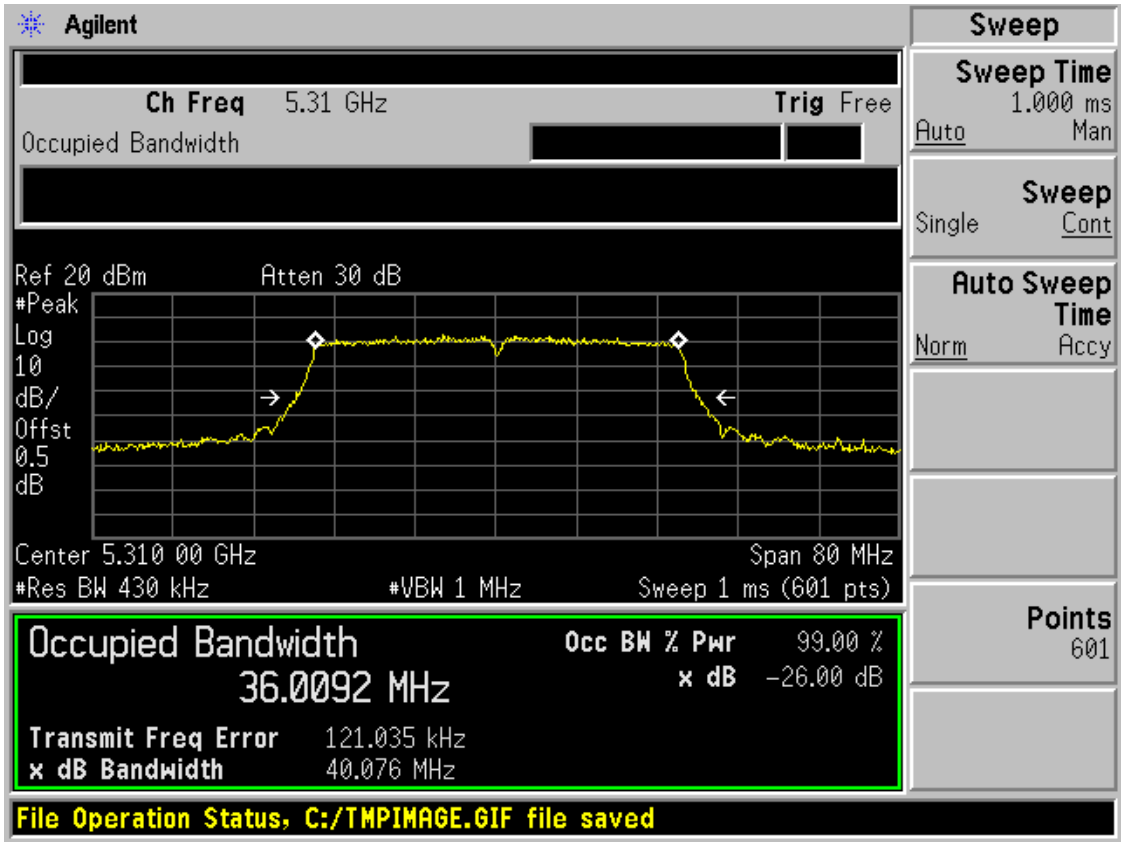
Band II 11ac(HT20) CH64



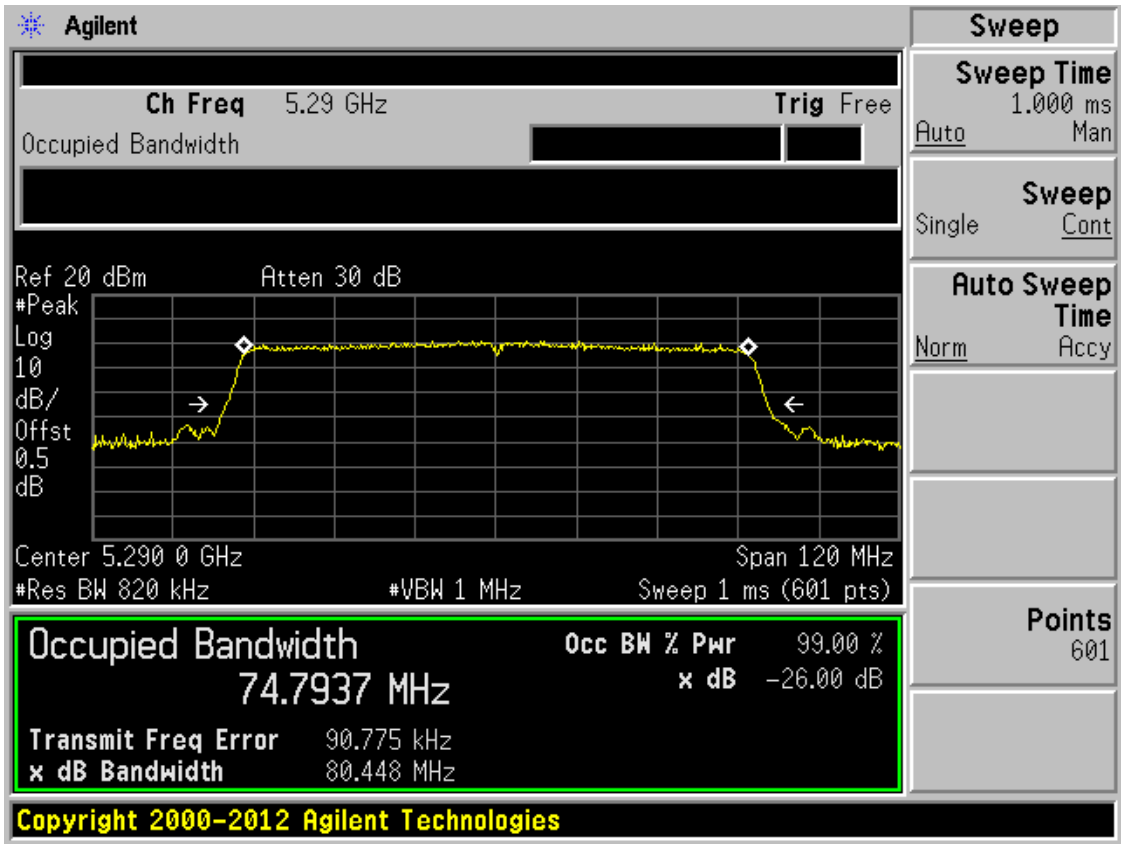

Band II 11ac(HT40) CH54



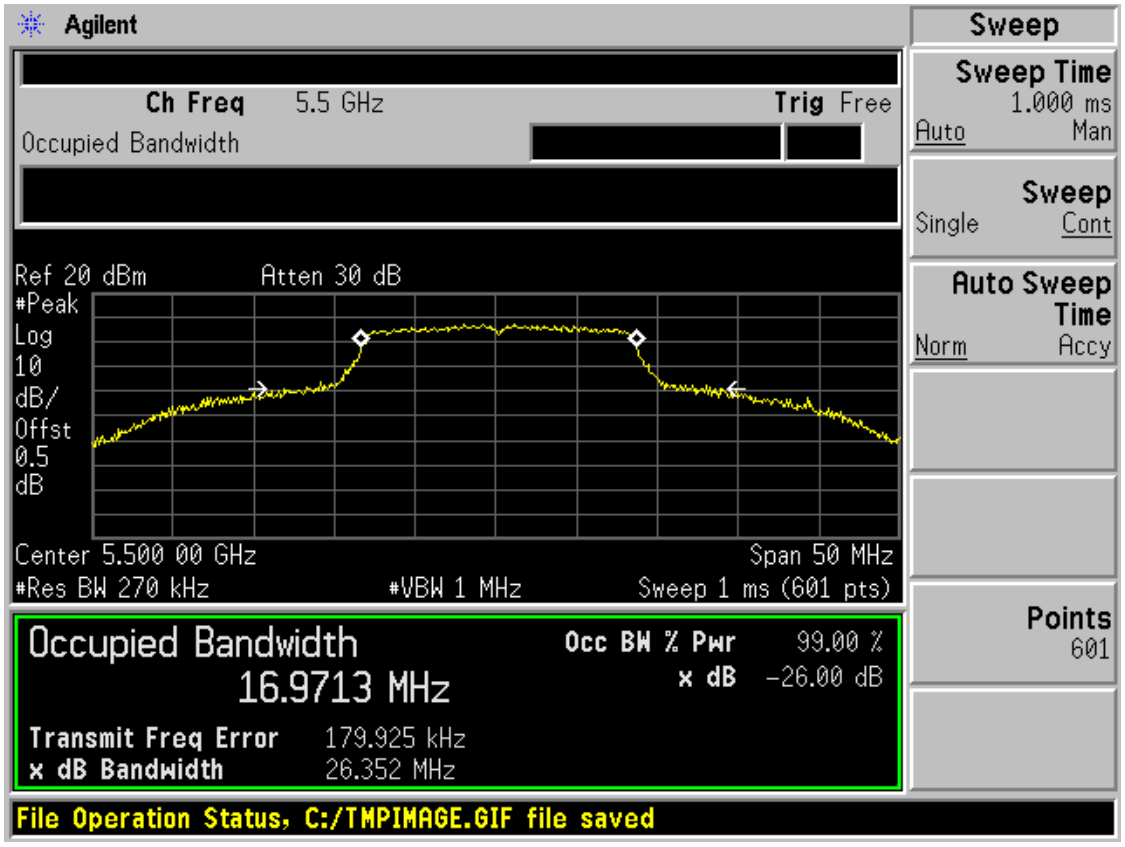
Band II 11ac(HT40) CH62



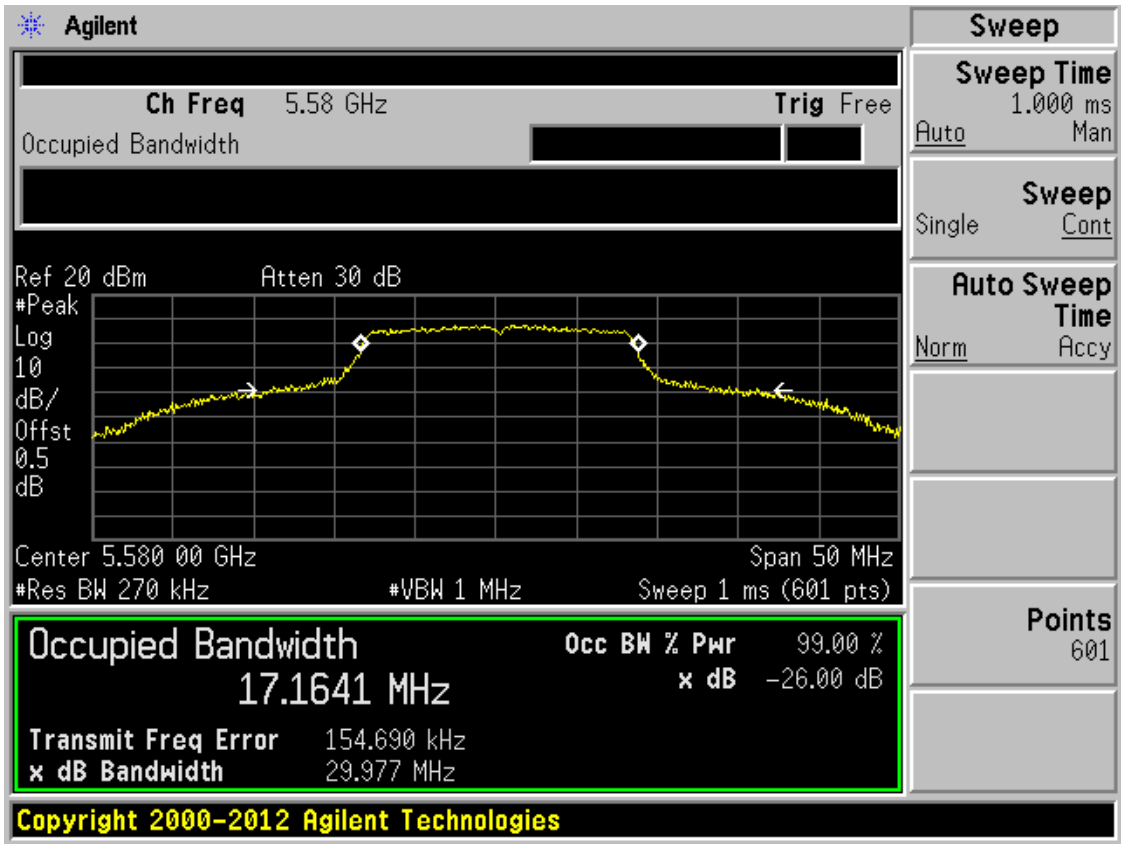

Band II 11ac(HT80) CH58



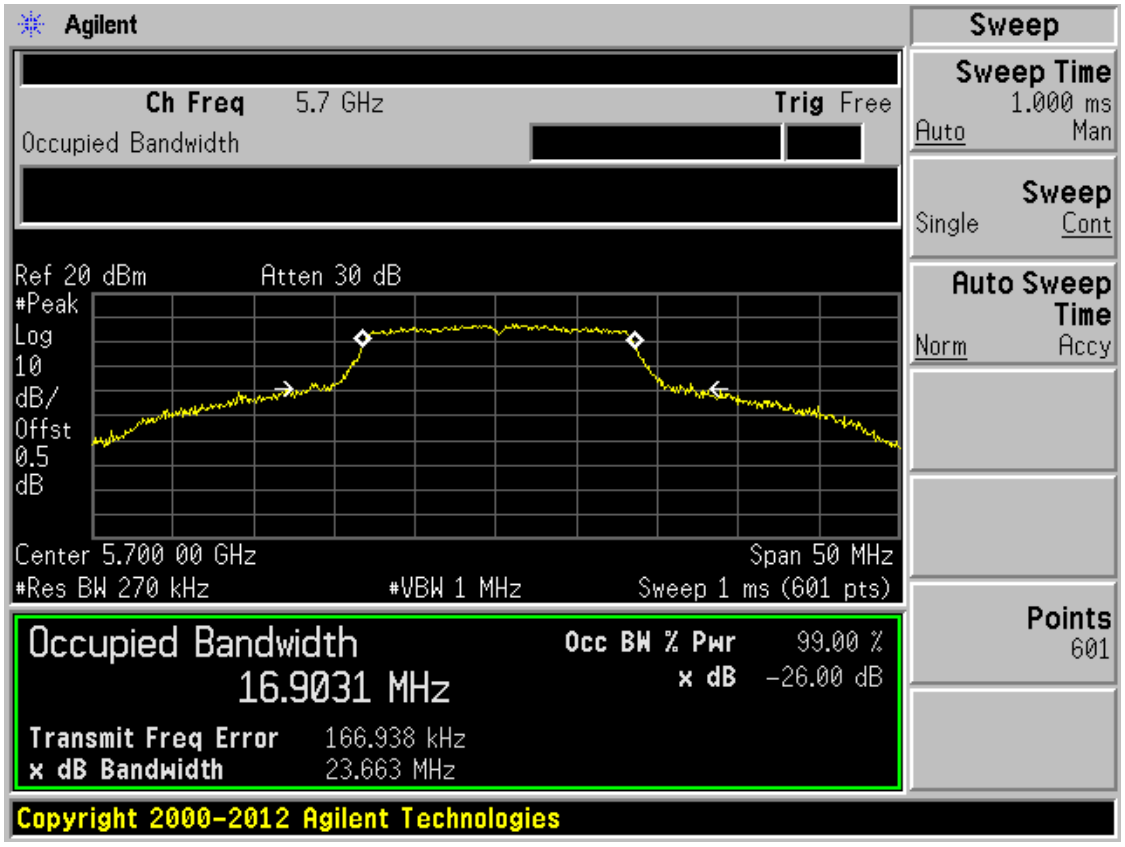
Band III 11a CH100



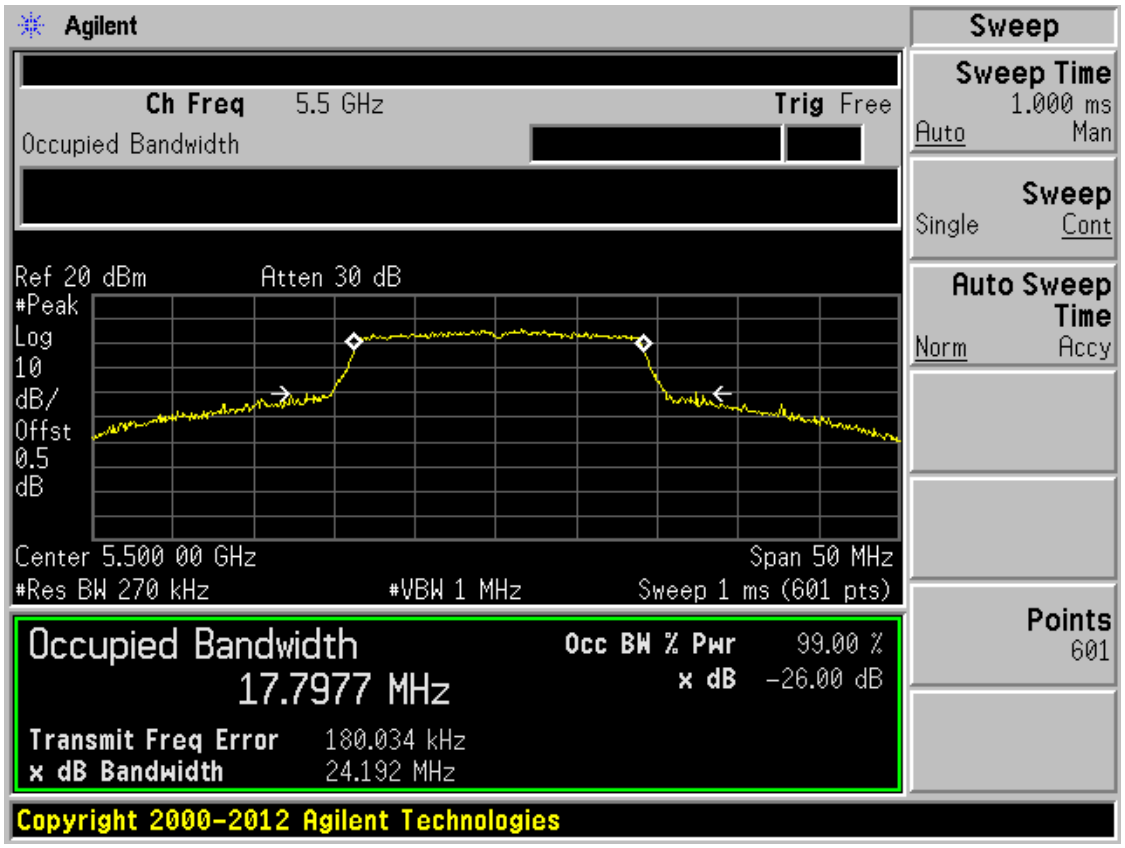

Band III 11a CH116



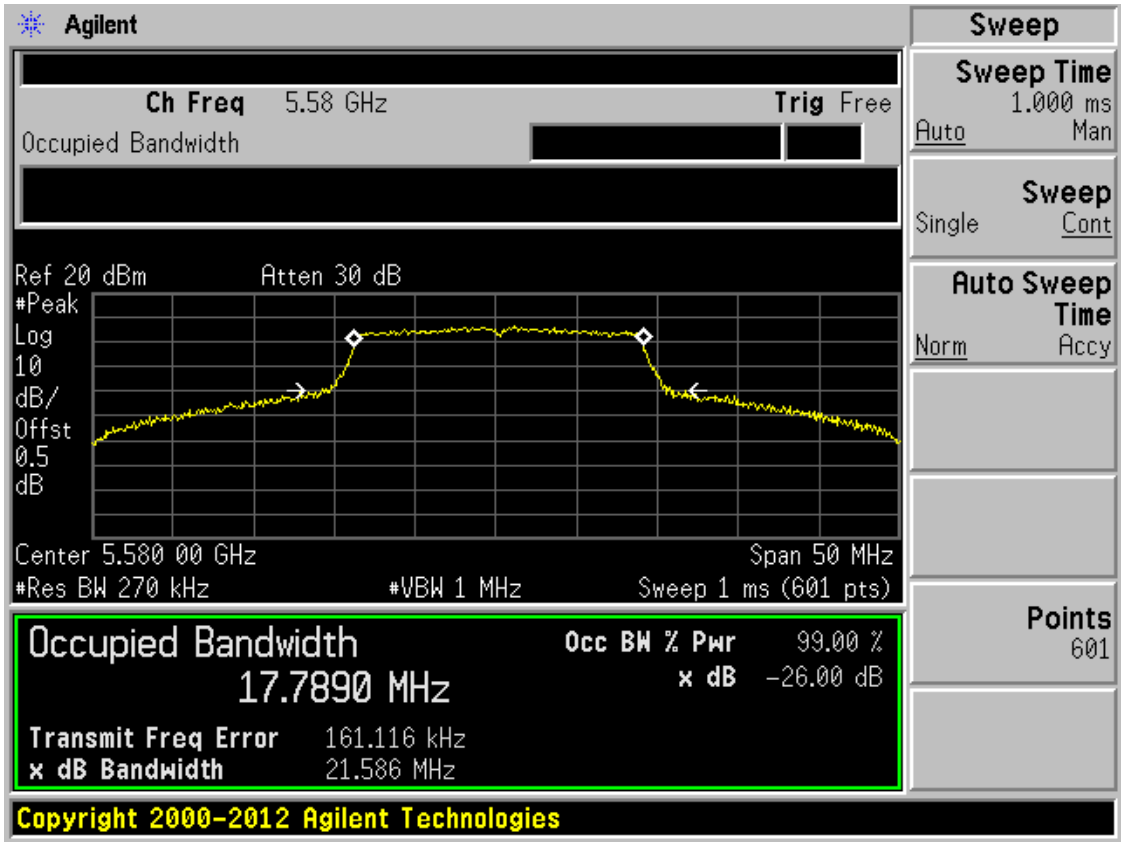
Band III 11a CH140



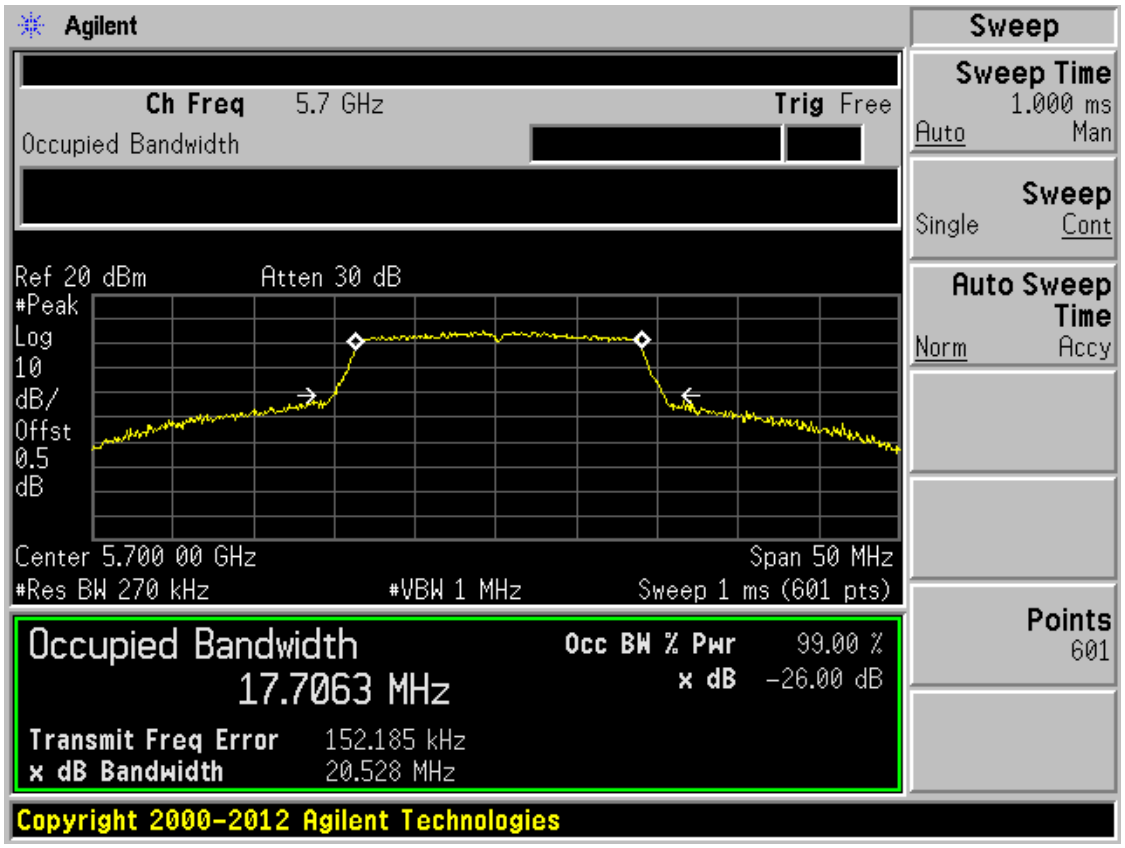

Band III 11n(HT20) CH100



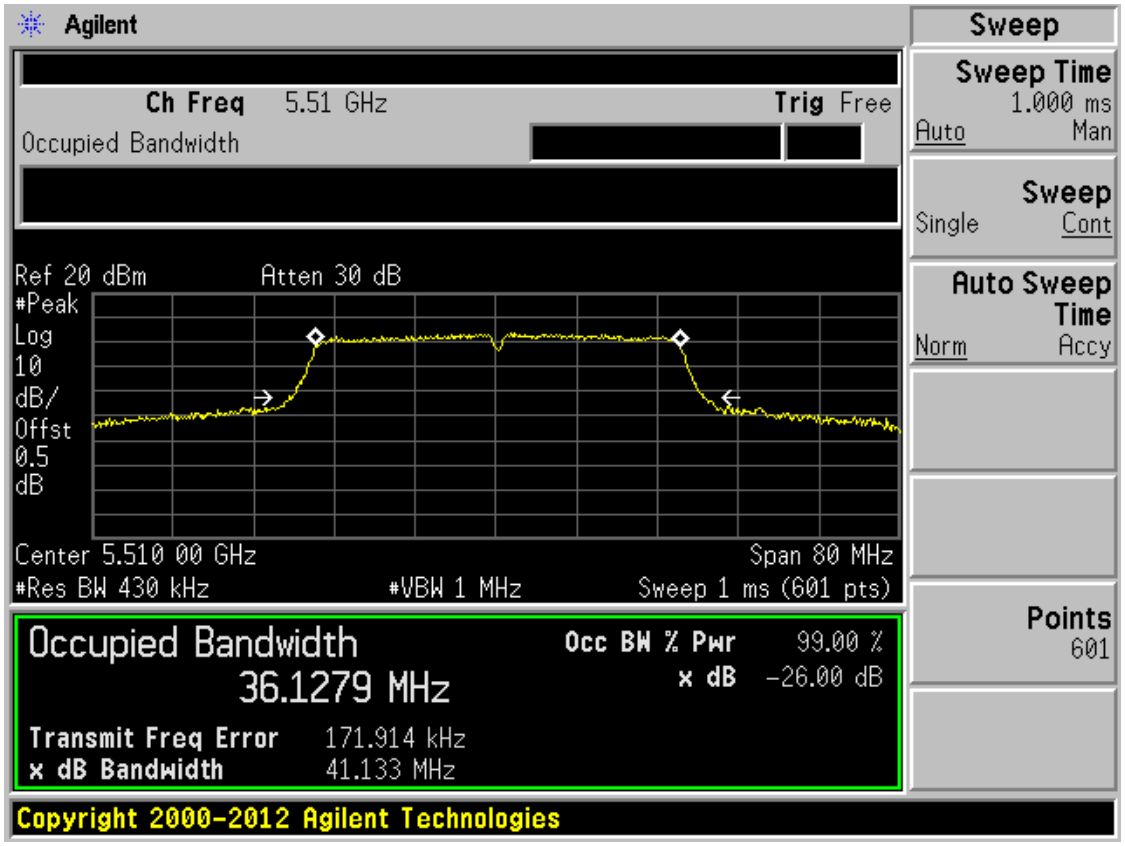
Band III 11n(HT20) CH116



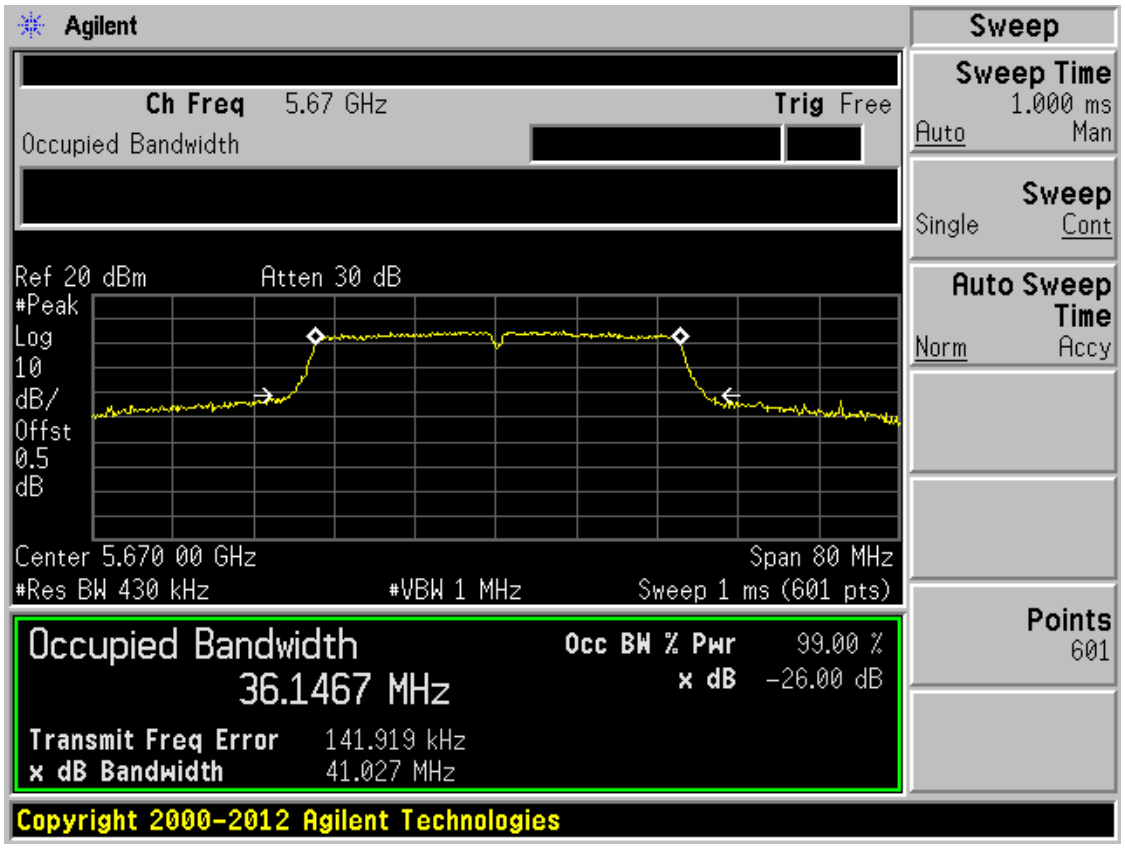

Band III 11n(HT20) CH140



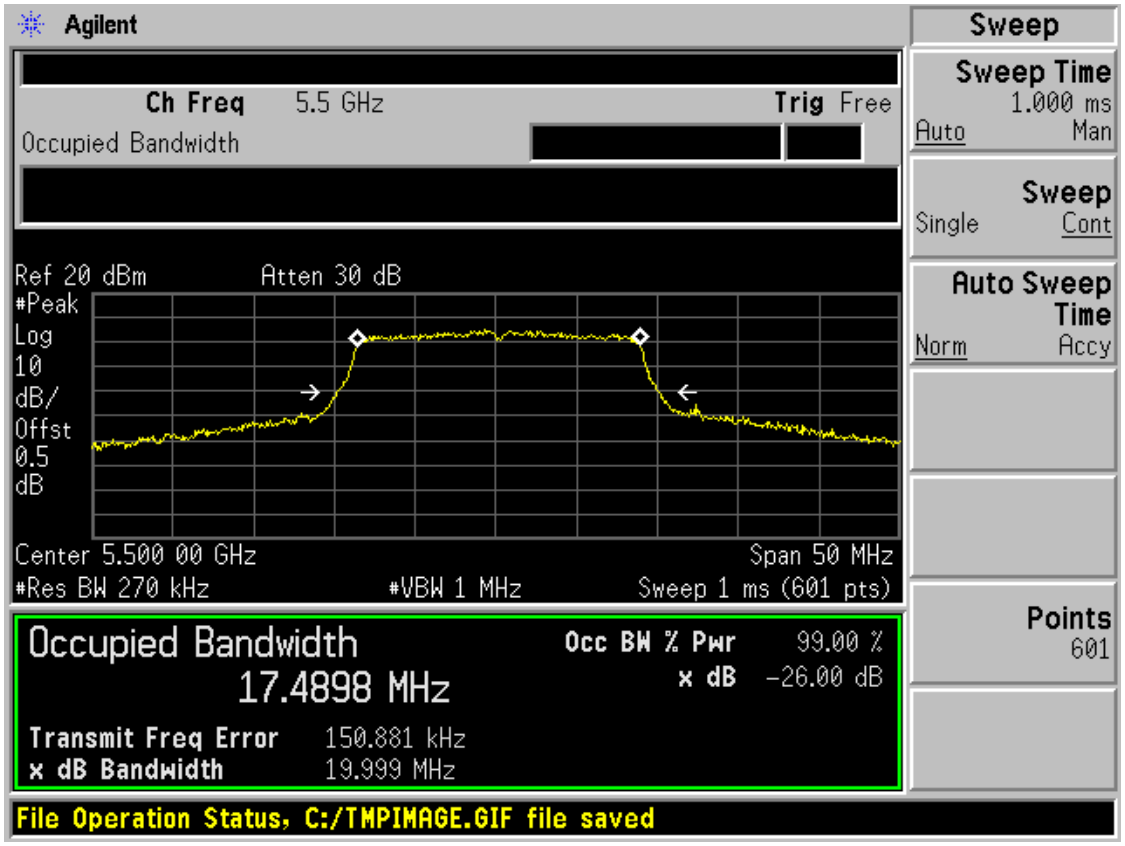
Band III 11n(HT40) CH102



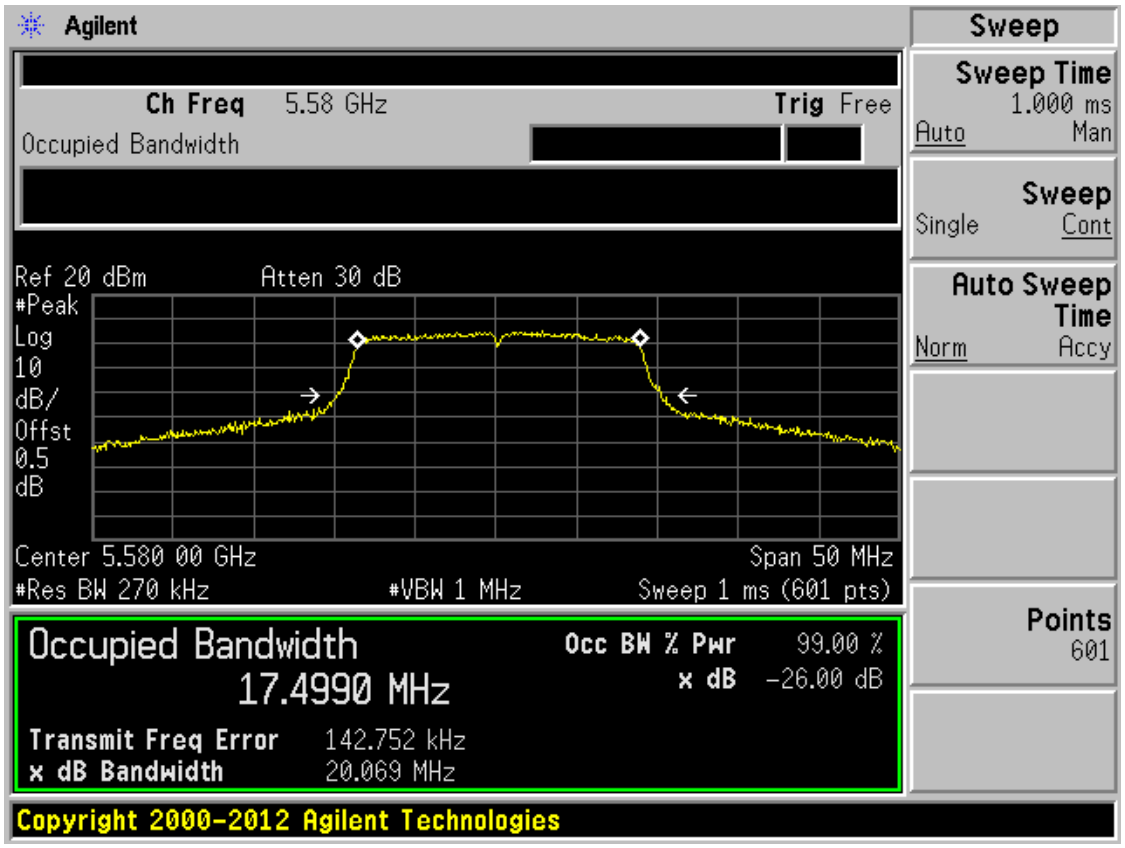

Band III 11n(HT40) CH134



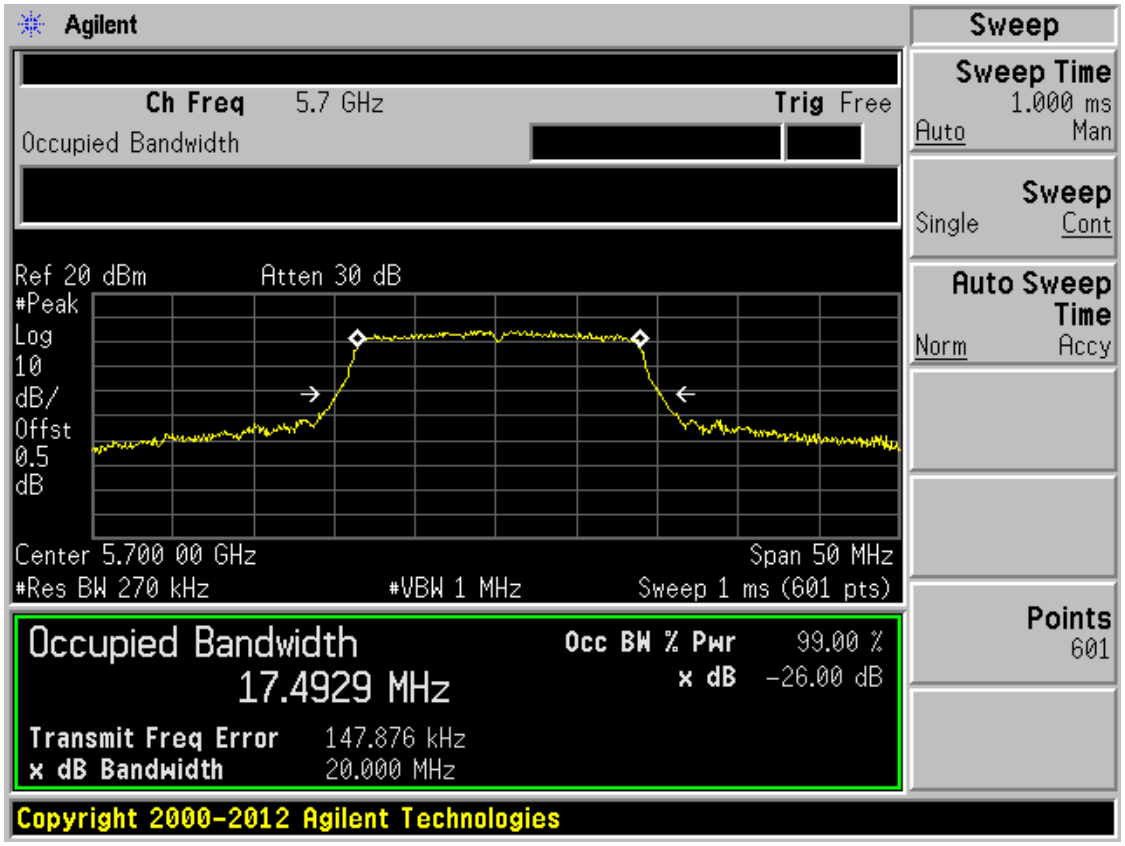
Band III 11ac(HT20) CH100



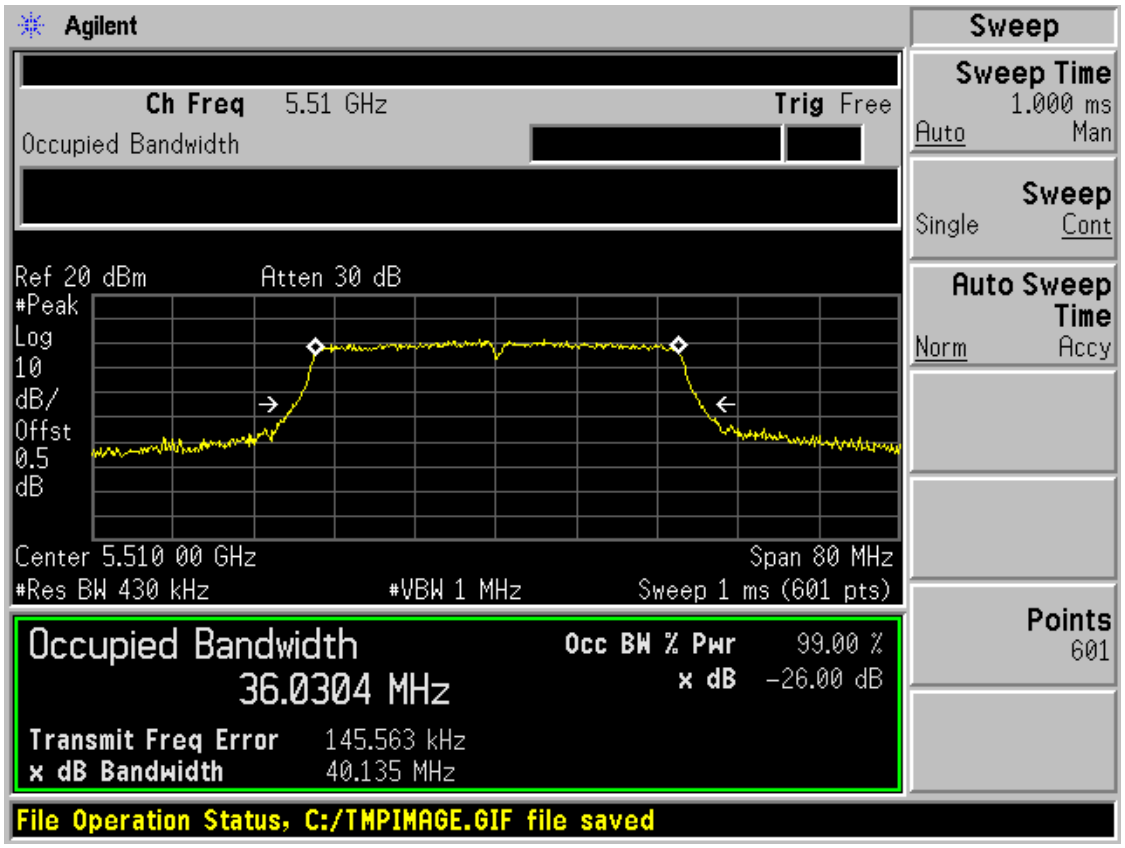

Band III 11ac(HT20) CH116



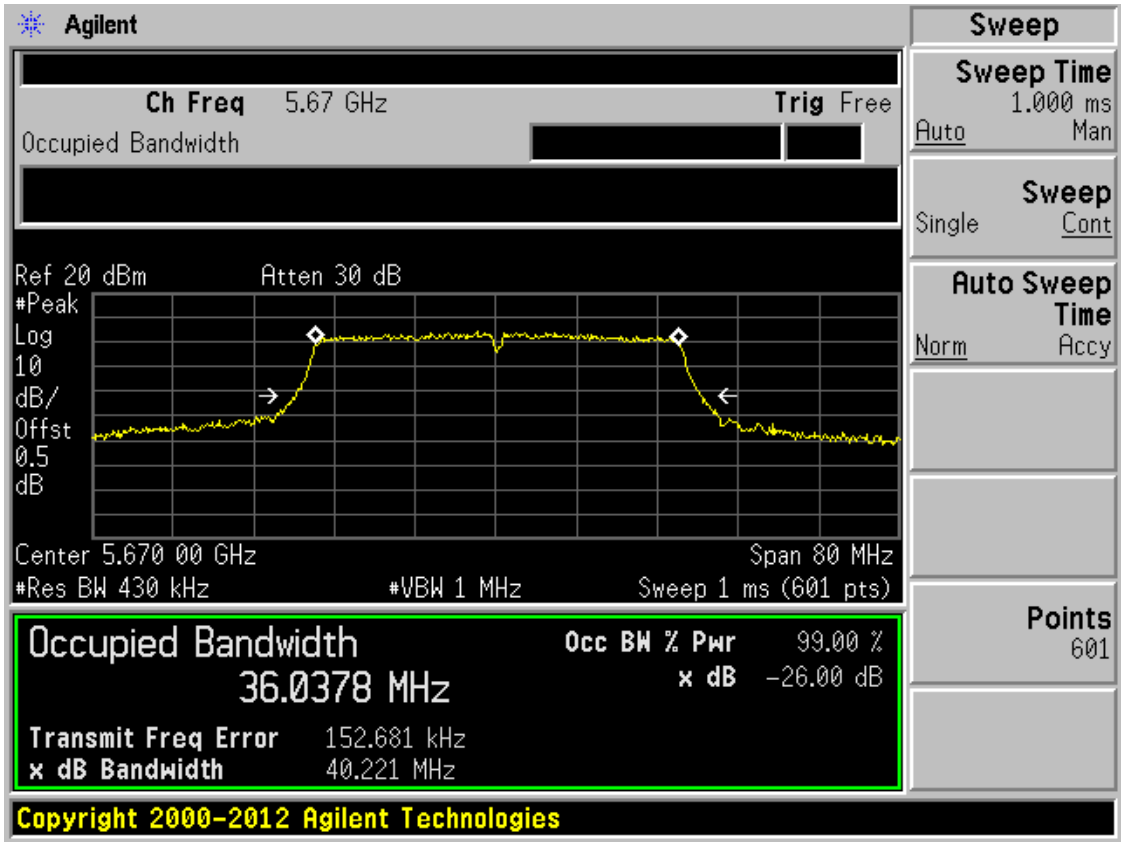
Band III 11ac(HT20) CH140



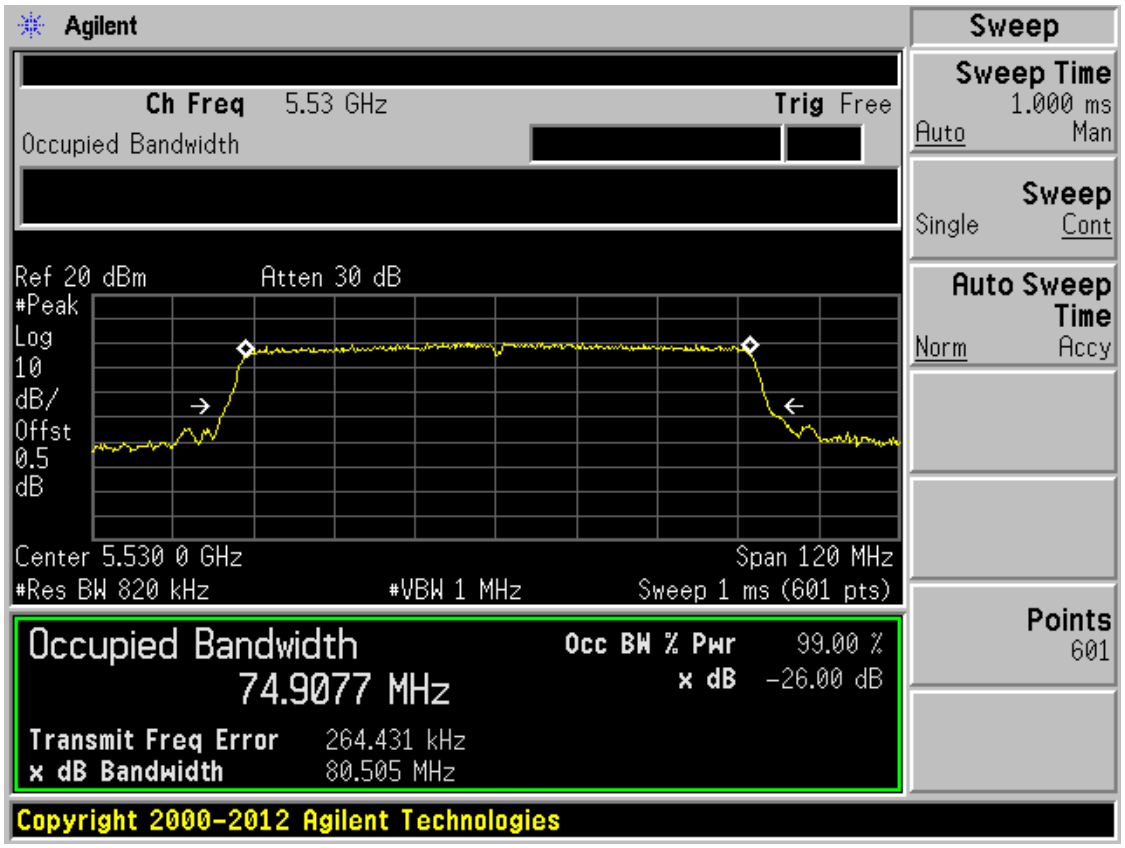

Band III 11ac(HT40) CH102



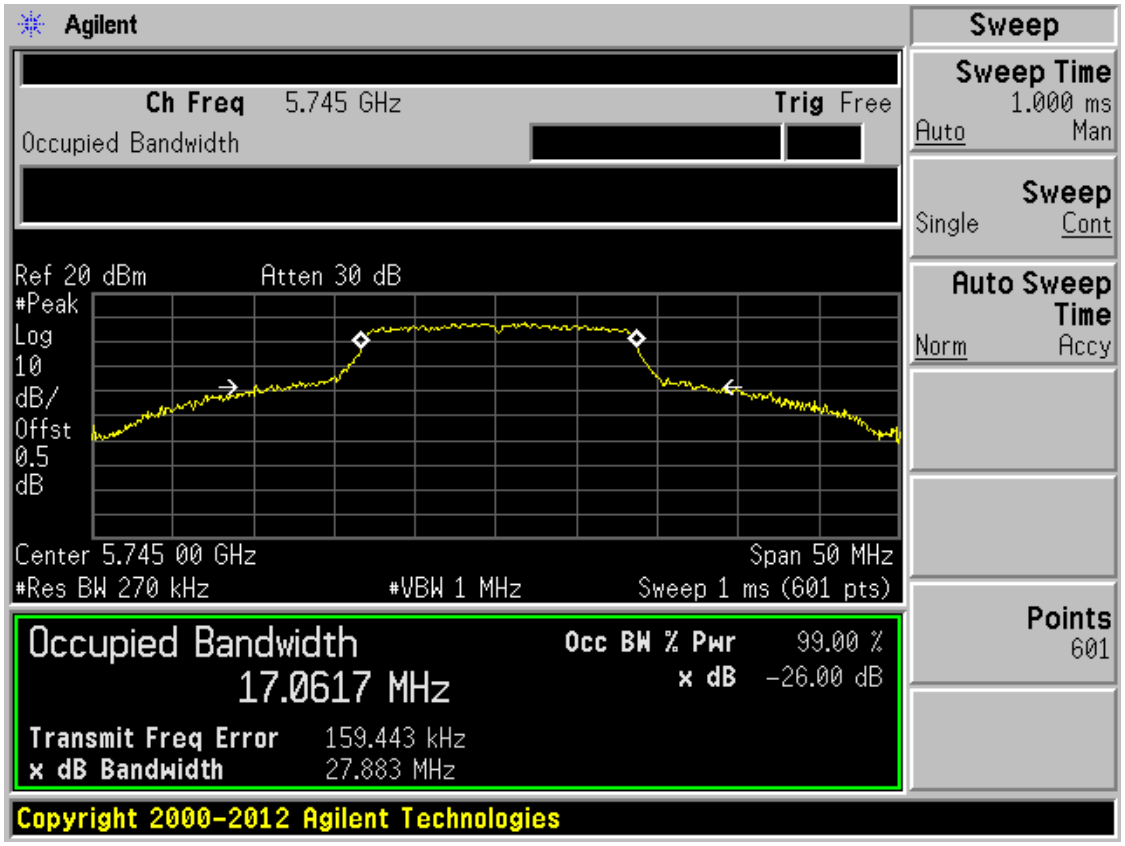
Band III 11ac(HT40) CH134



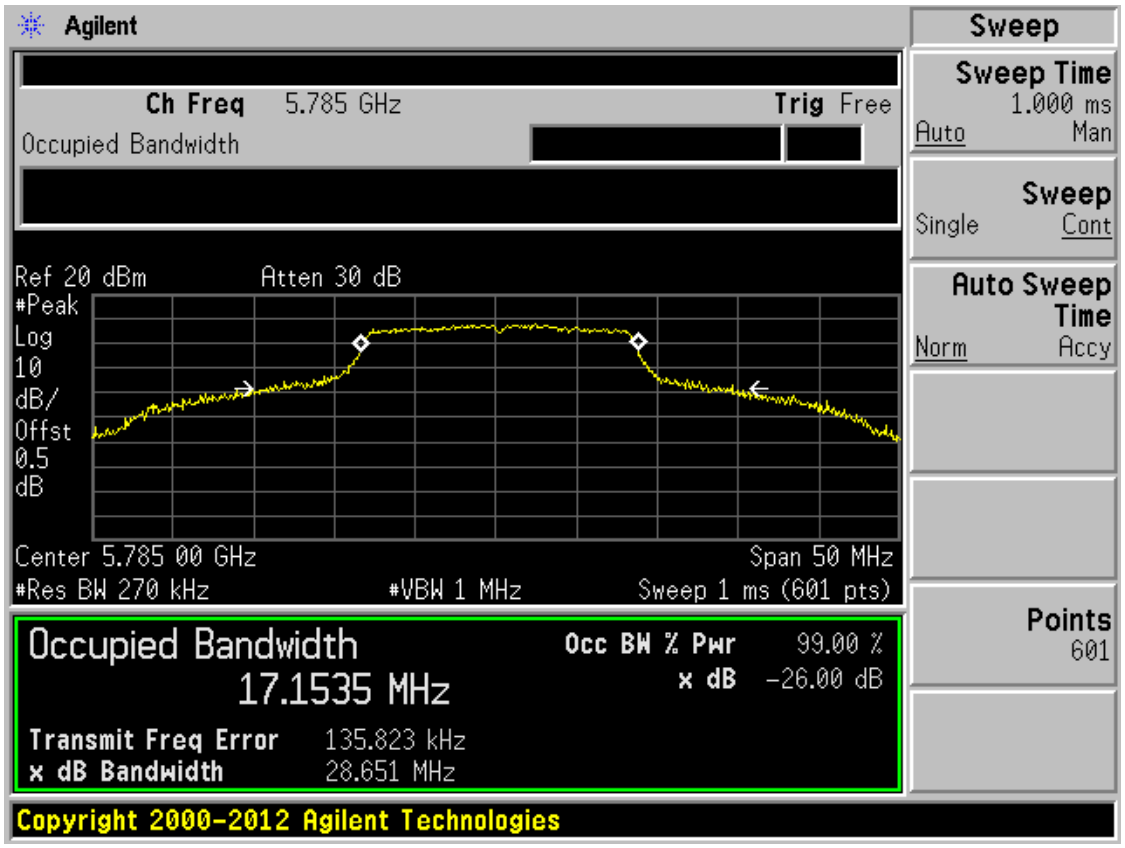

Band III 11ac(HT80) CH106



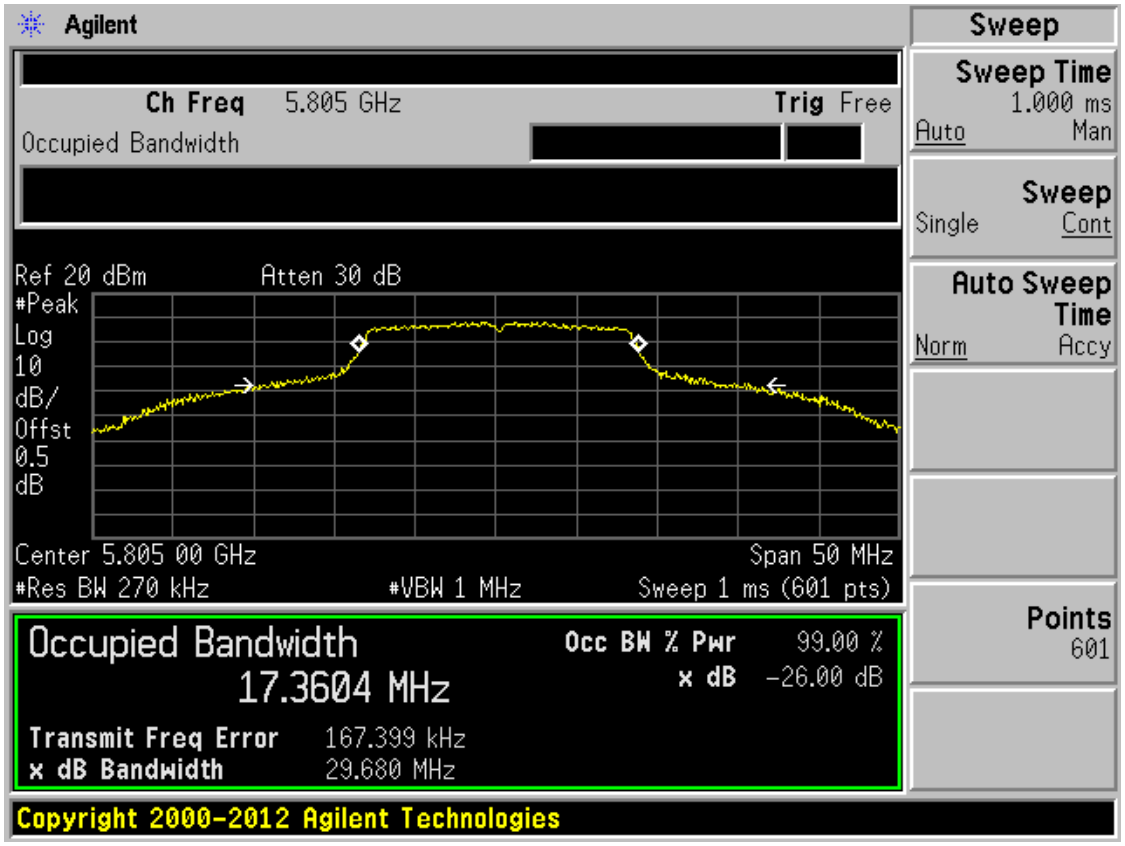
## Band IV 11a CH149



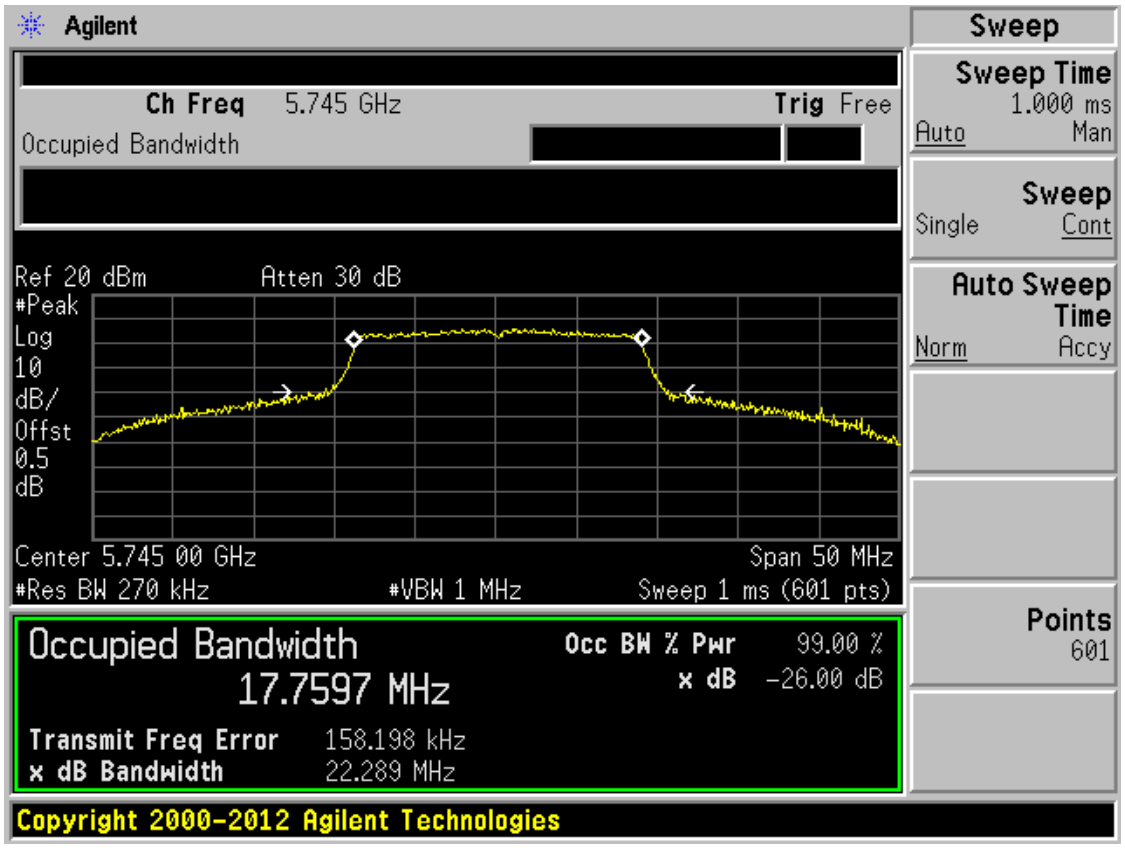

## Band IV 11a CH157



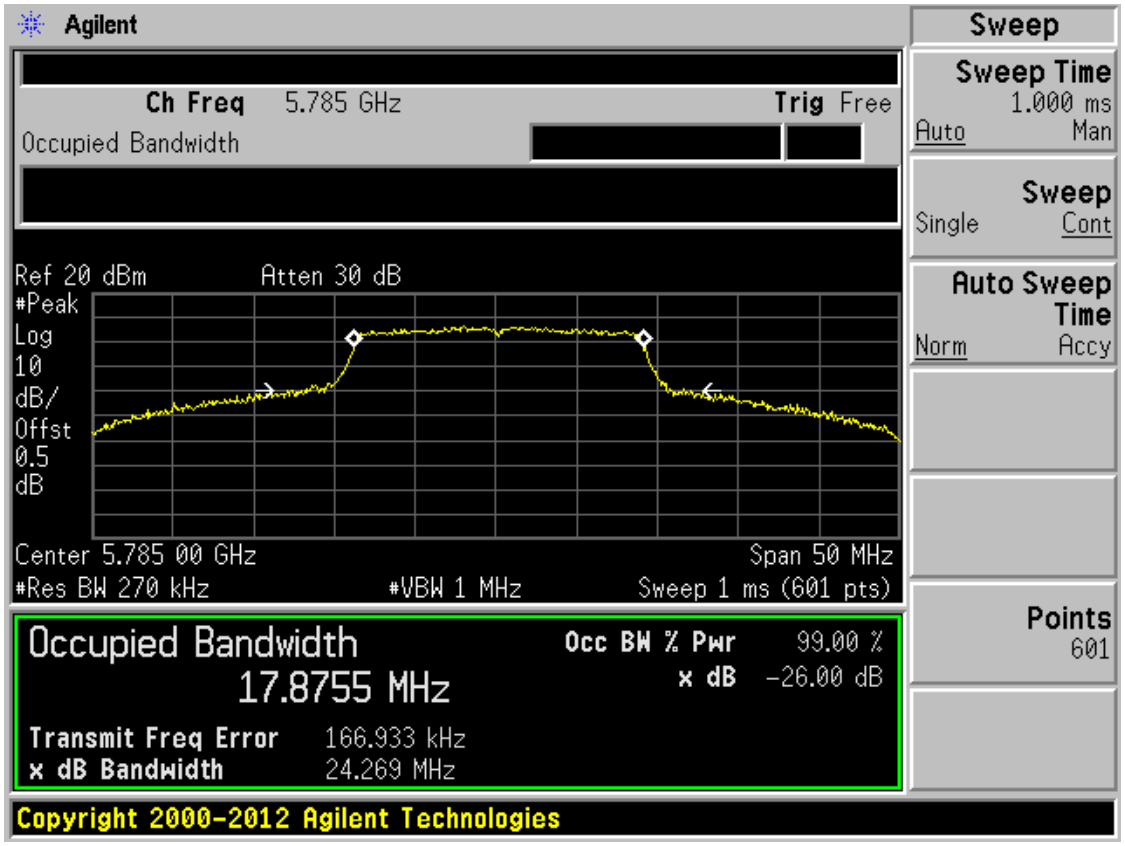
Band IV 11a CH161



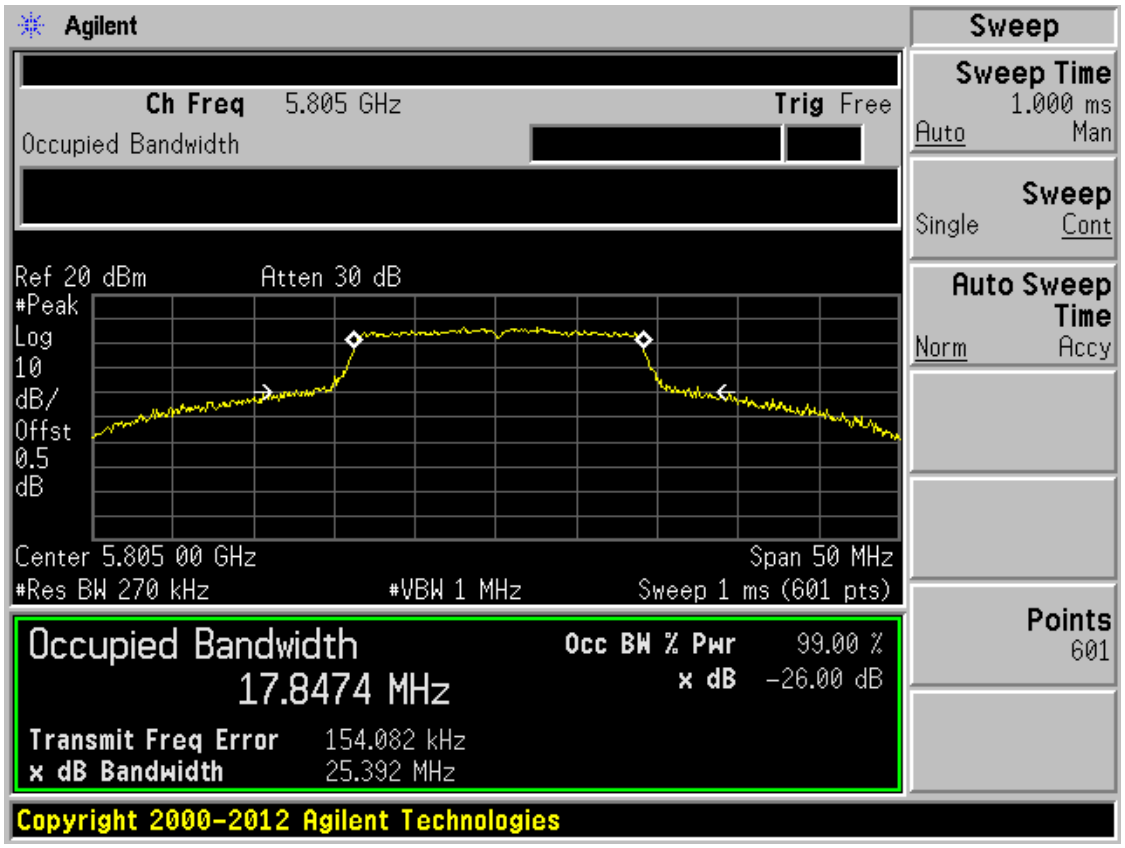

Band IV 11n(HT20) CH149



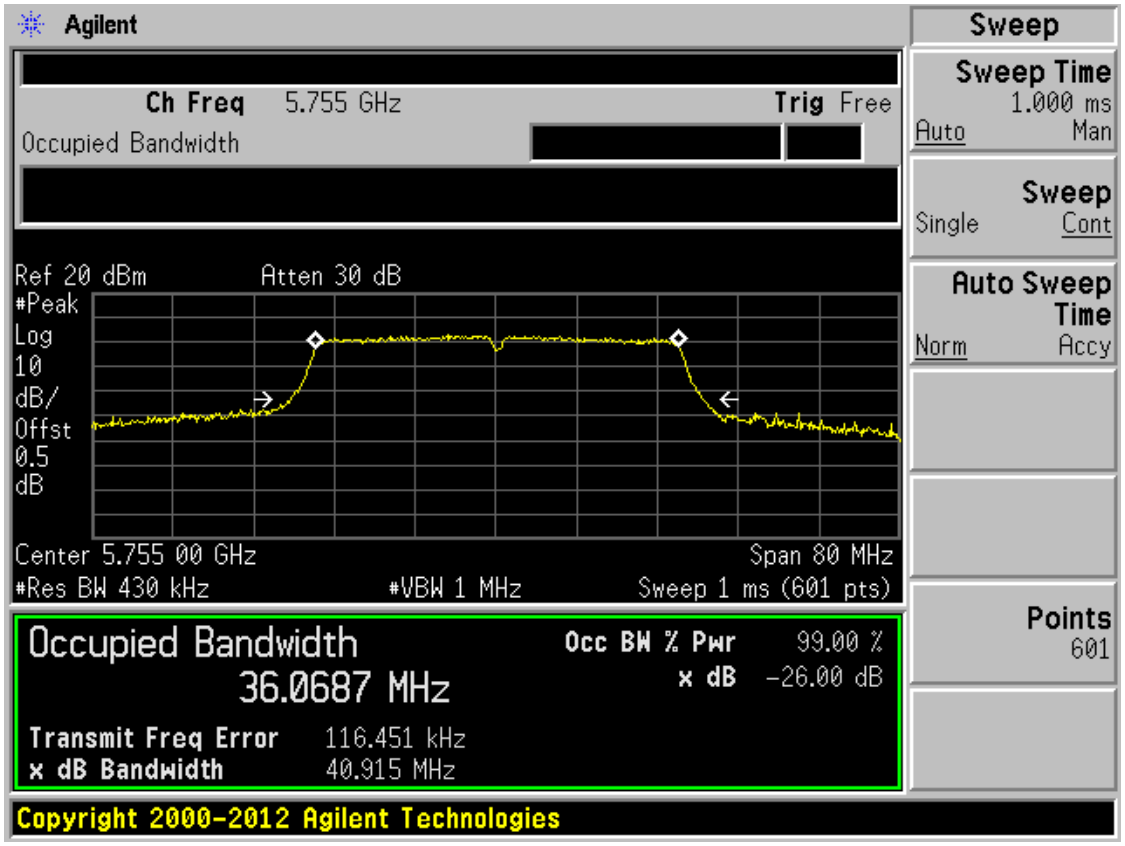
Band IV 11n(HT20) CH157



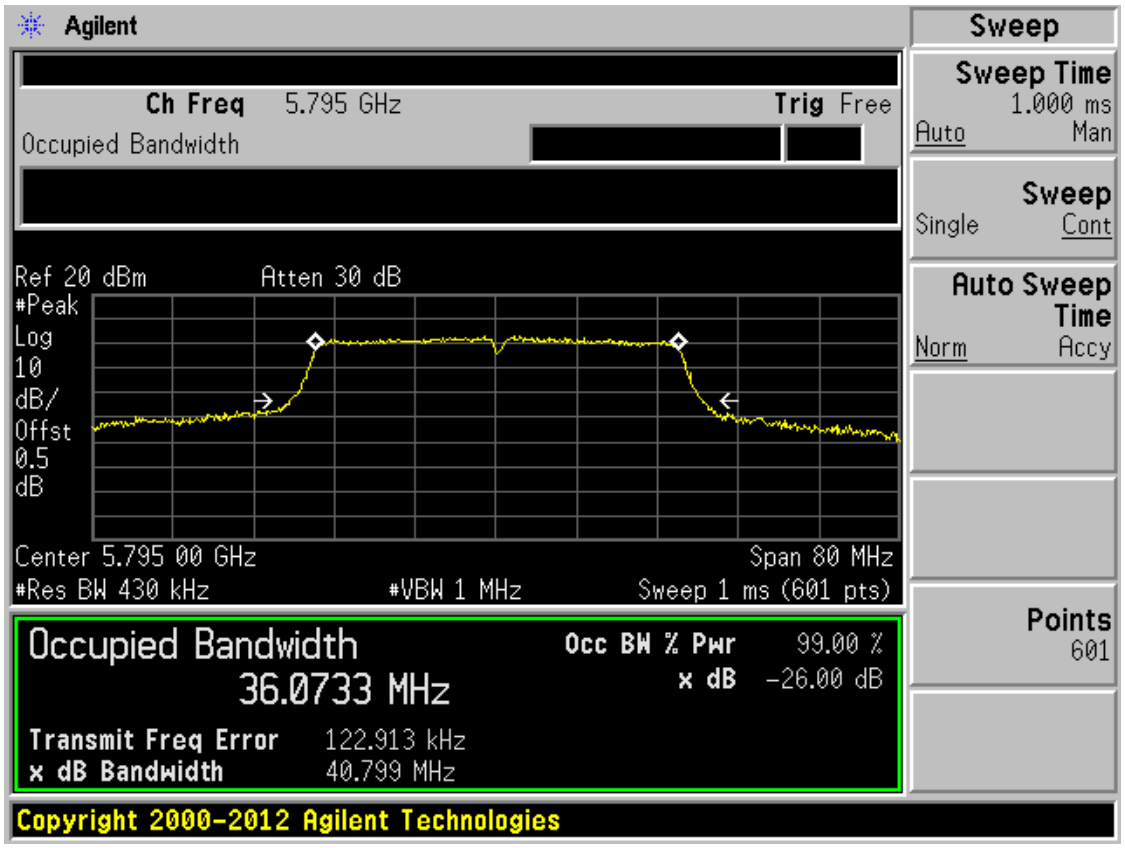

Band IV 11n(HT20) CH161



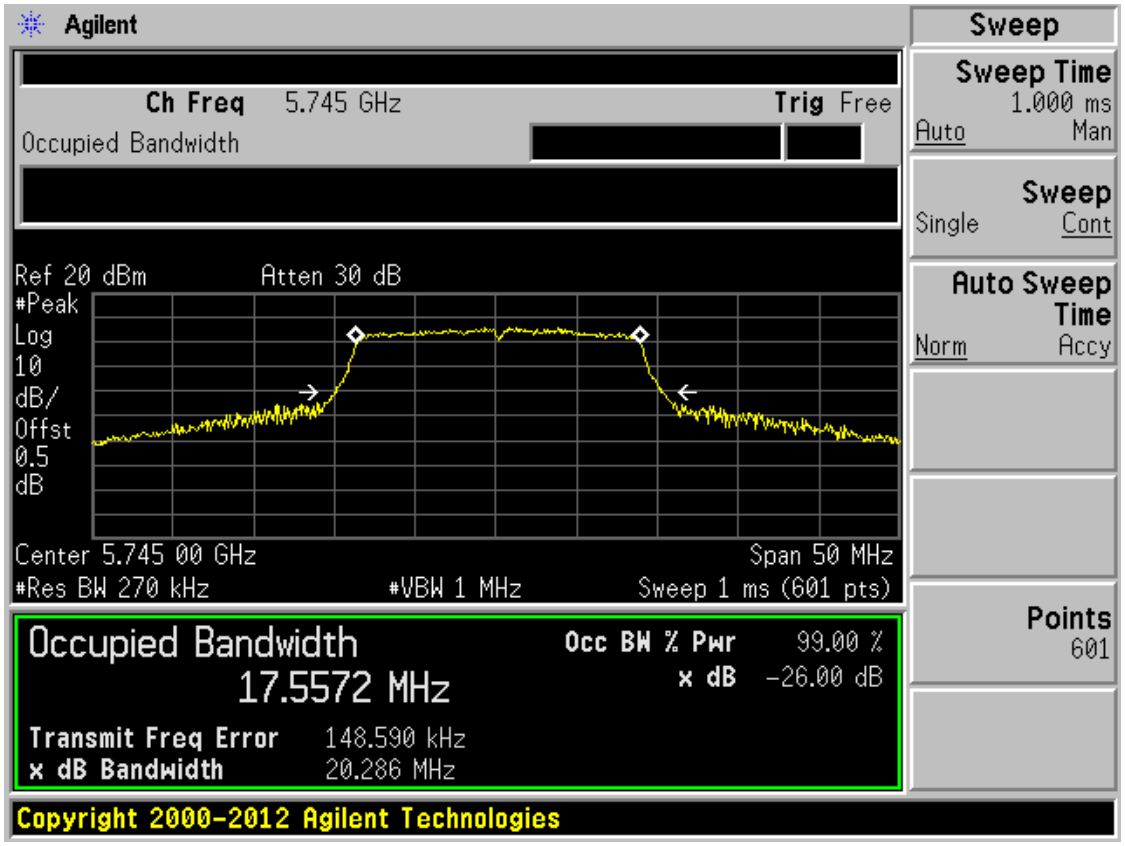
Band IV 11n(HT40) CH151



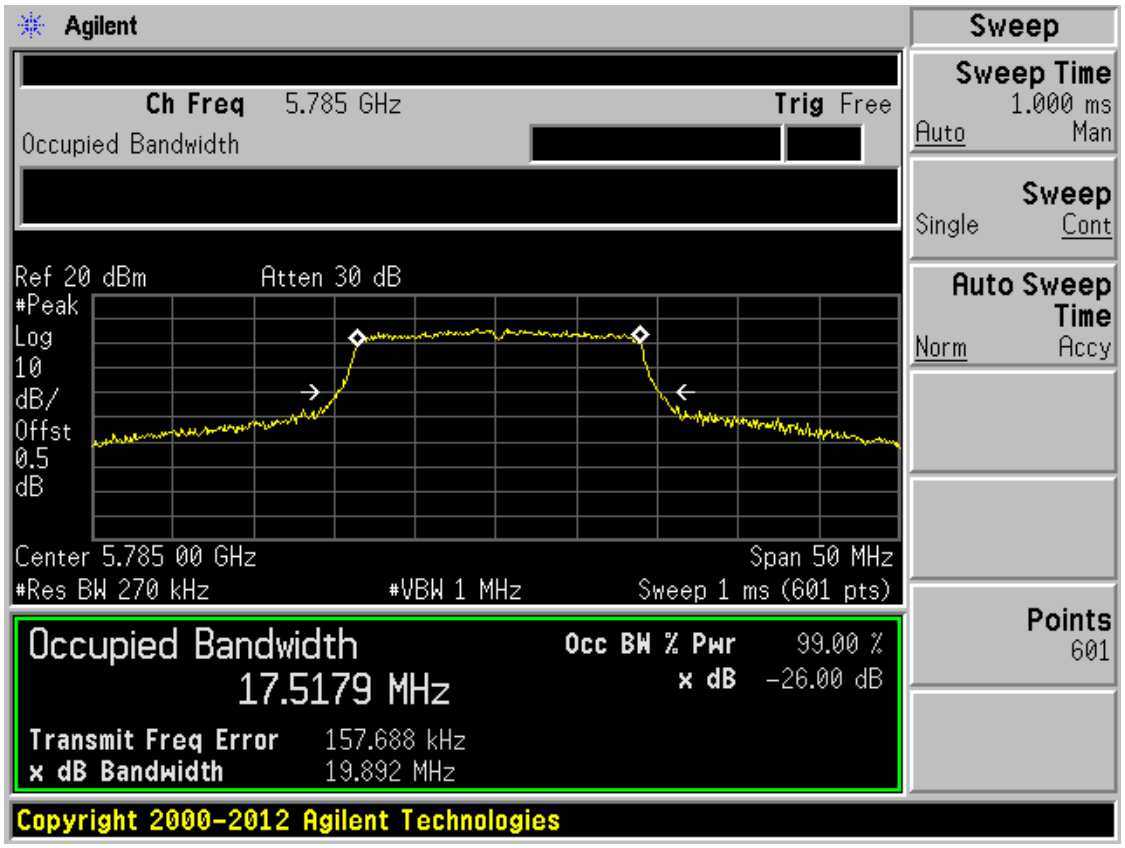

Band IV 11n(HT40) CH159



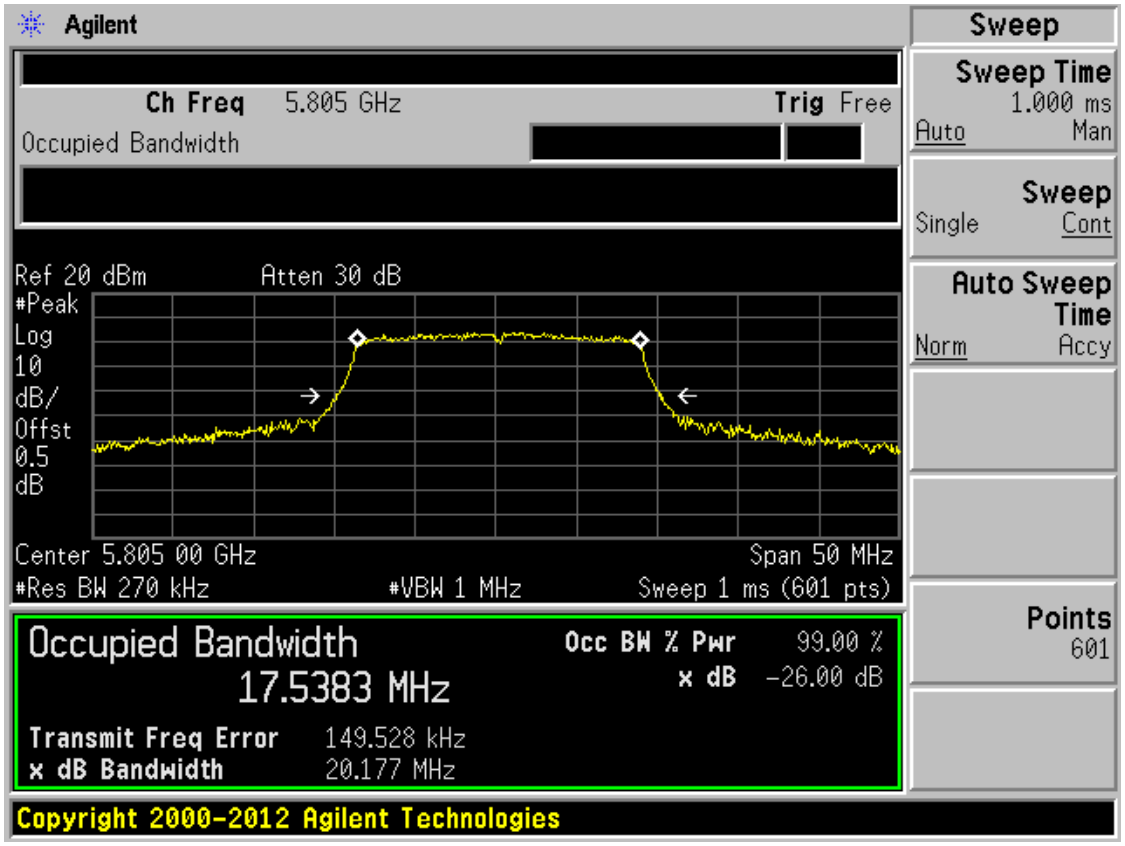
Band IV 11ac(HT20) CH149



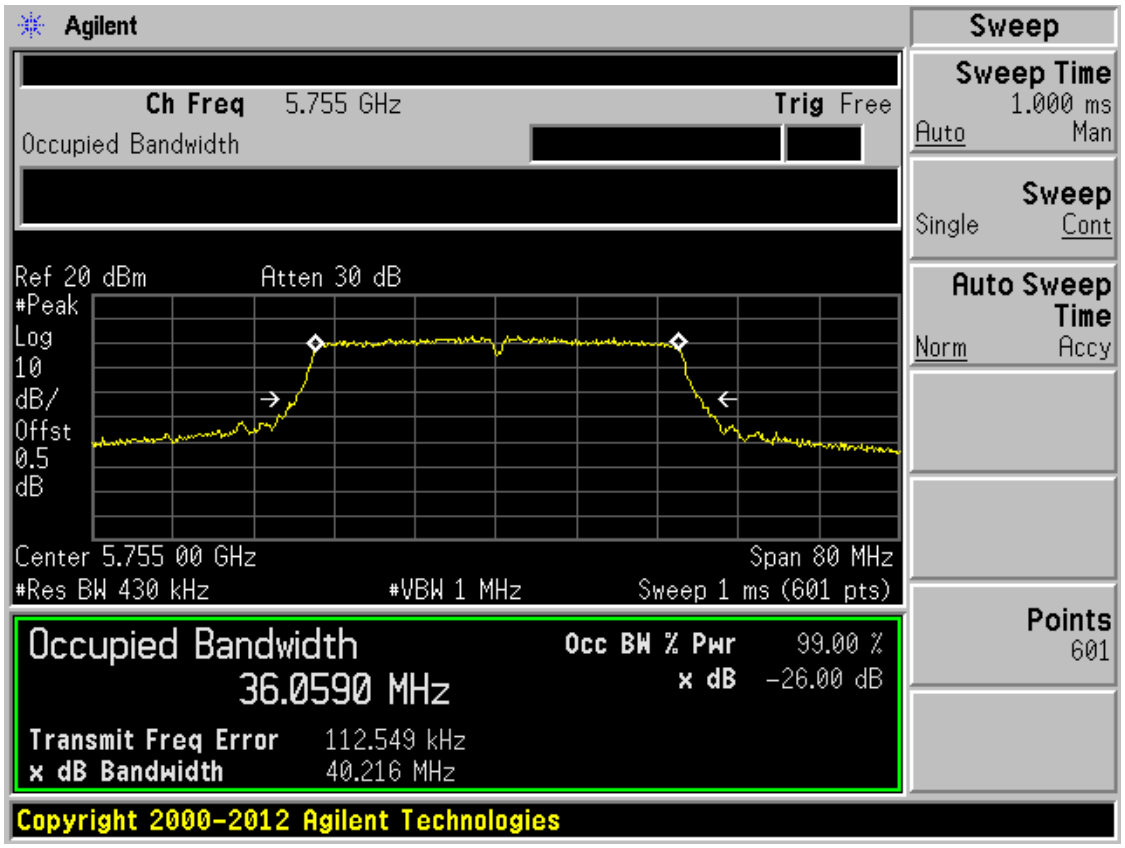

Band IV 11ac(HT20) CH157



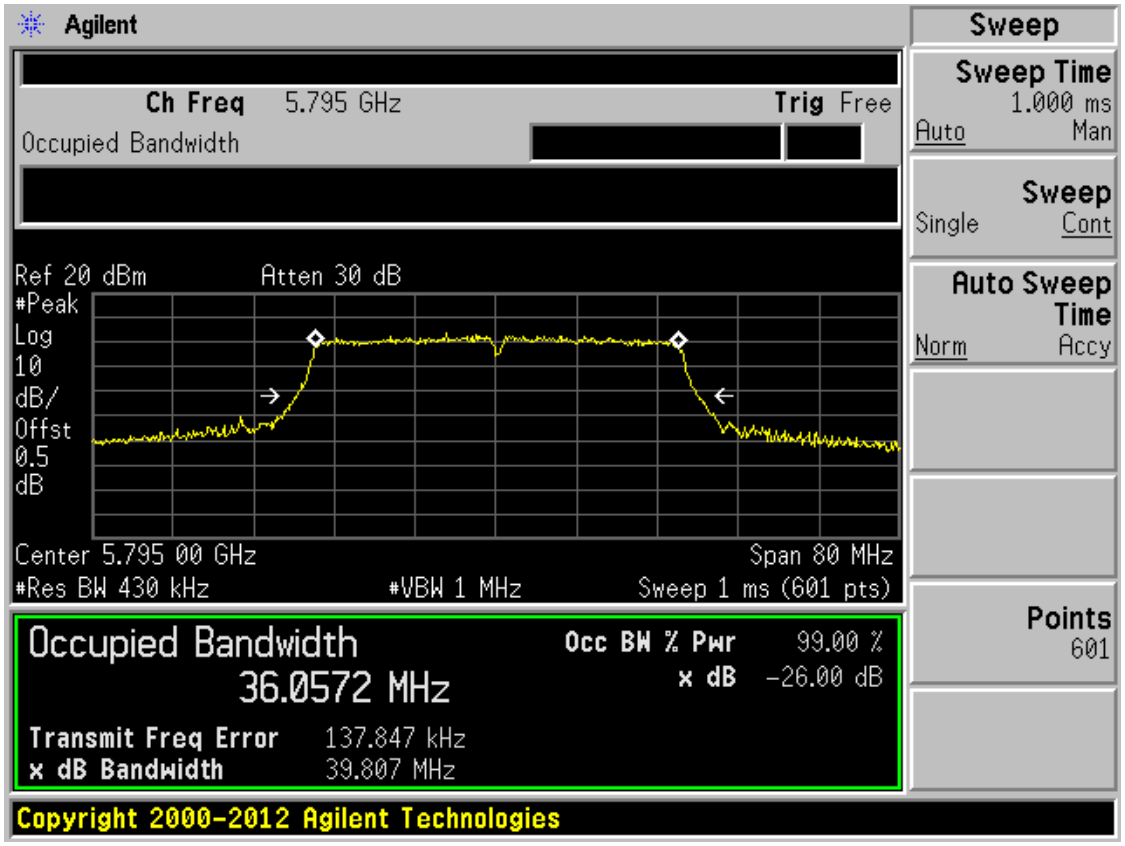
Band IV 11ac(HT20) CH161



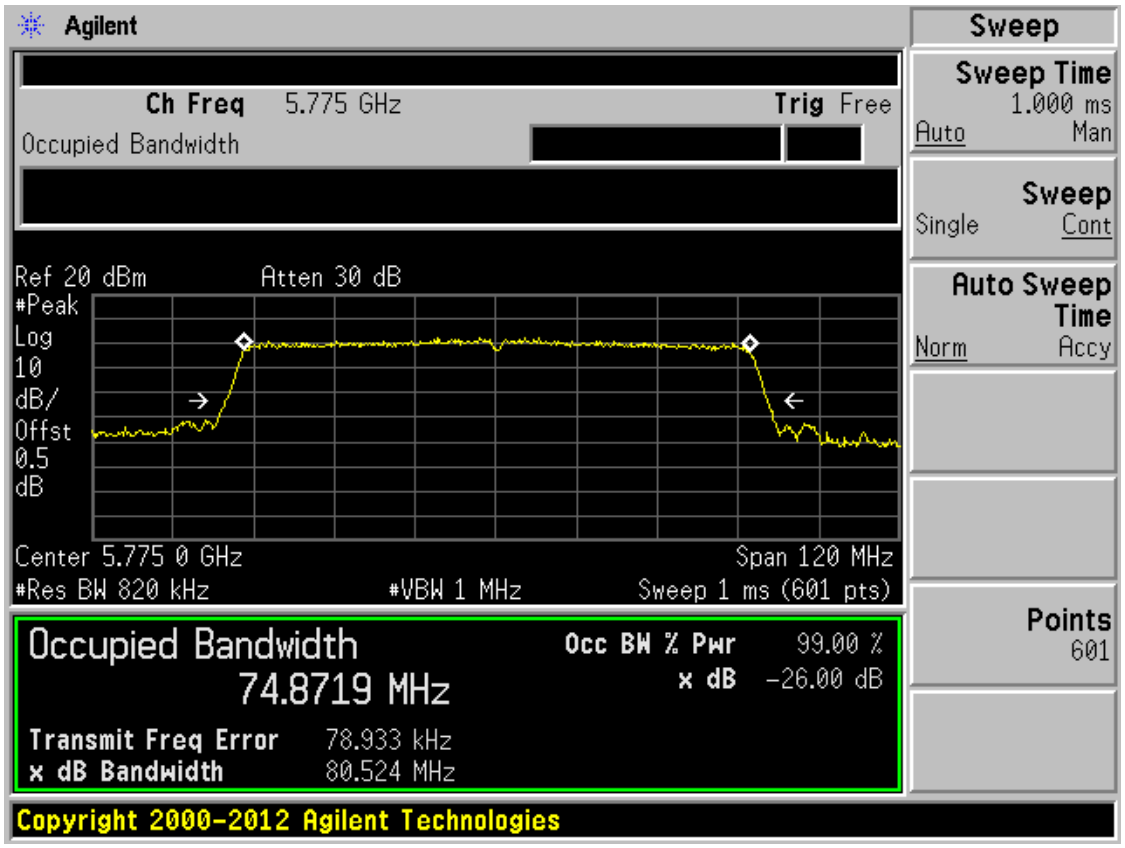

Band IV 11ac(HT40) CH151



Band IV 11ac(HT40) CH159

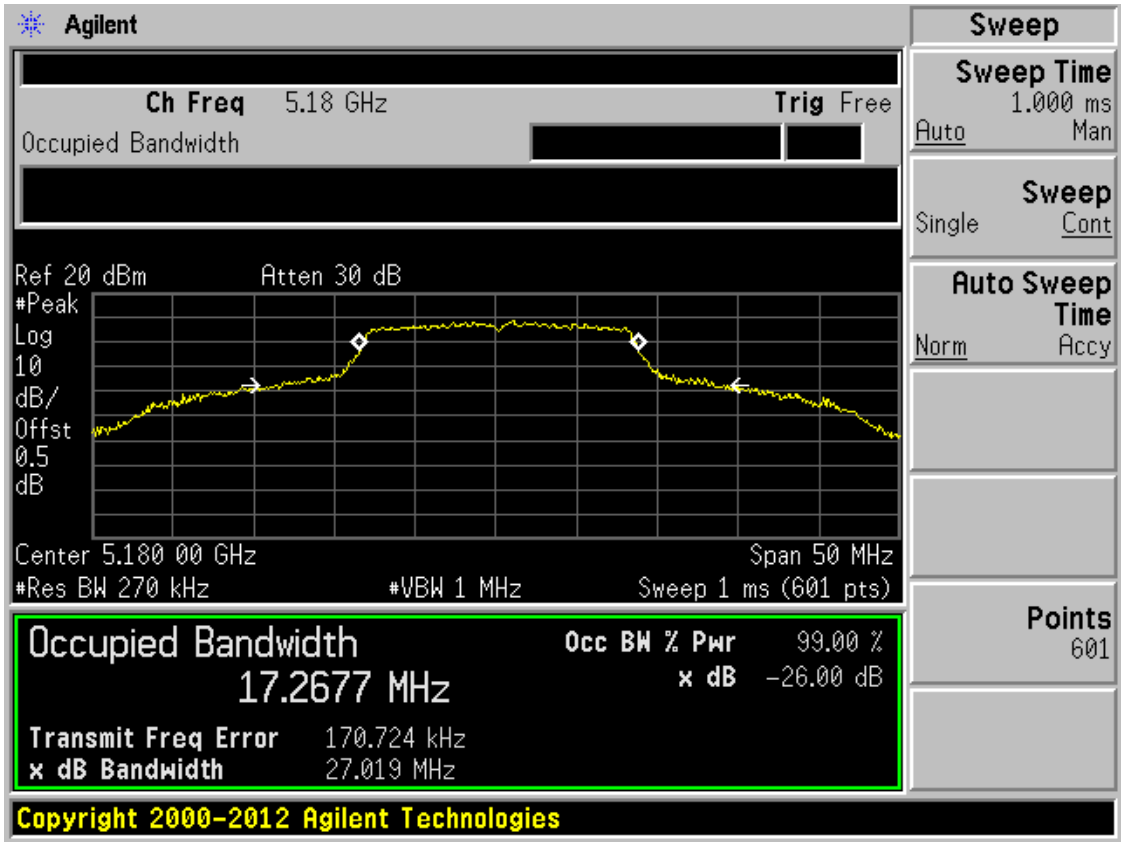



Band IV 11ac(HT80) CH155

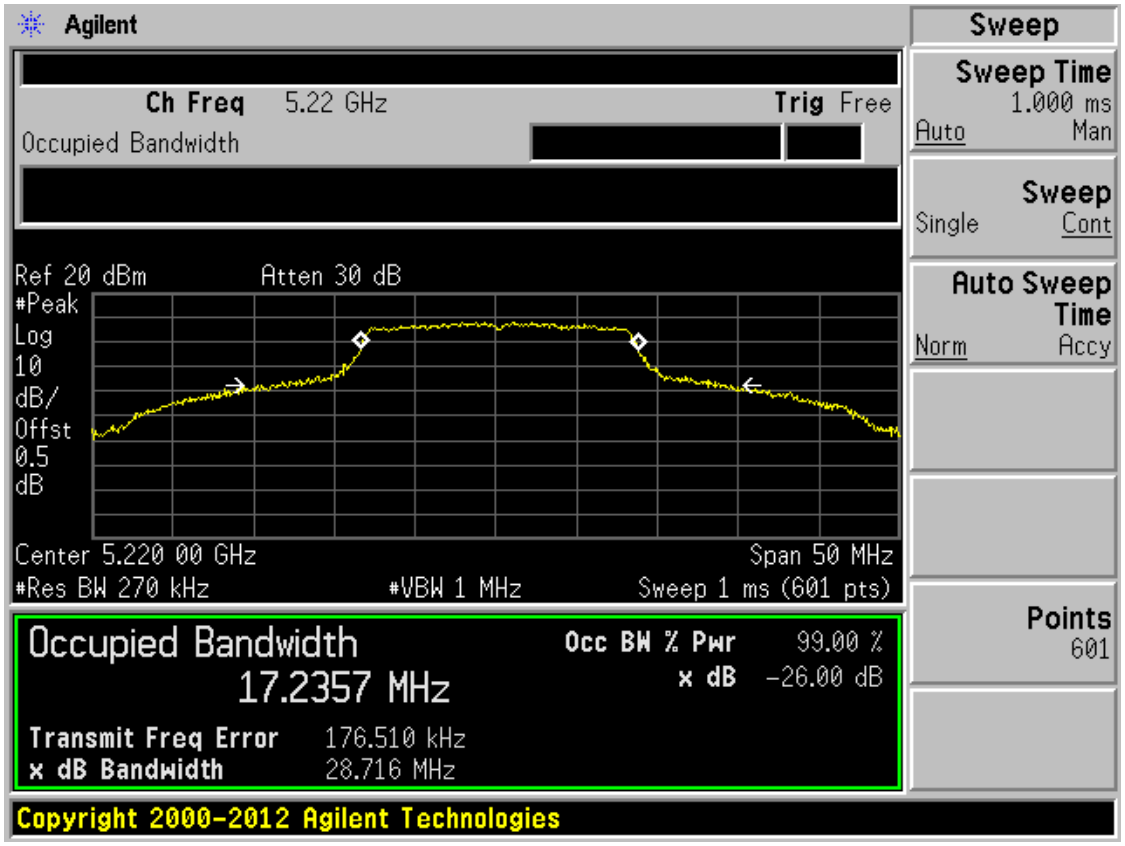


ANT 1

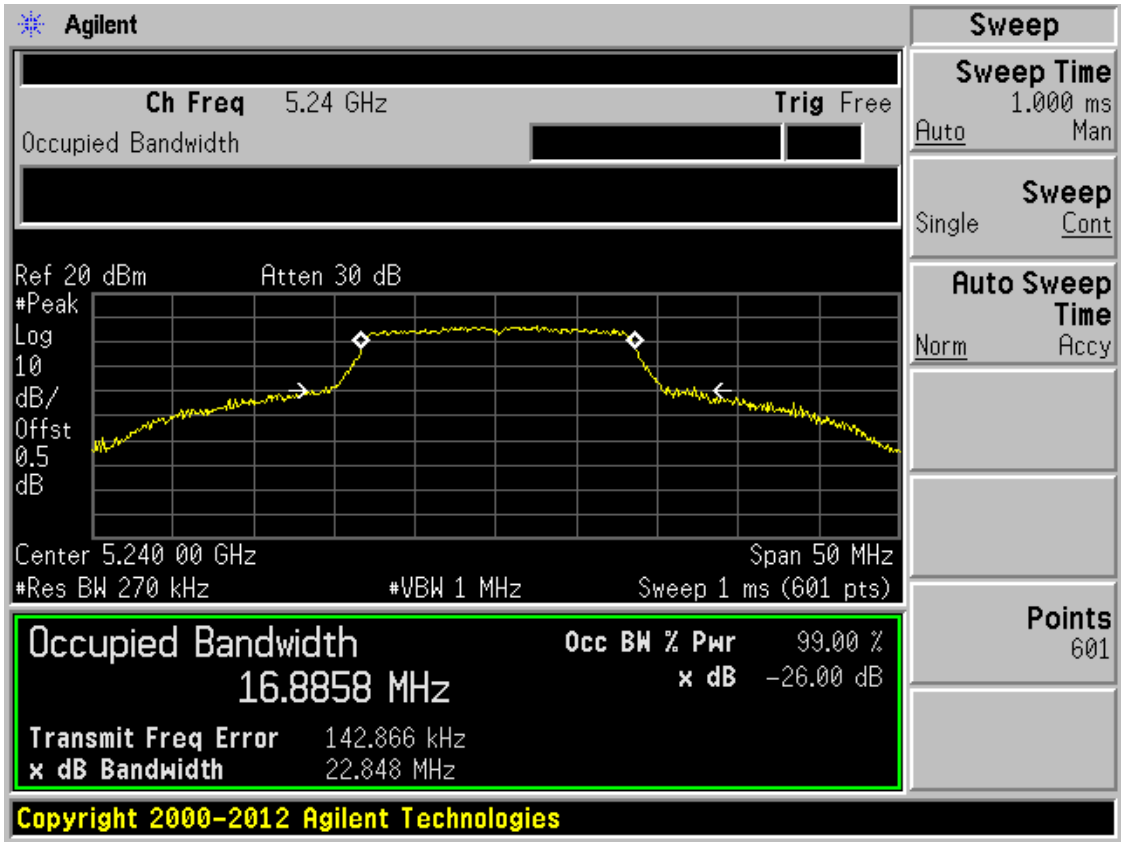
Band I 11a CH36



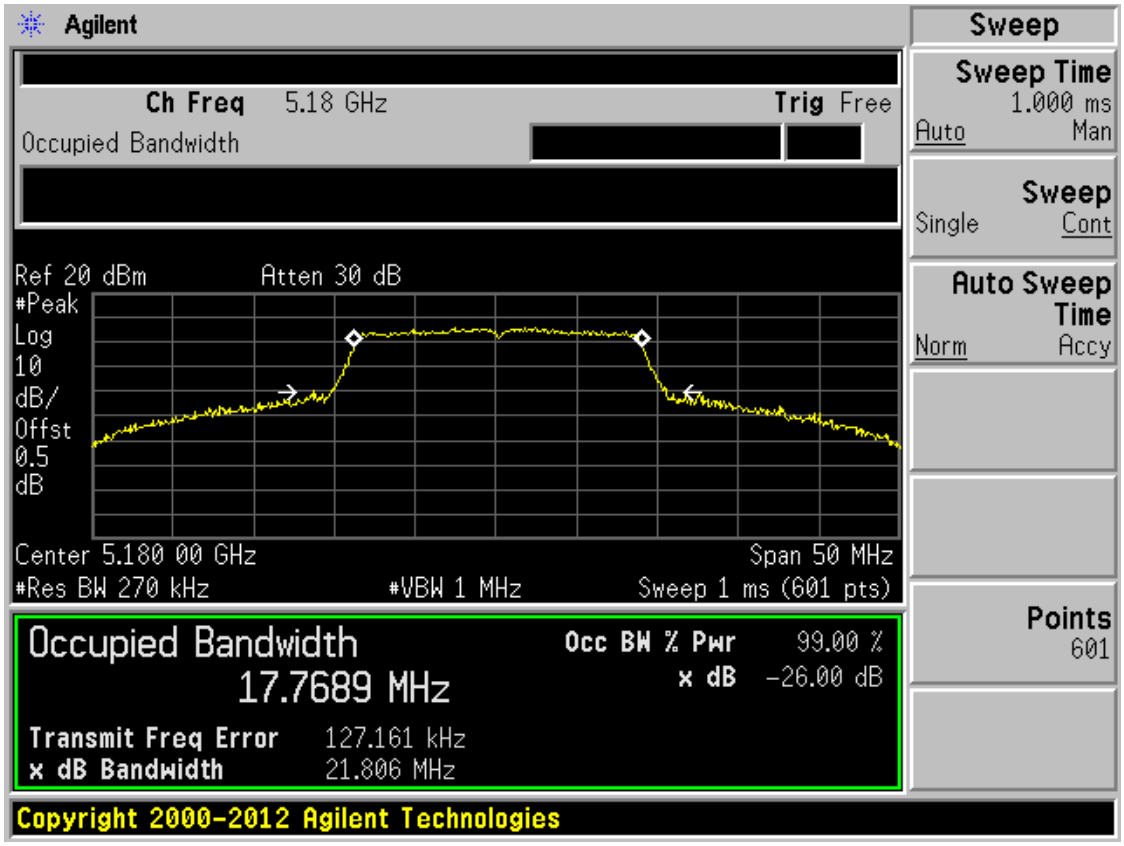

Band I 11a CH44



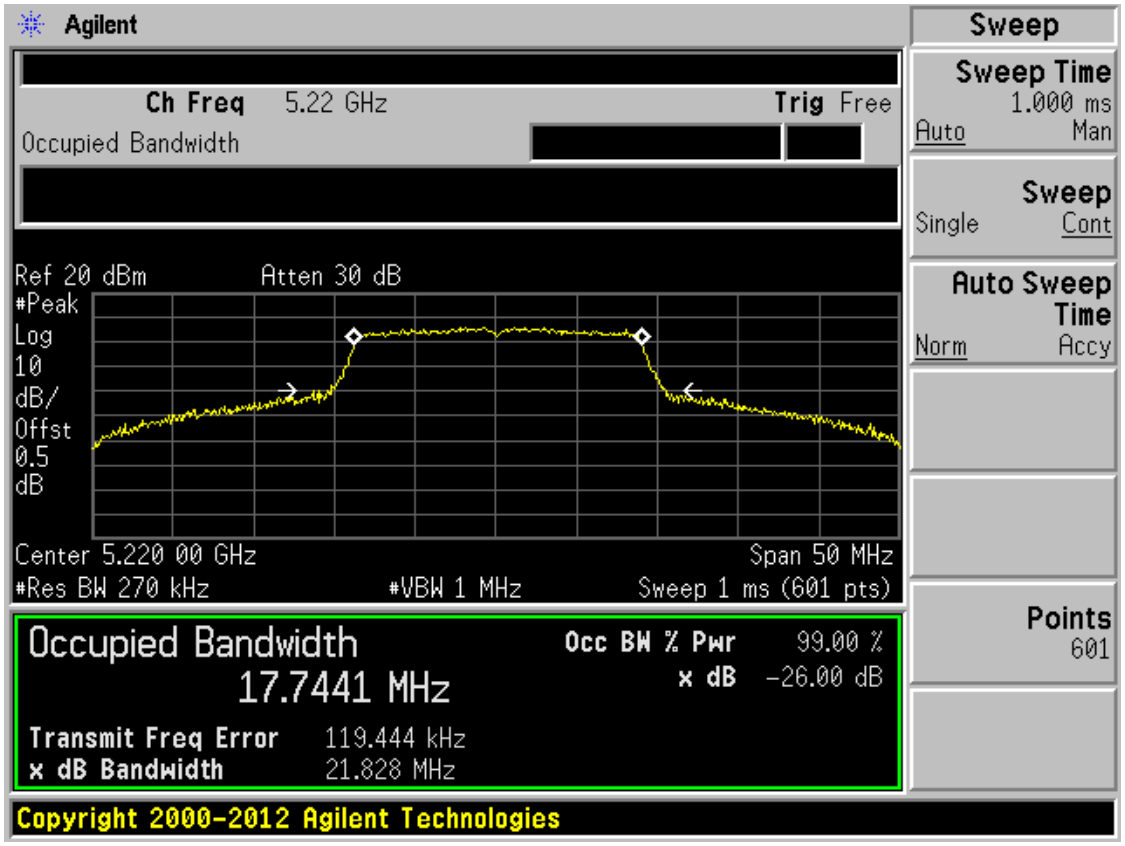

Band I 11a CH48



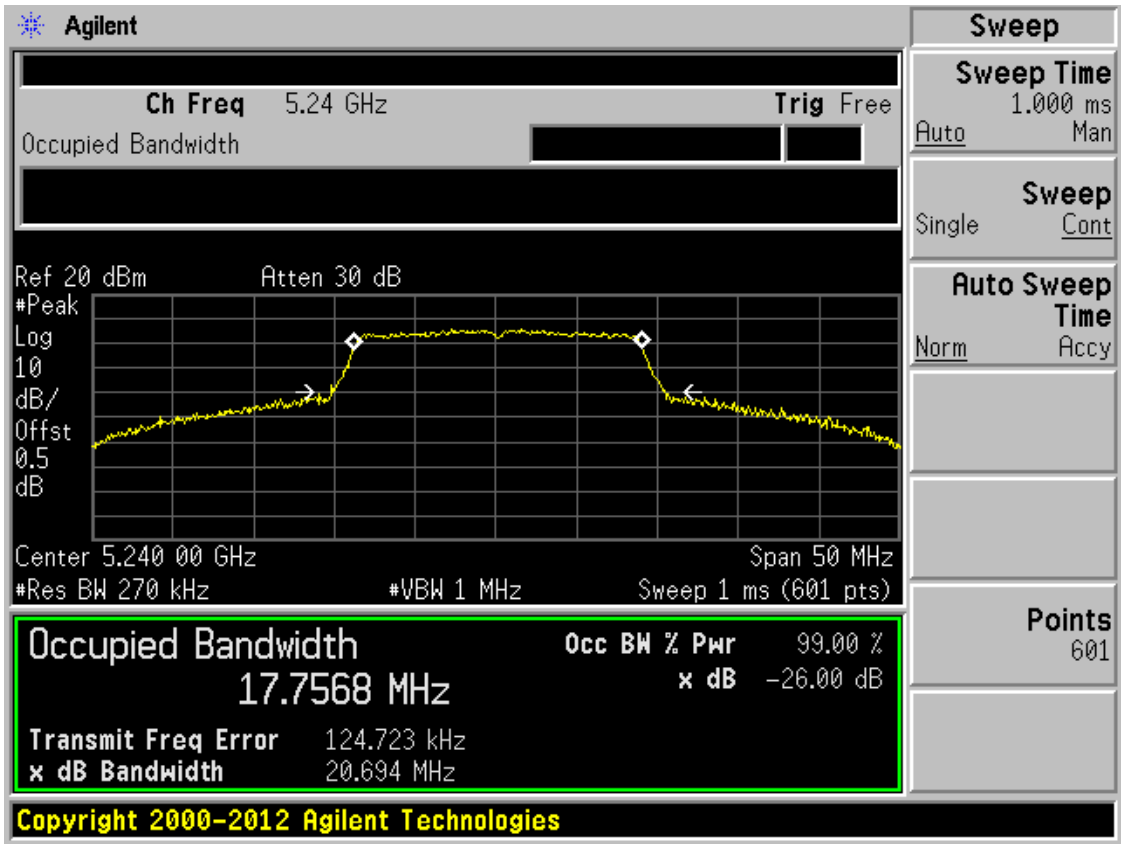

## Band I 11n(HT20) CH36



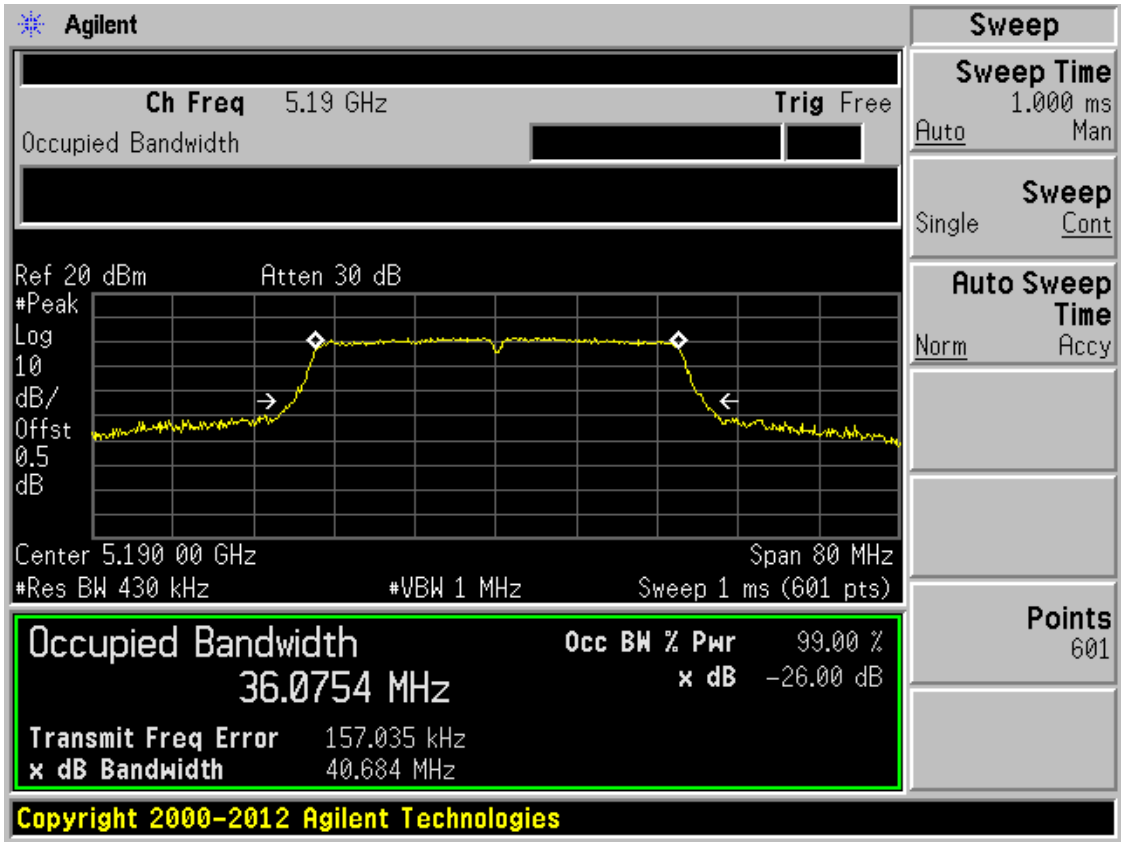
Band I 11n(HT20) CH44



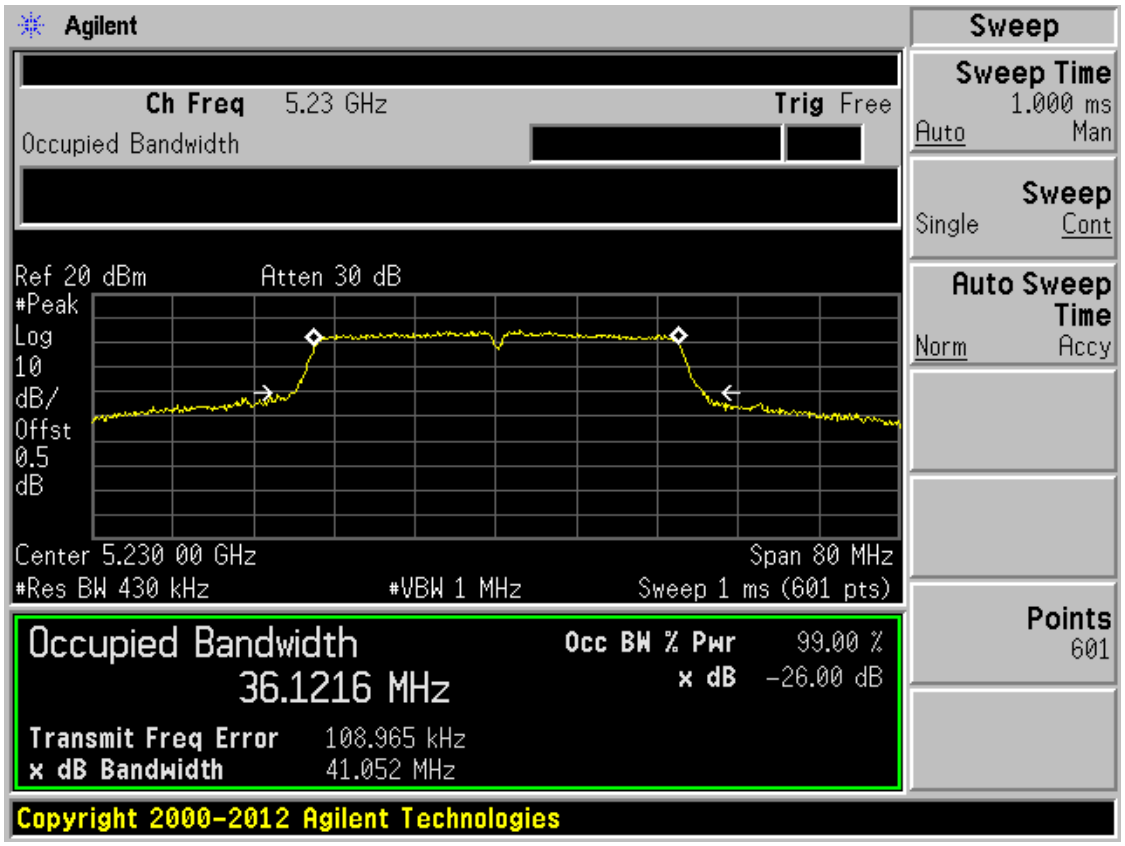

Band I 11n(HT20) CH48



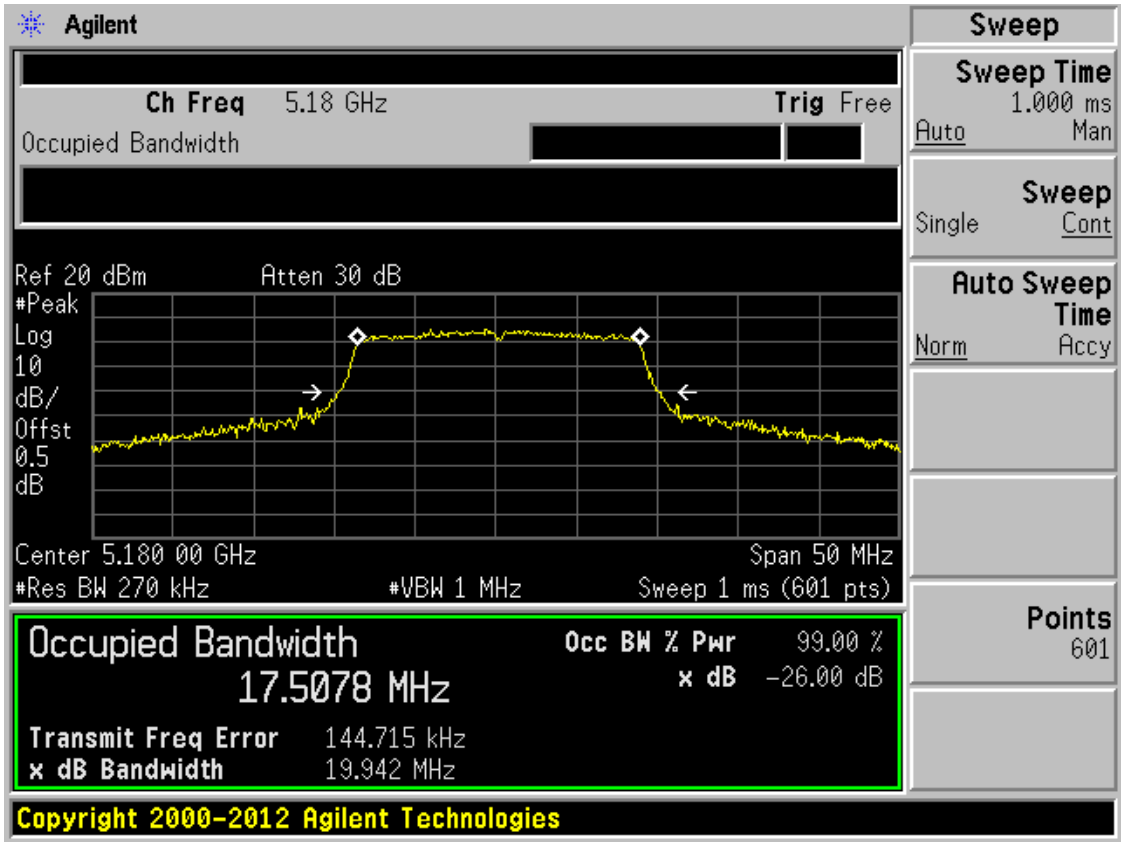
Band I 11n(HT40) CH38



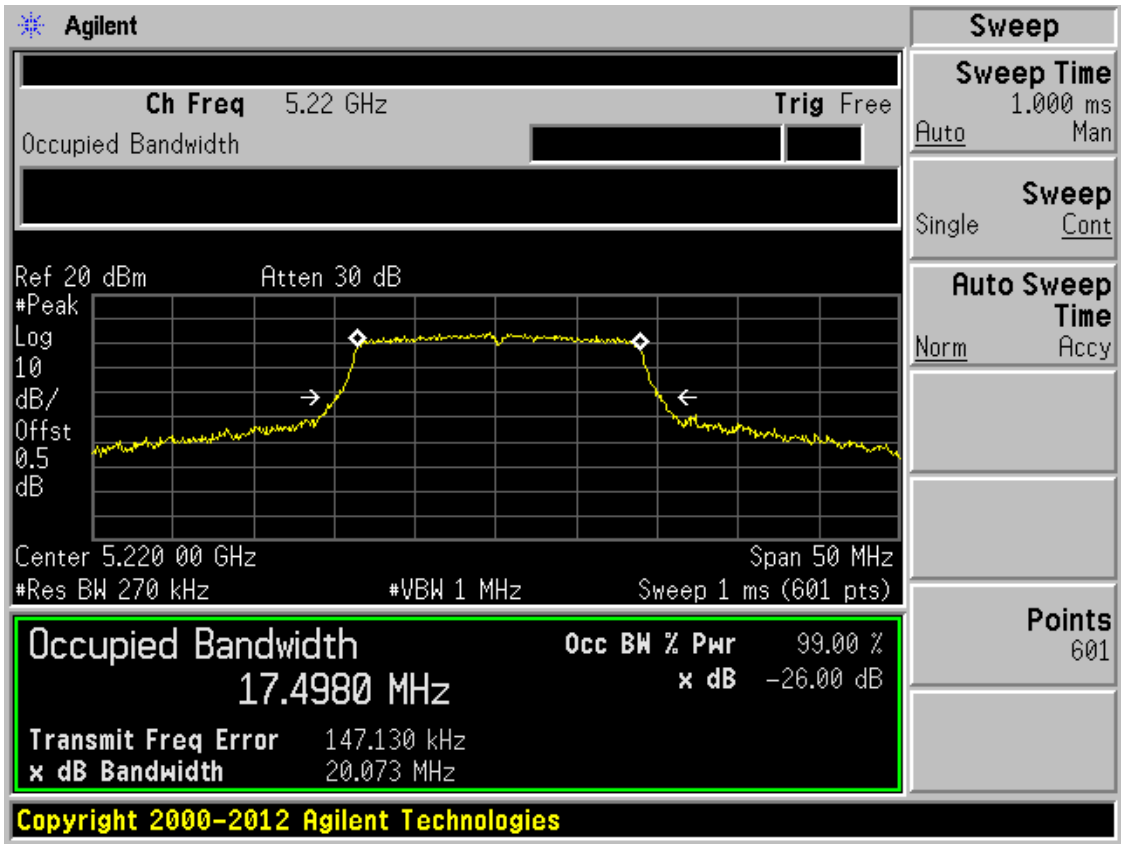

Band I 11n(HT40) CH46



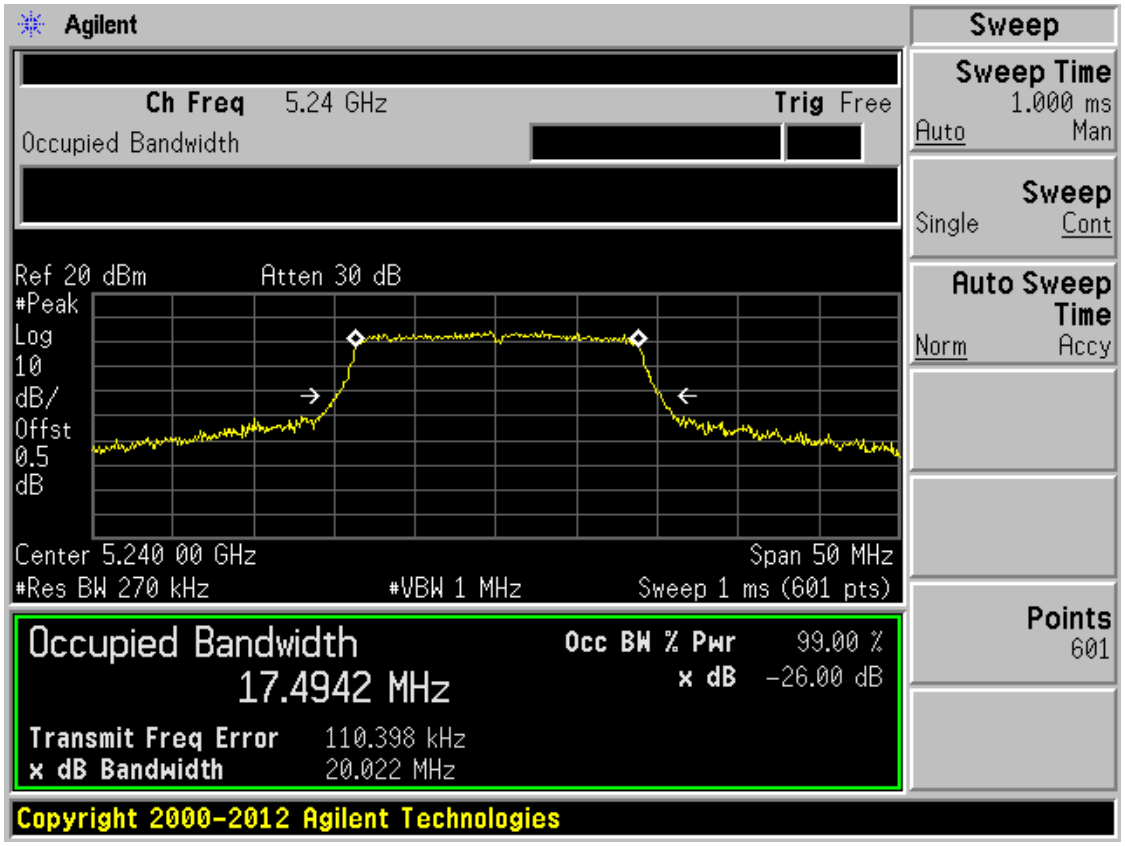
Band I 11ac(HT20) CH36



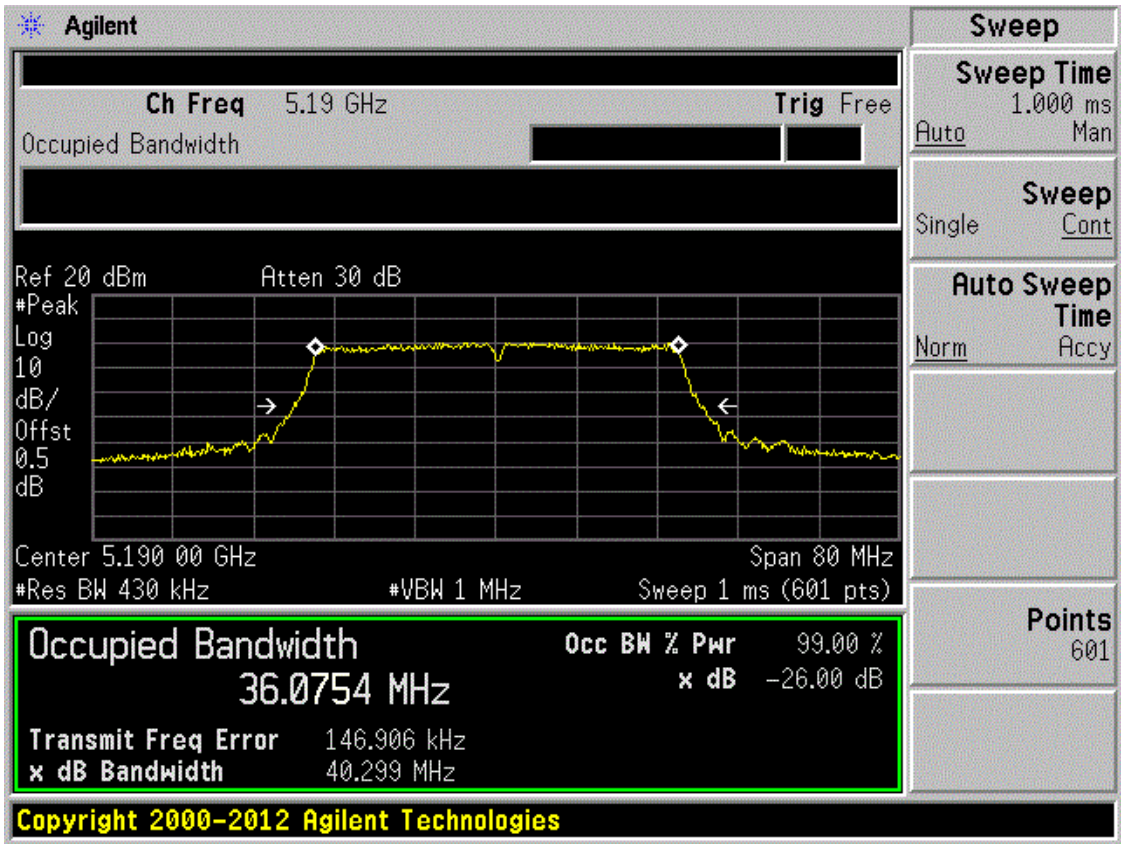

Band I 11ac(HT20) CH44



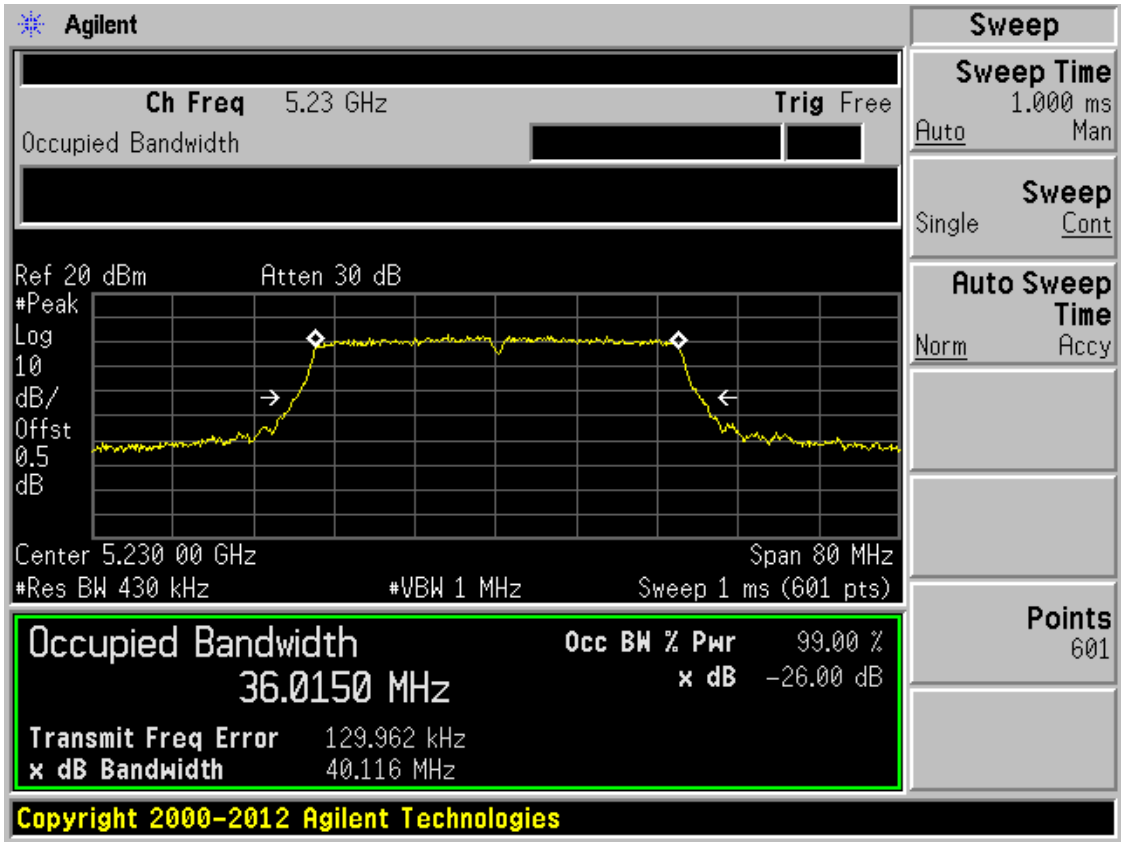
Band I 11ac(HT20) CH48



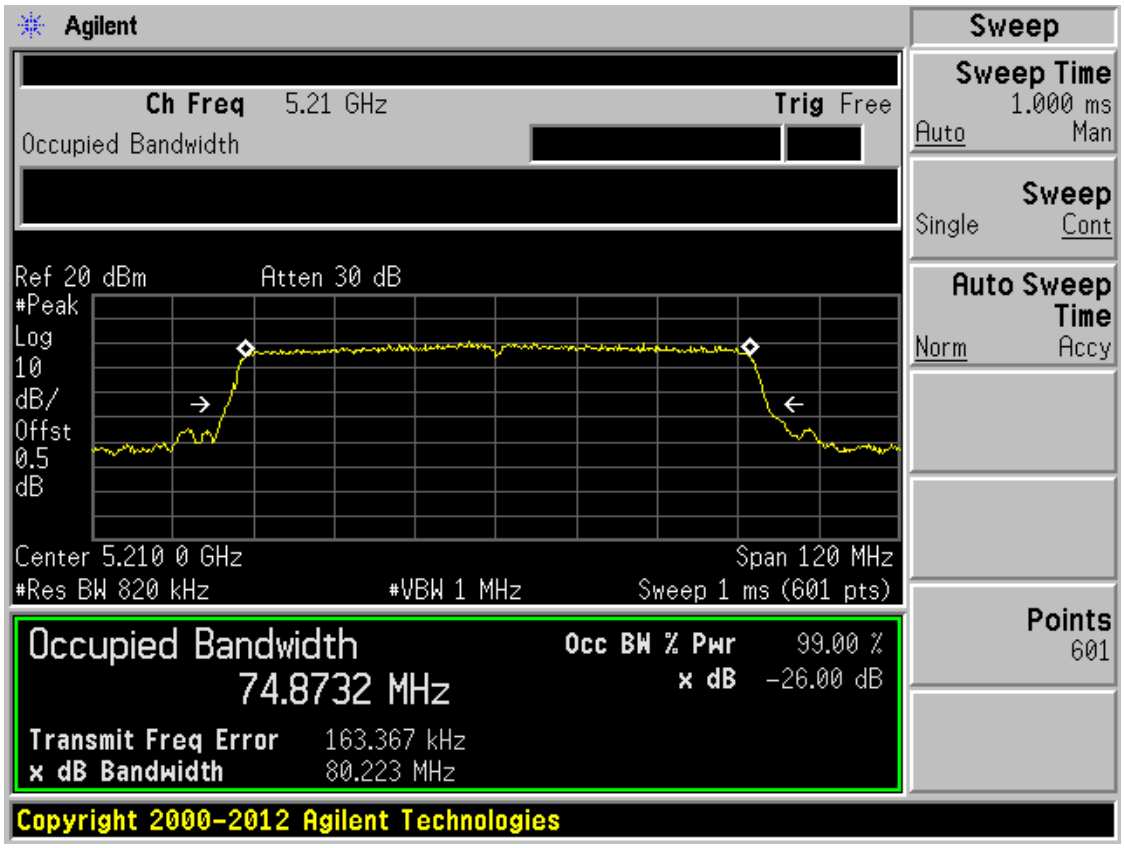

Band I 11ac(HT40) CH38



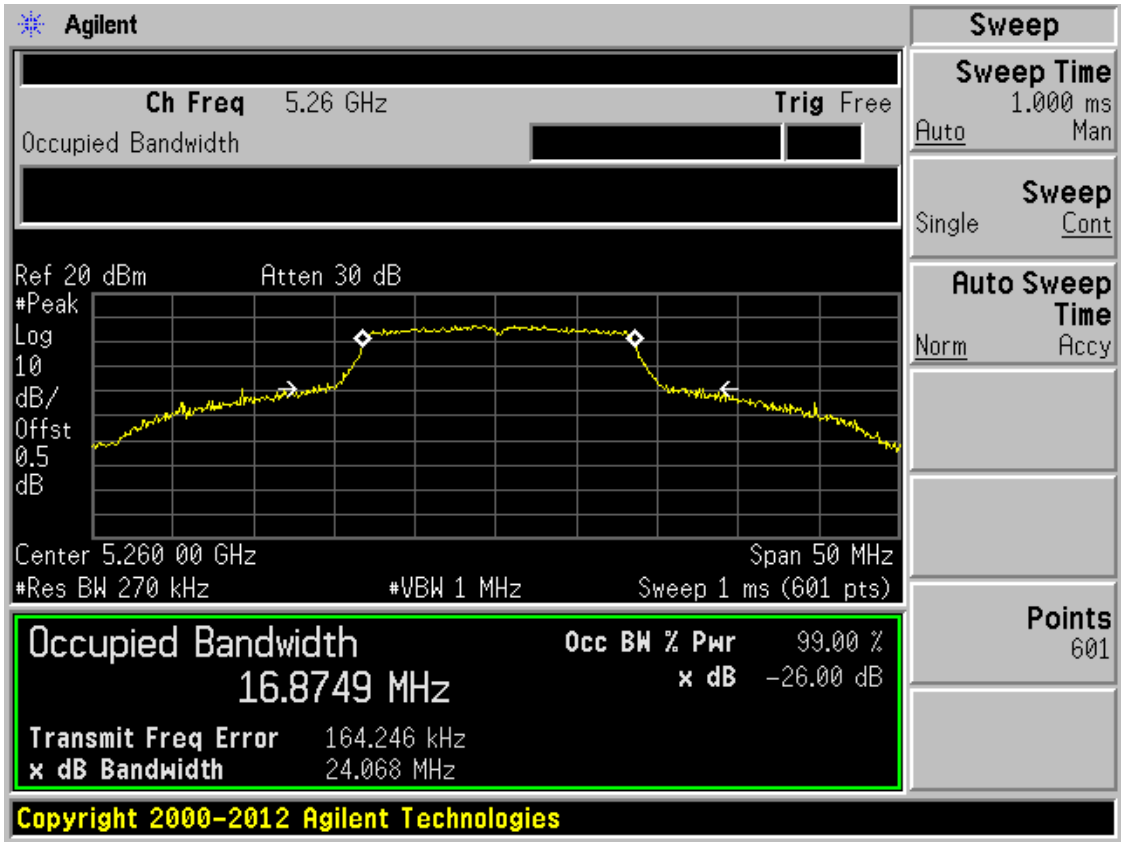
Band I 11ac(HT40) CH46



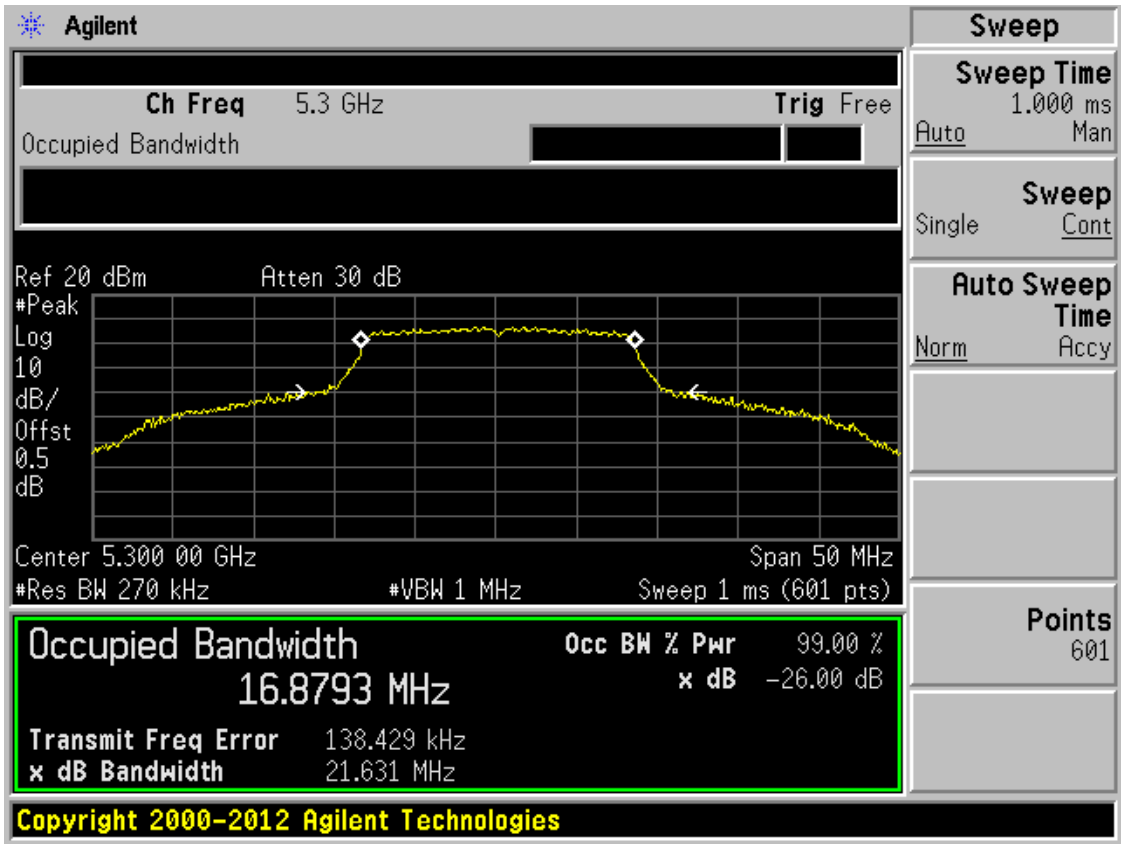

Band I 11ac(HT80) CH42



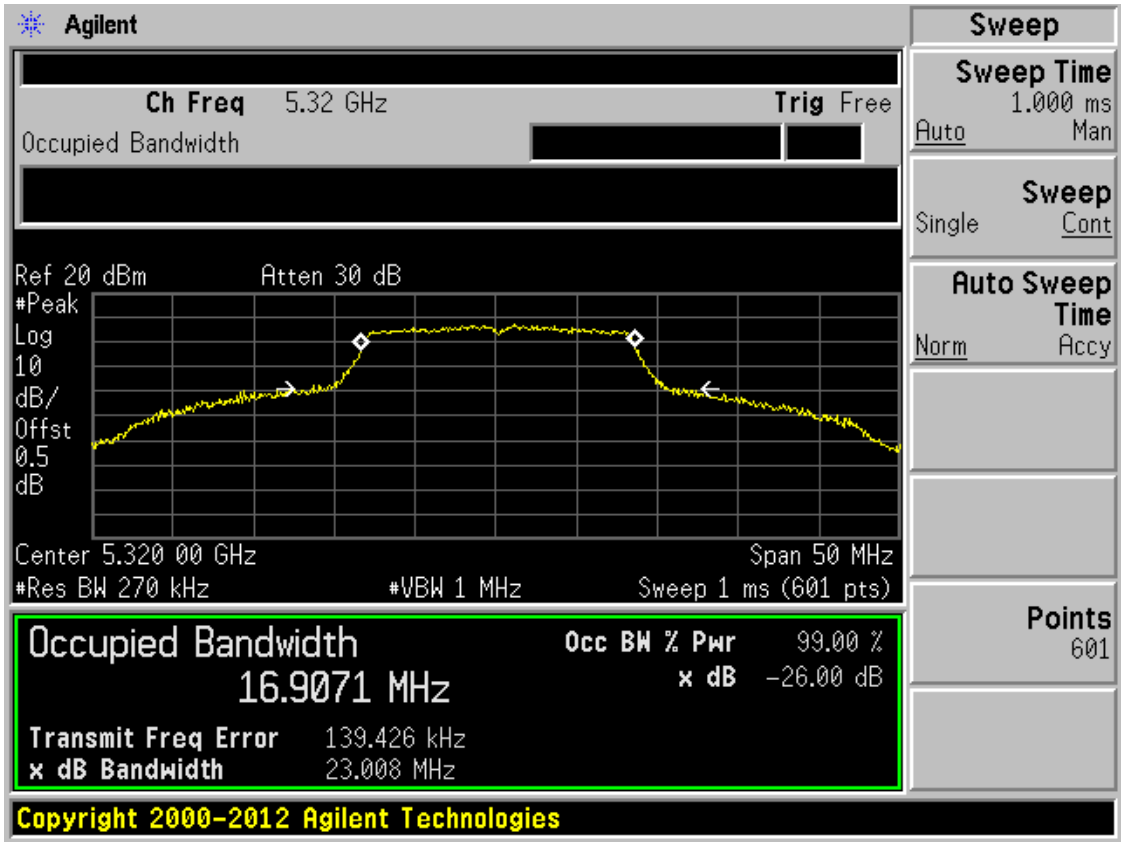
## Band II 11a CH52



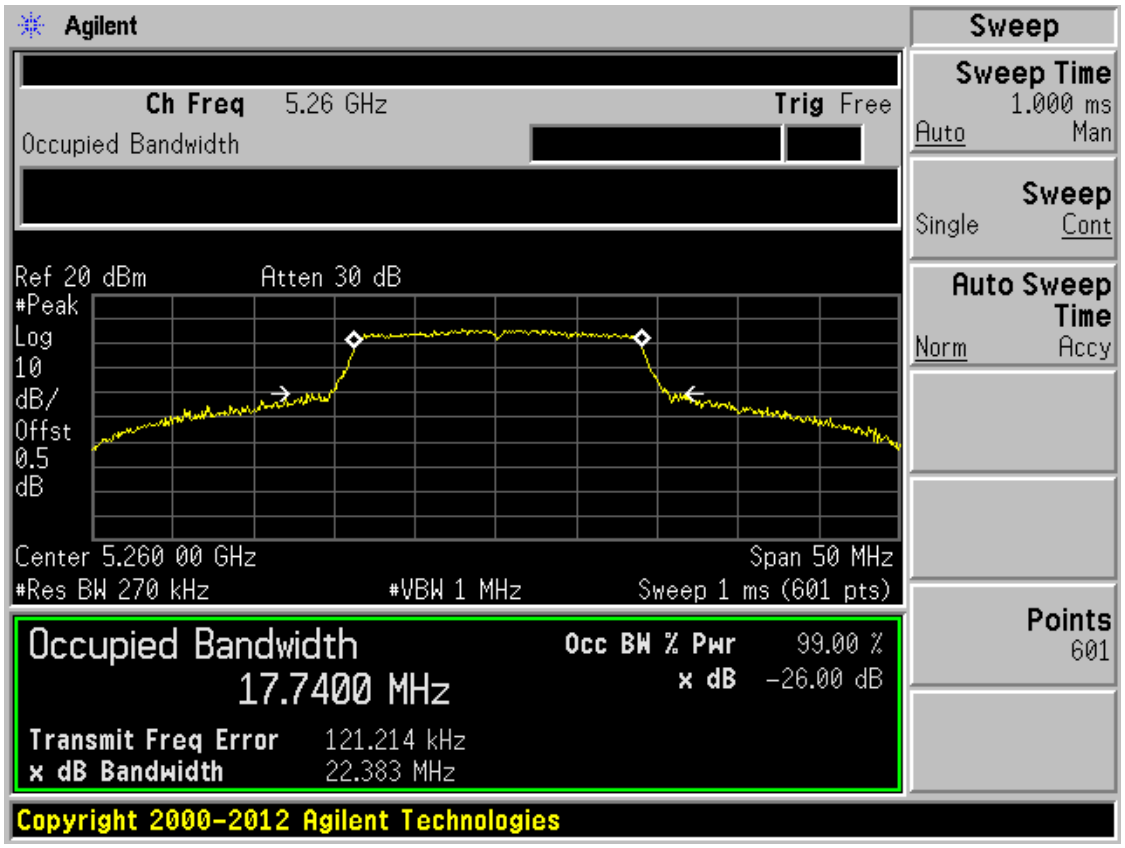

## Band II 11a CH60



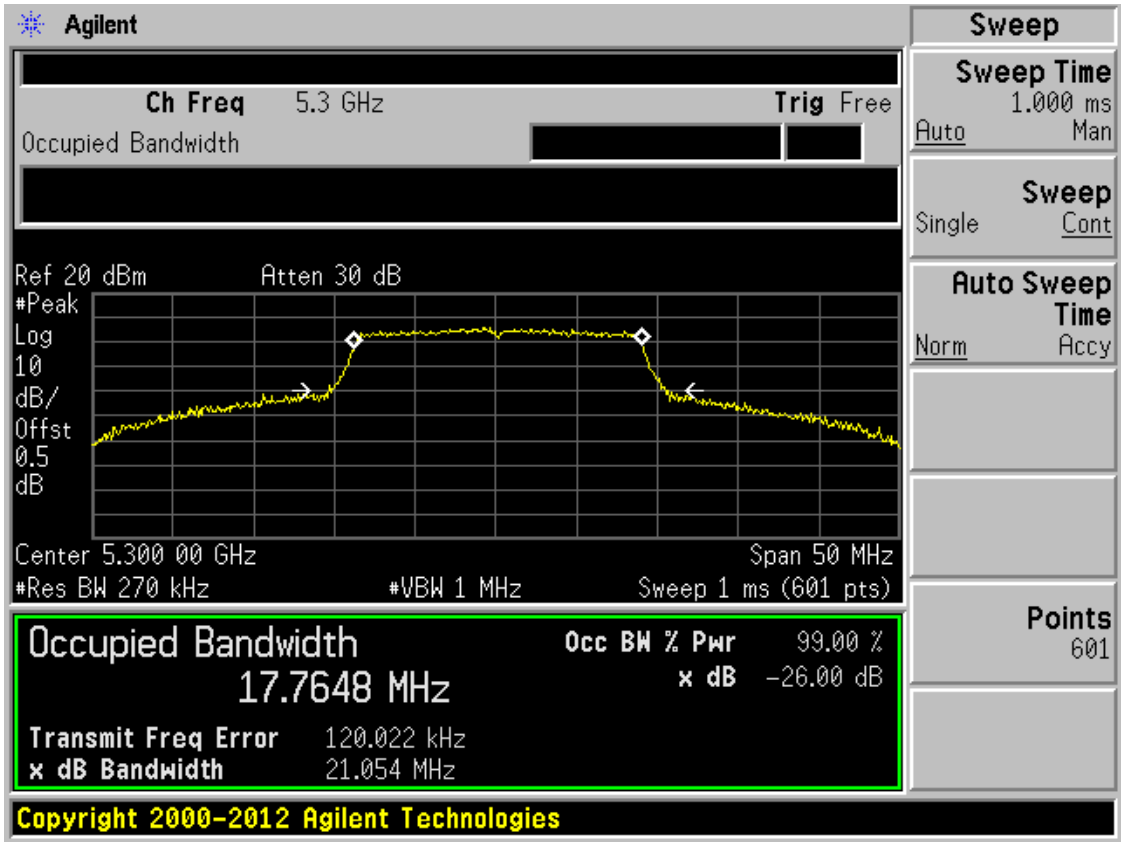
Band II 11a CH64



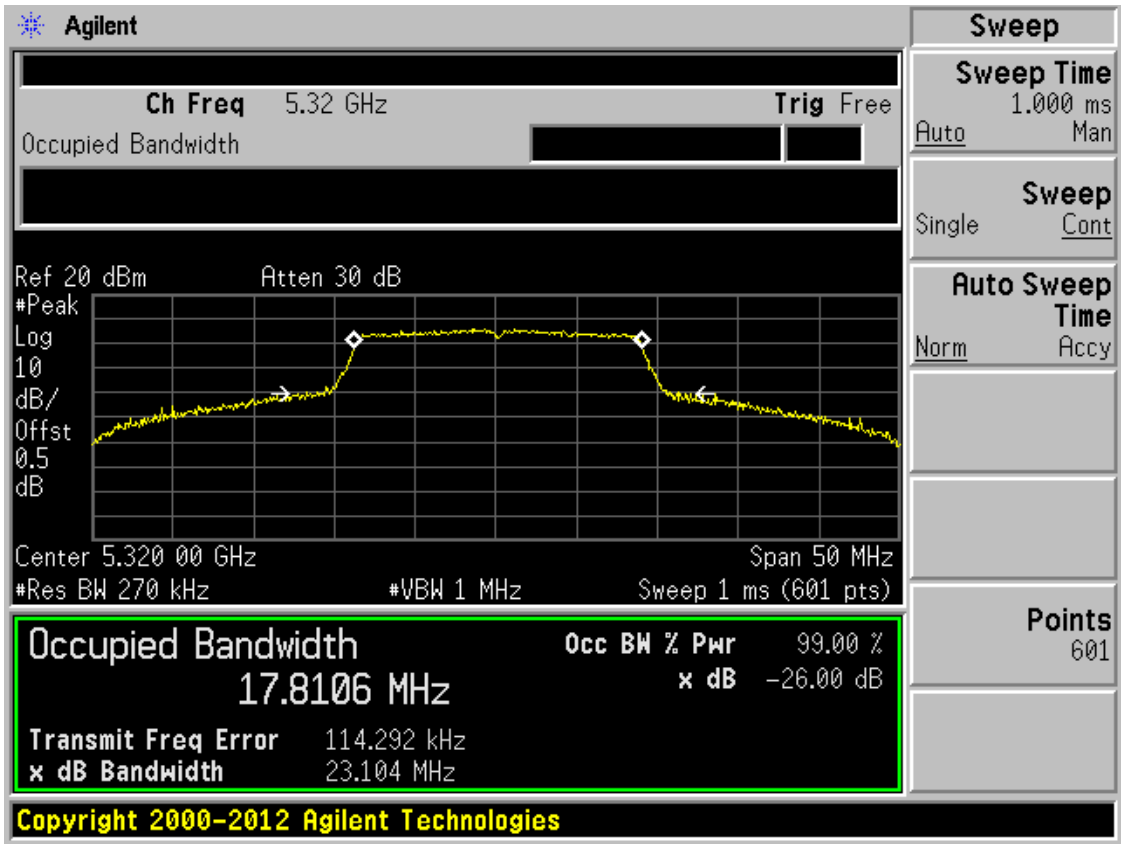

Band II 11n(HT20) CH52



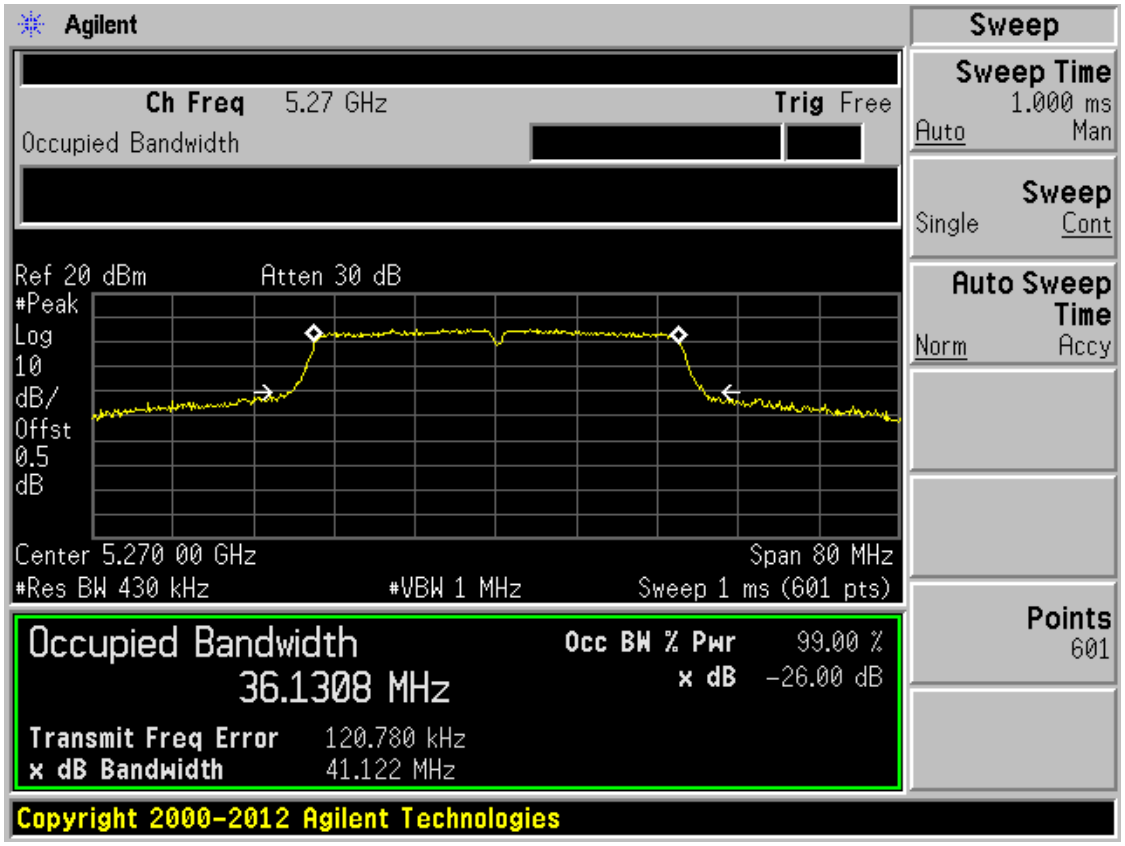
Band II 11n(HT20) CH60



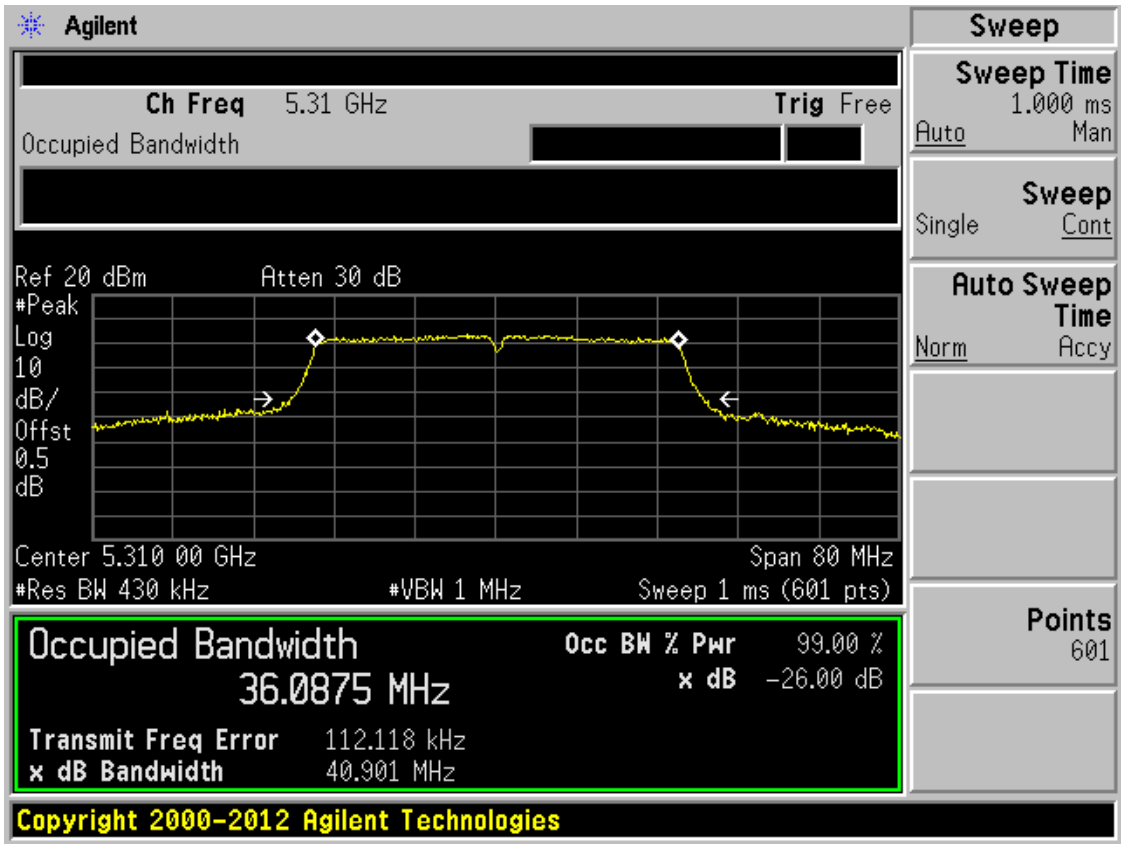

Band II 11n(HT20) CH64



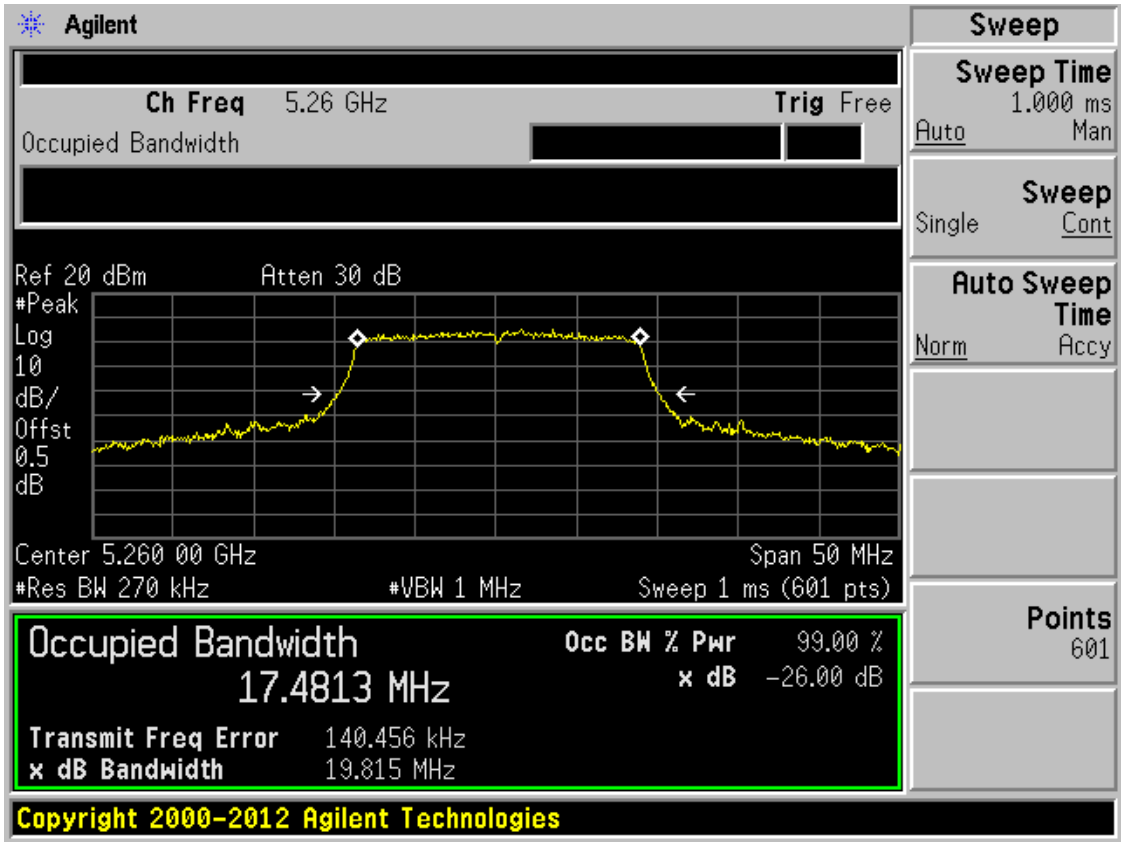
Band II 11n(HT40) CH54



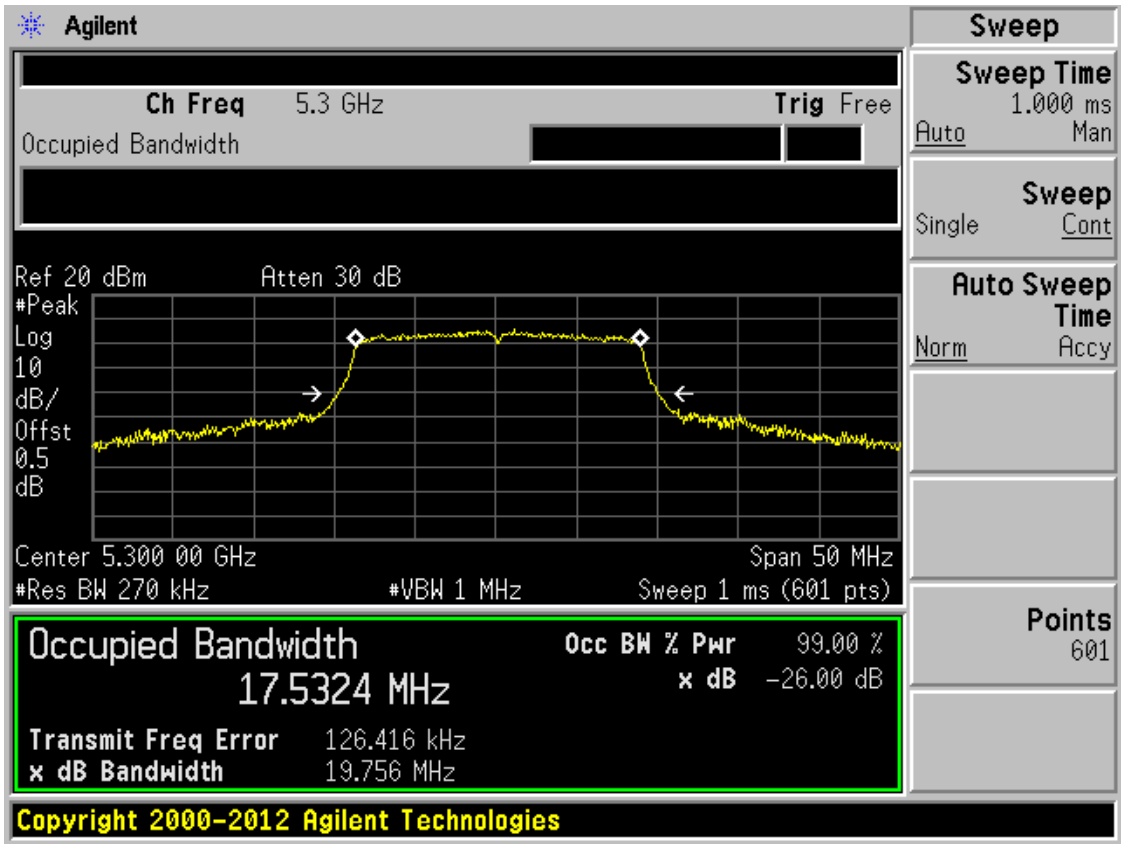

Band II 11n(HT40) CH62



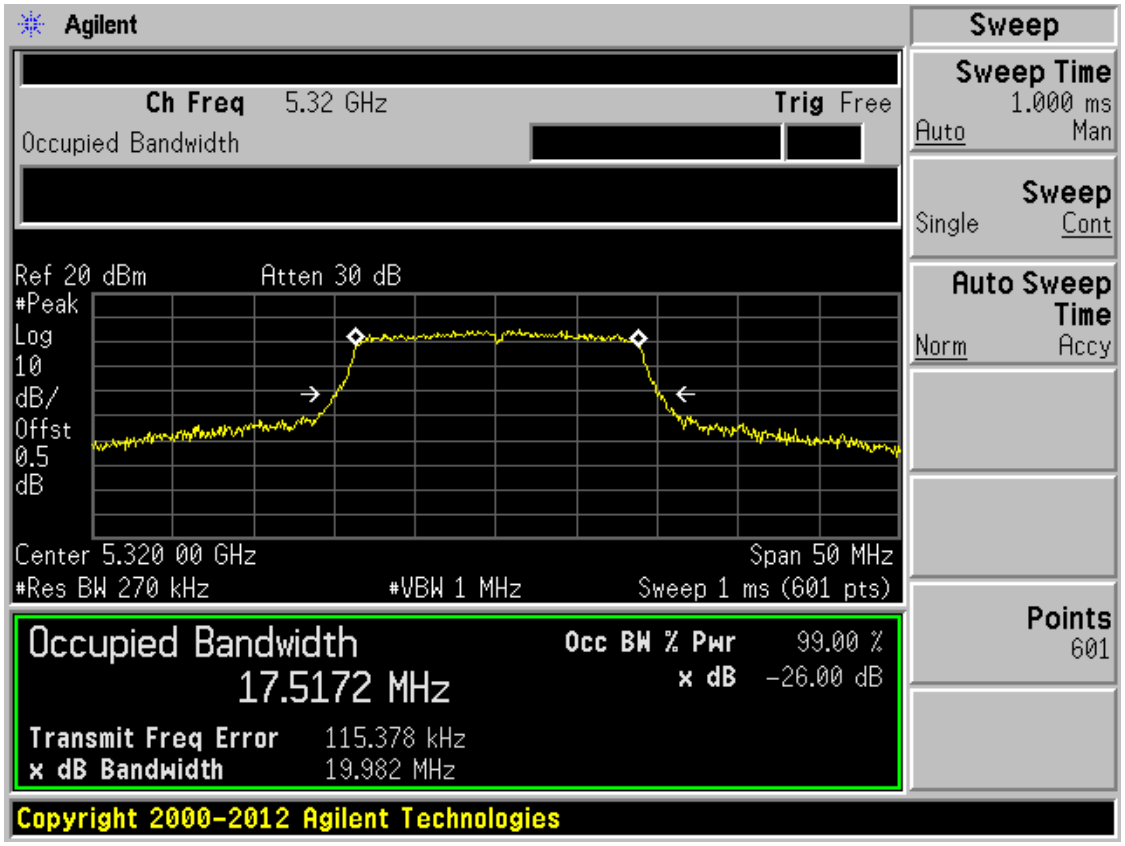
Band II 11ac(HT20) CH52



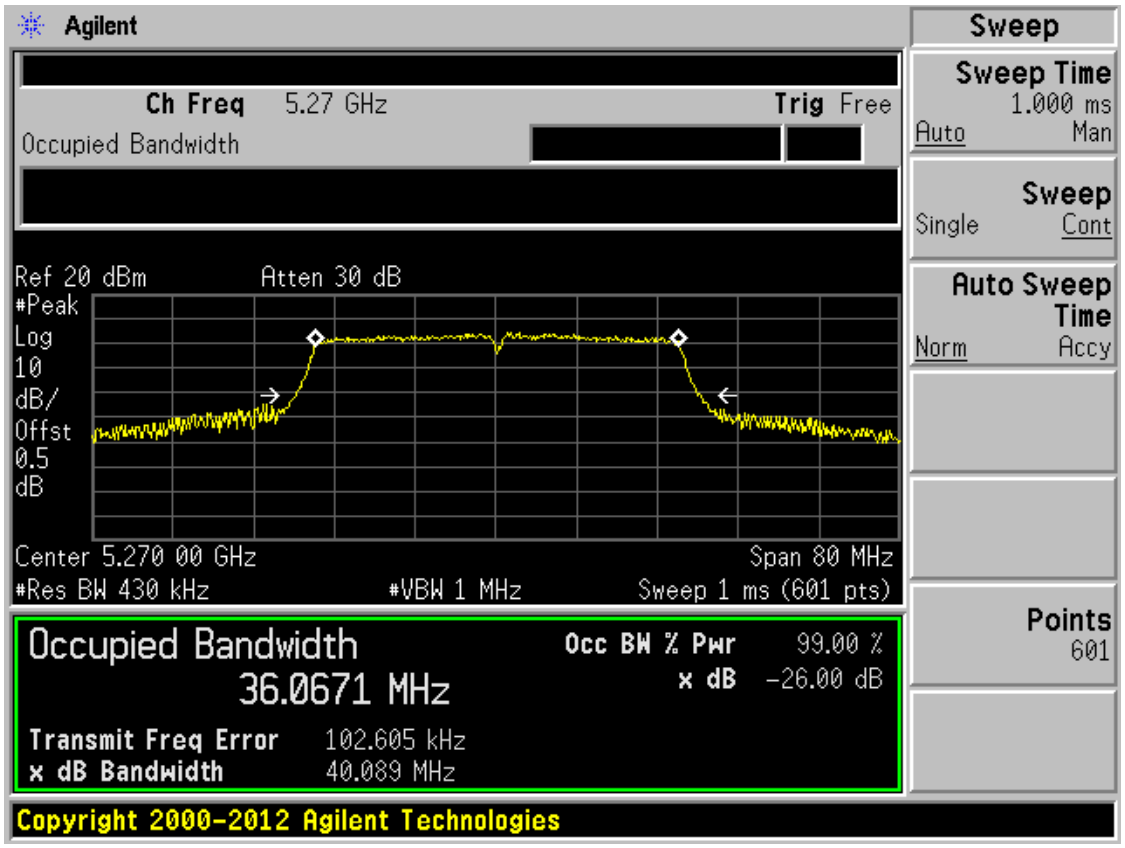

Band II 11ac(HT20) CH60



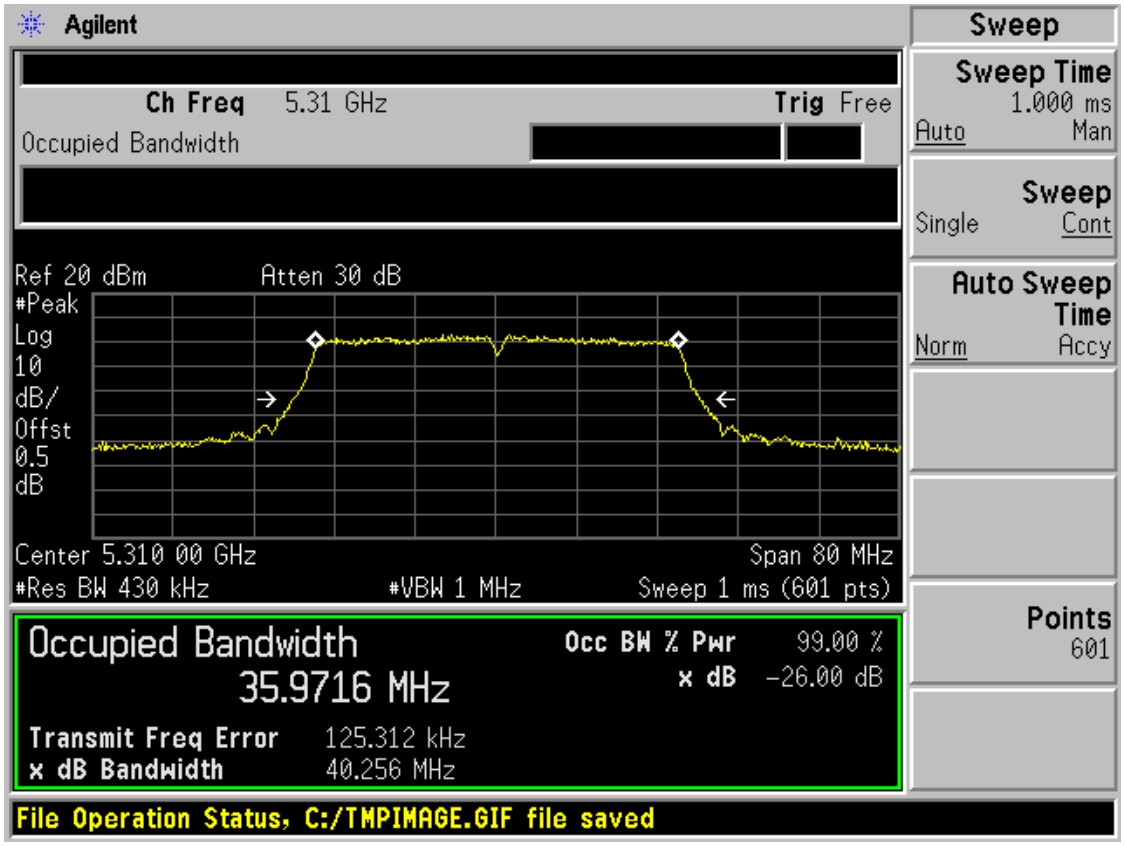
Band II 11ac(HT20) CH64



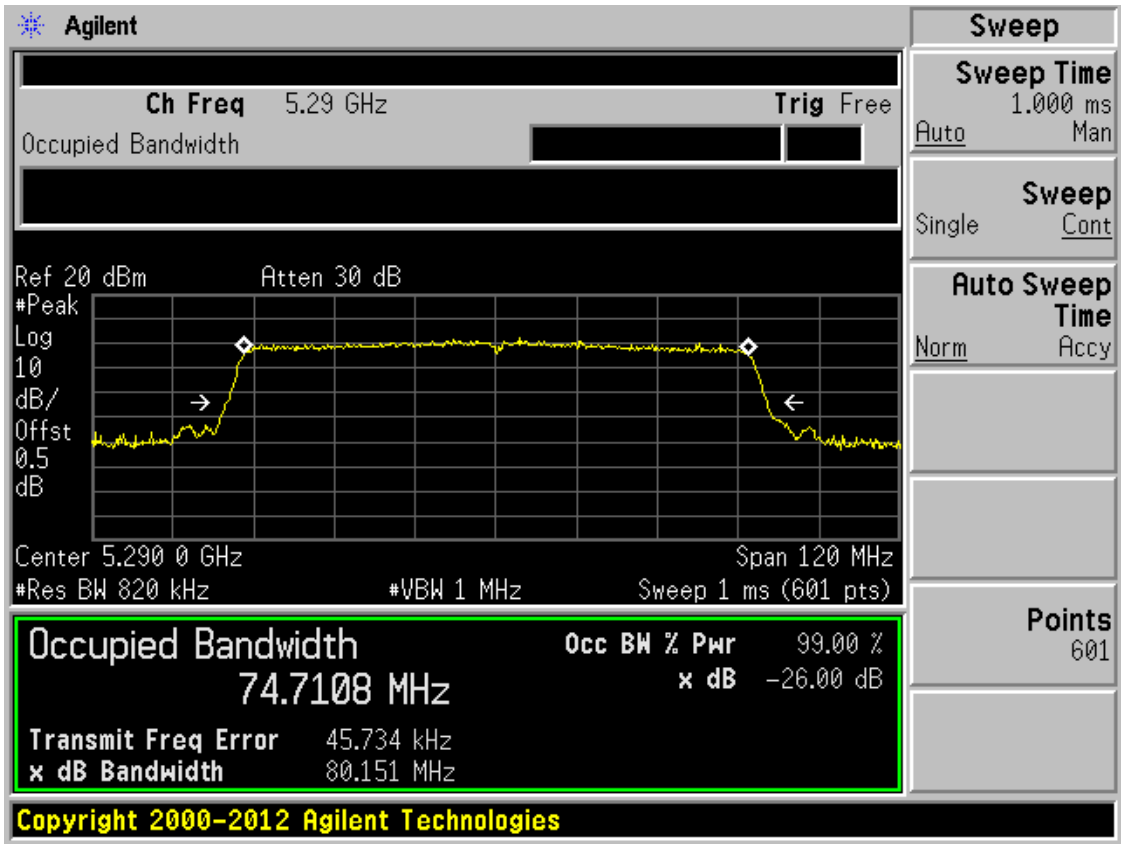

Band II 11ac(HT40) CH54



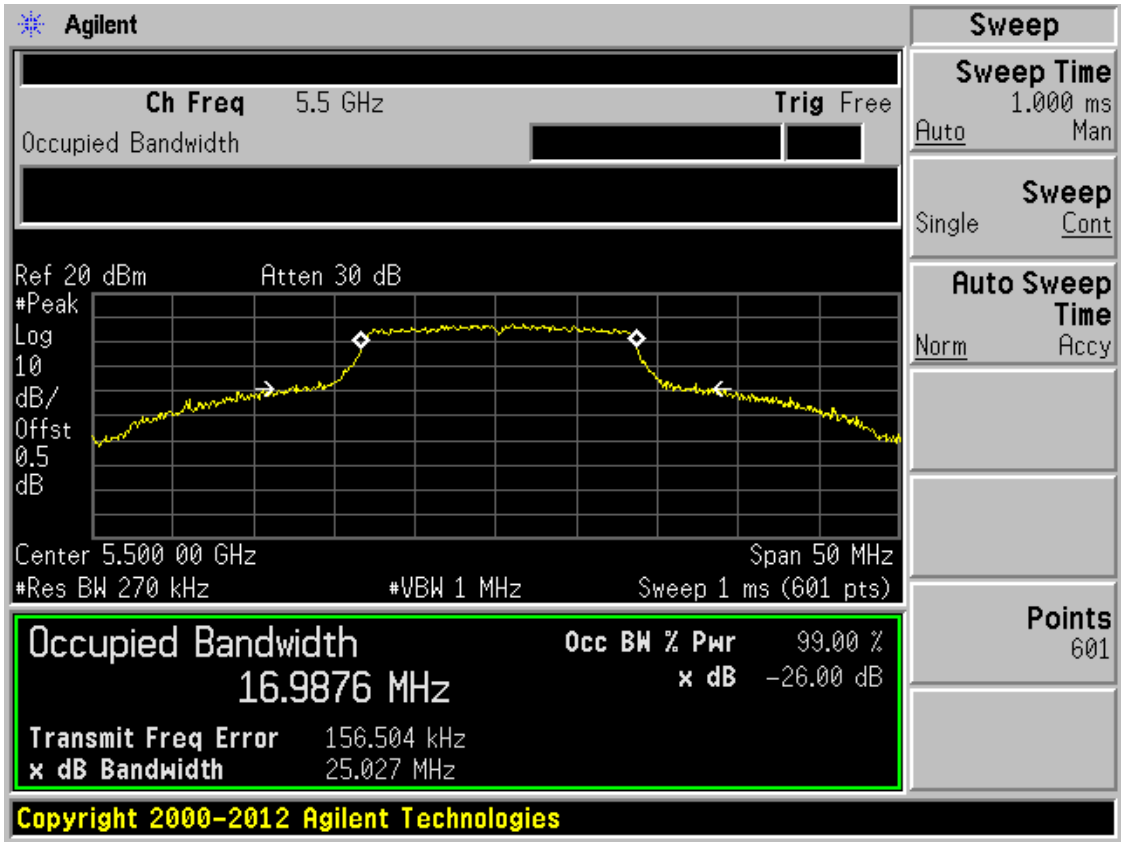
Band II 11ac(HT40) CH62



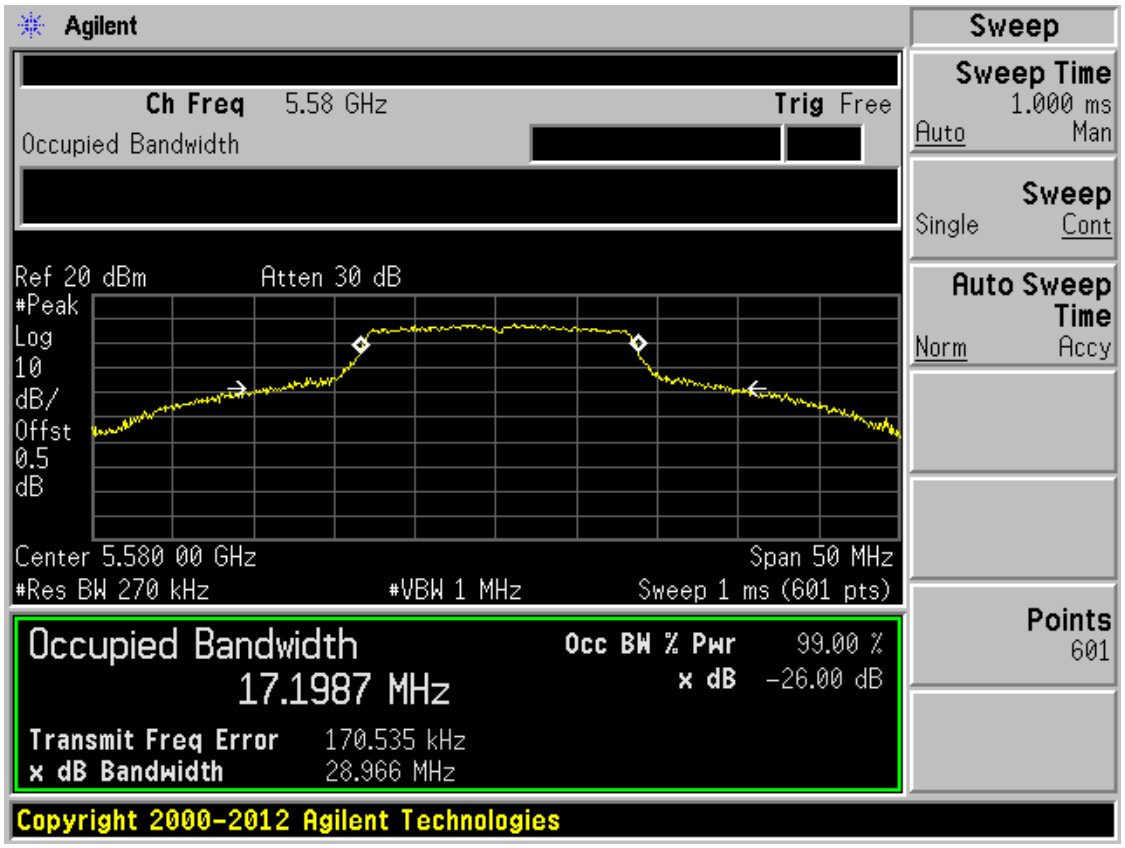

Band II 11ac(HT80) CH58



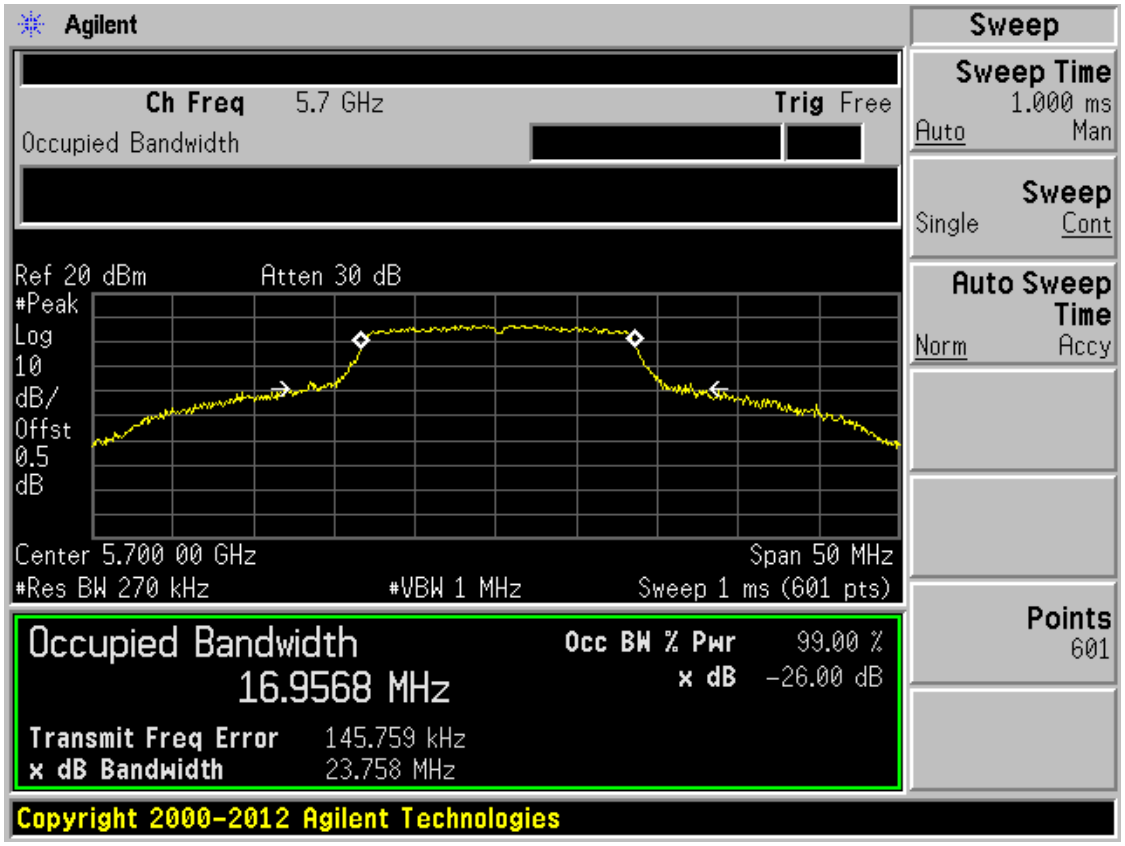
## Band III 11a CH100



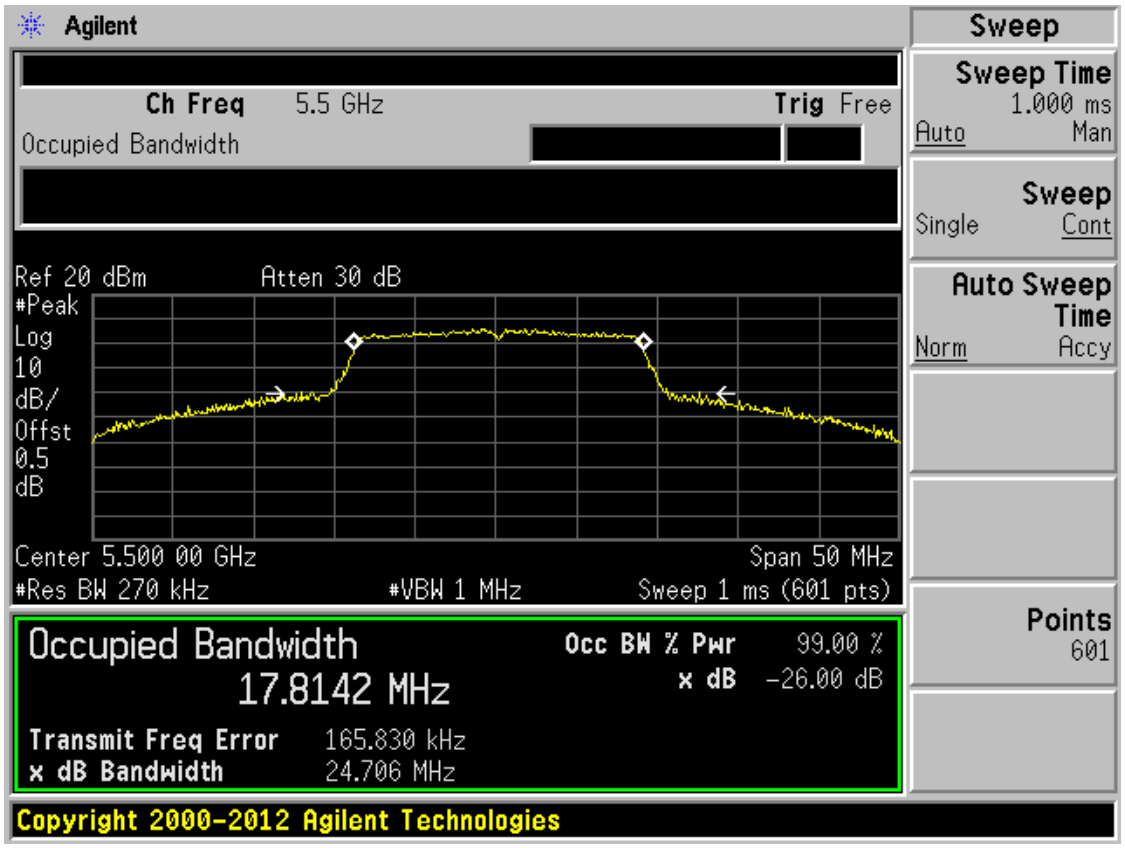

## Band III 11a CH116



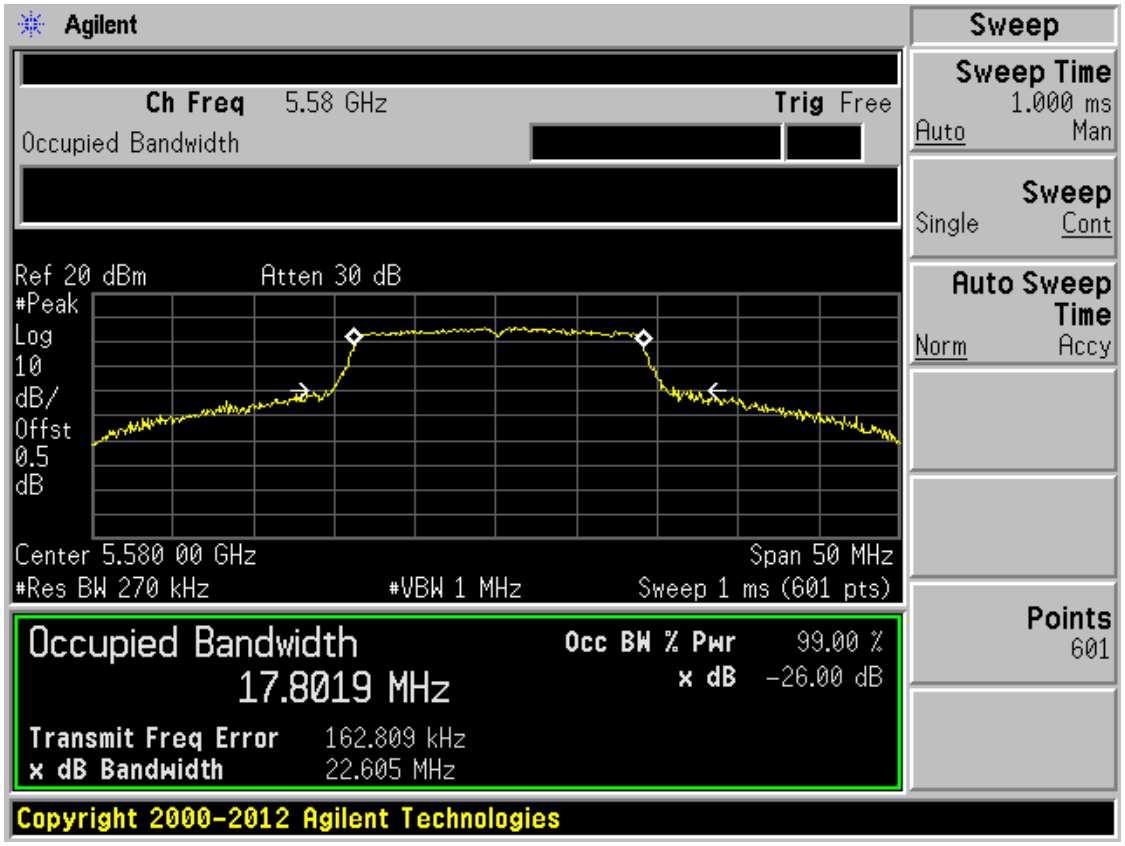
Band III 11a CH140



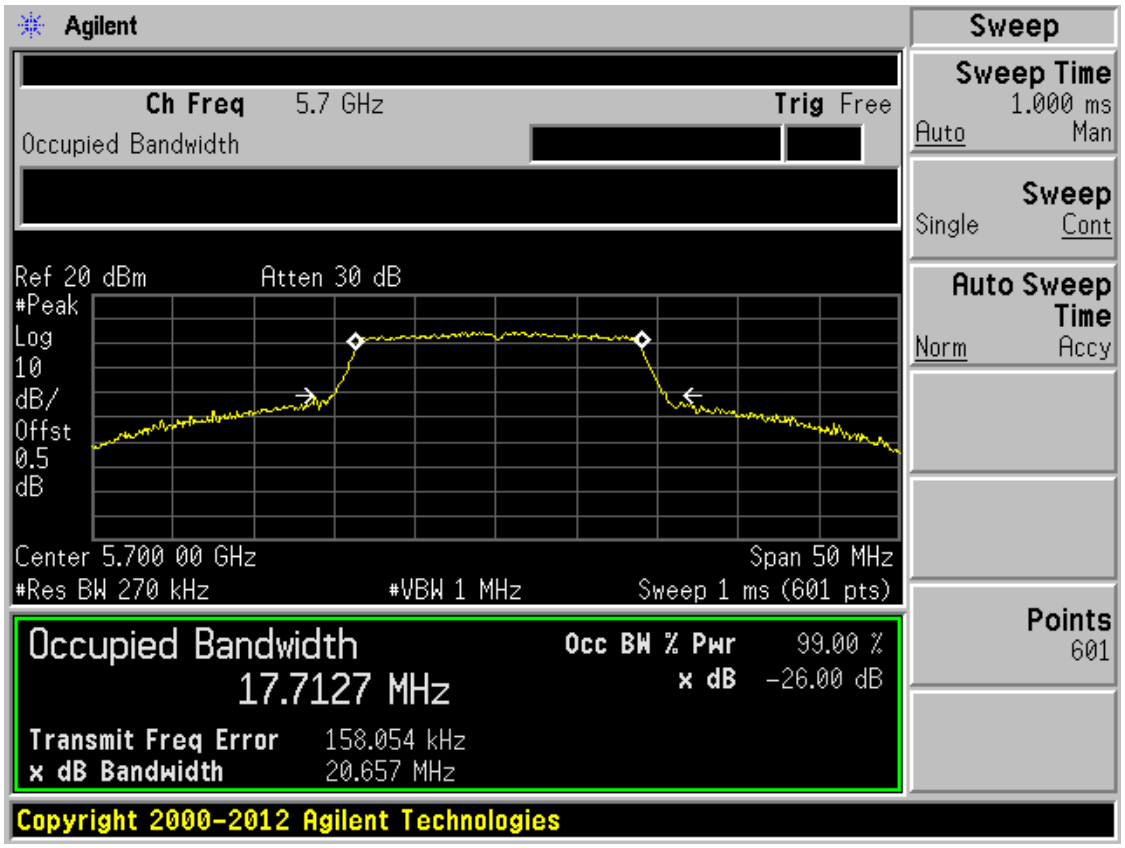

Band III 11n(HT20) CH100



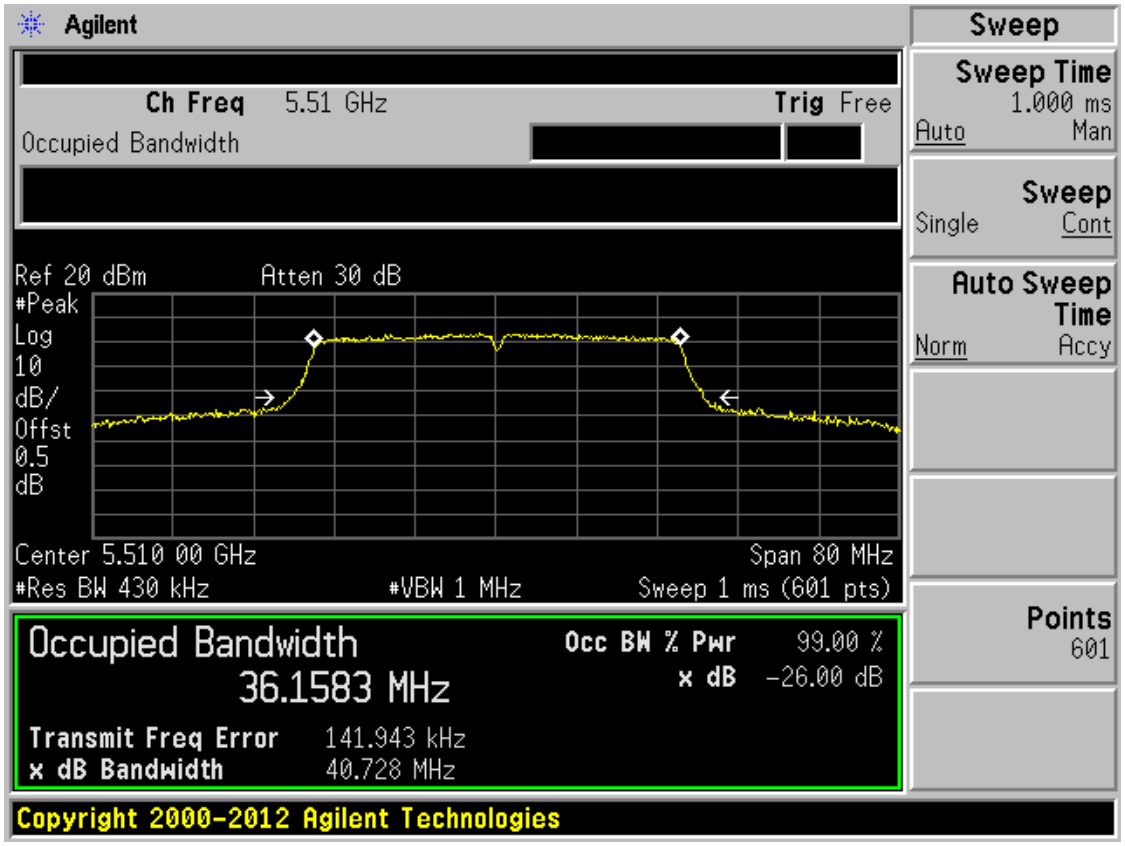
Band III 11n(HT20) CH116



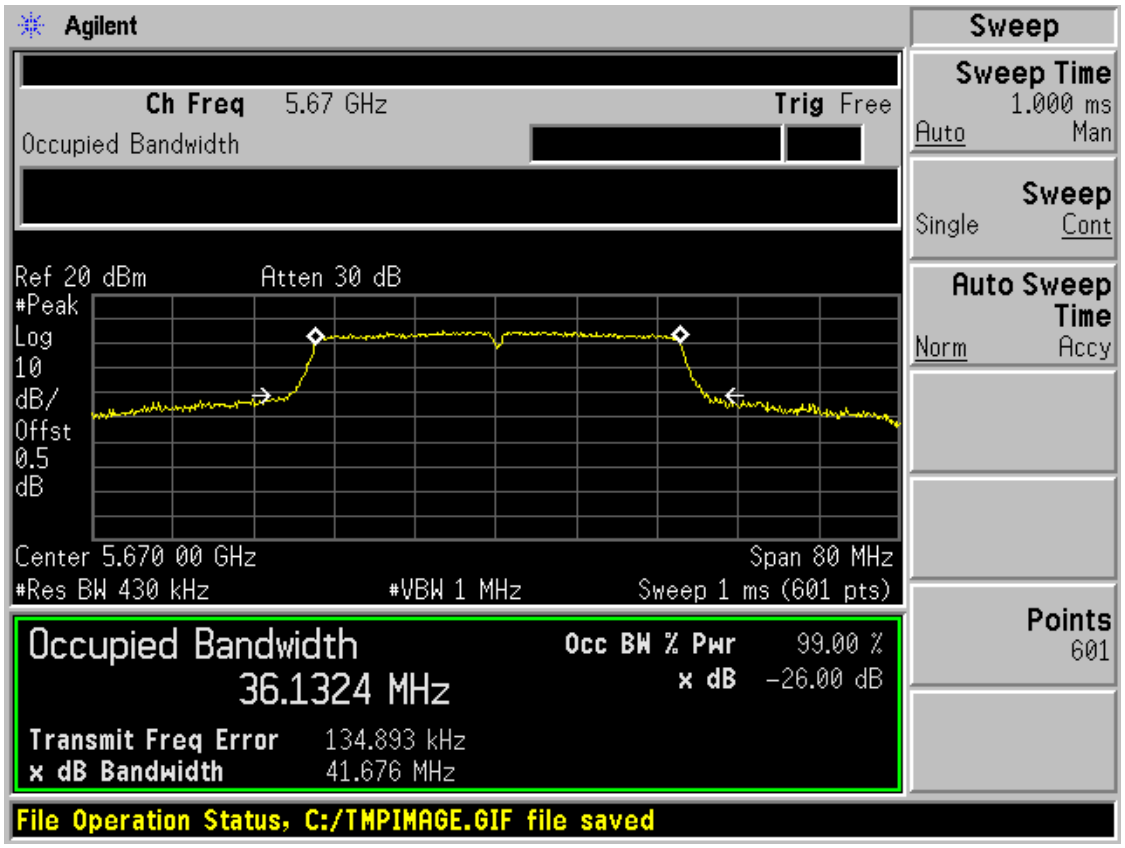

Band III 11n(HT20) CH140



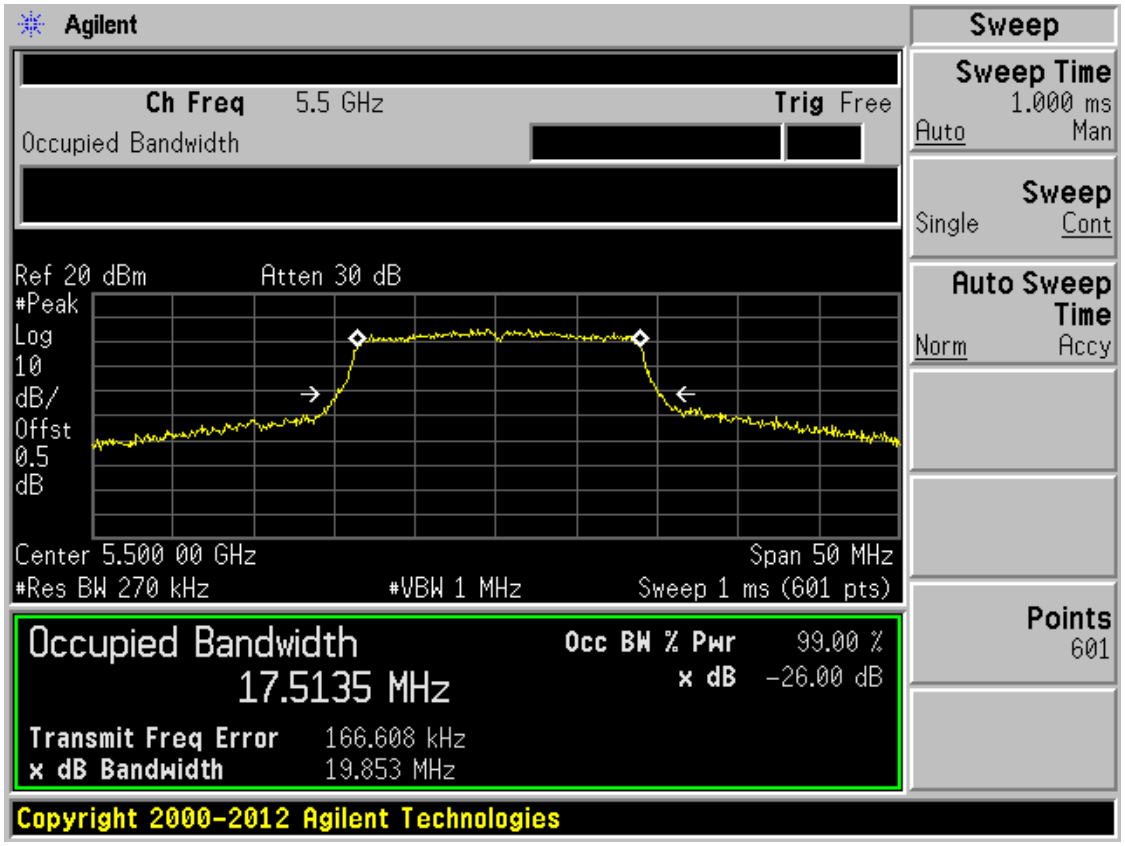
Band III 11n(HT40) CH102



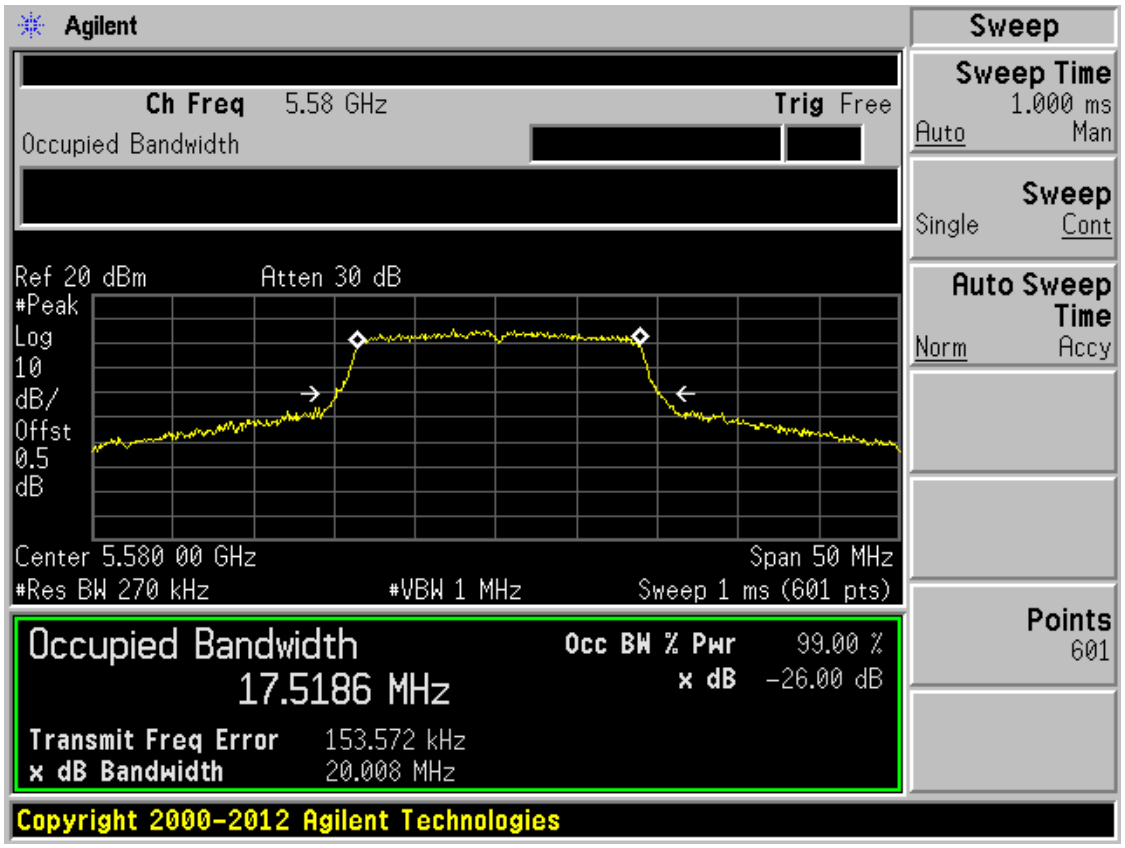

Band III 11n(HT40) CH134



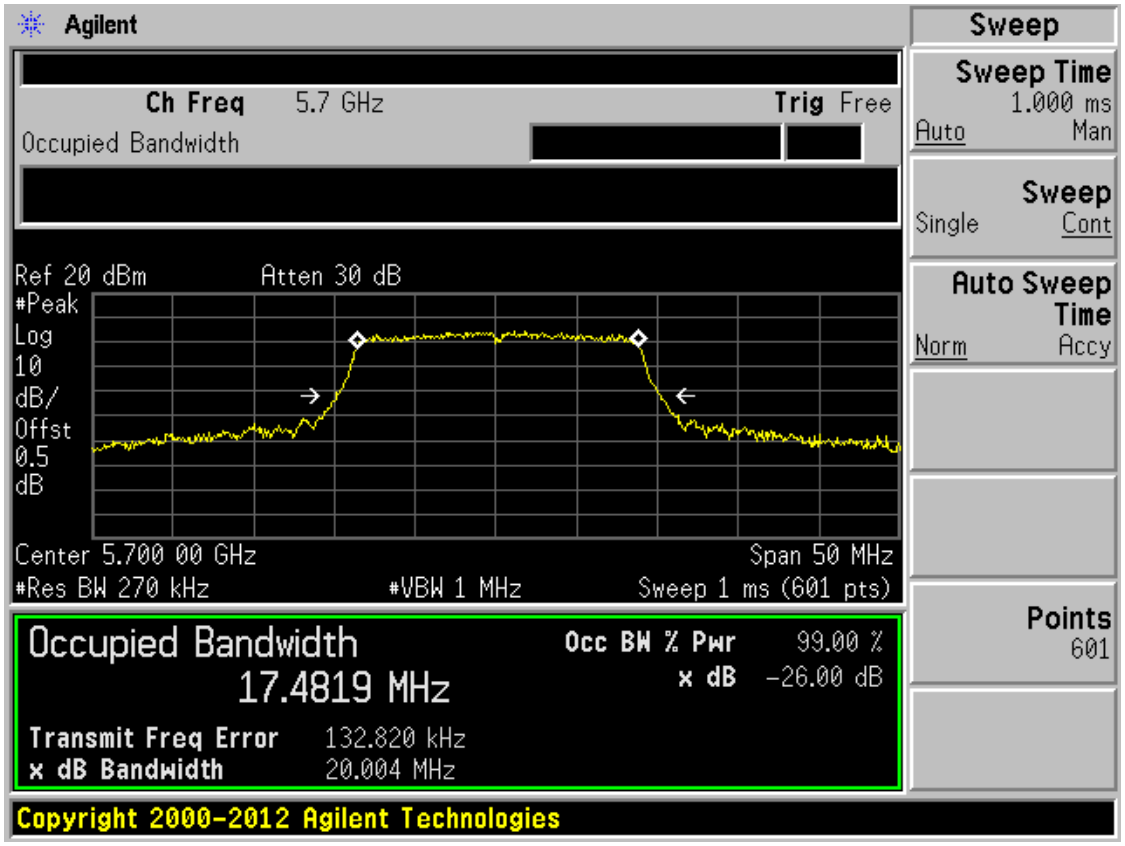
Band III 11ac(HT20) CH100



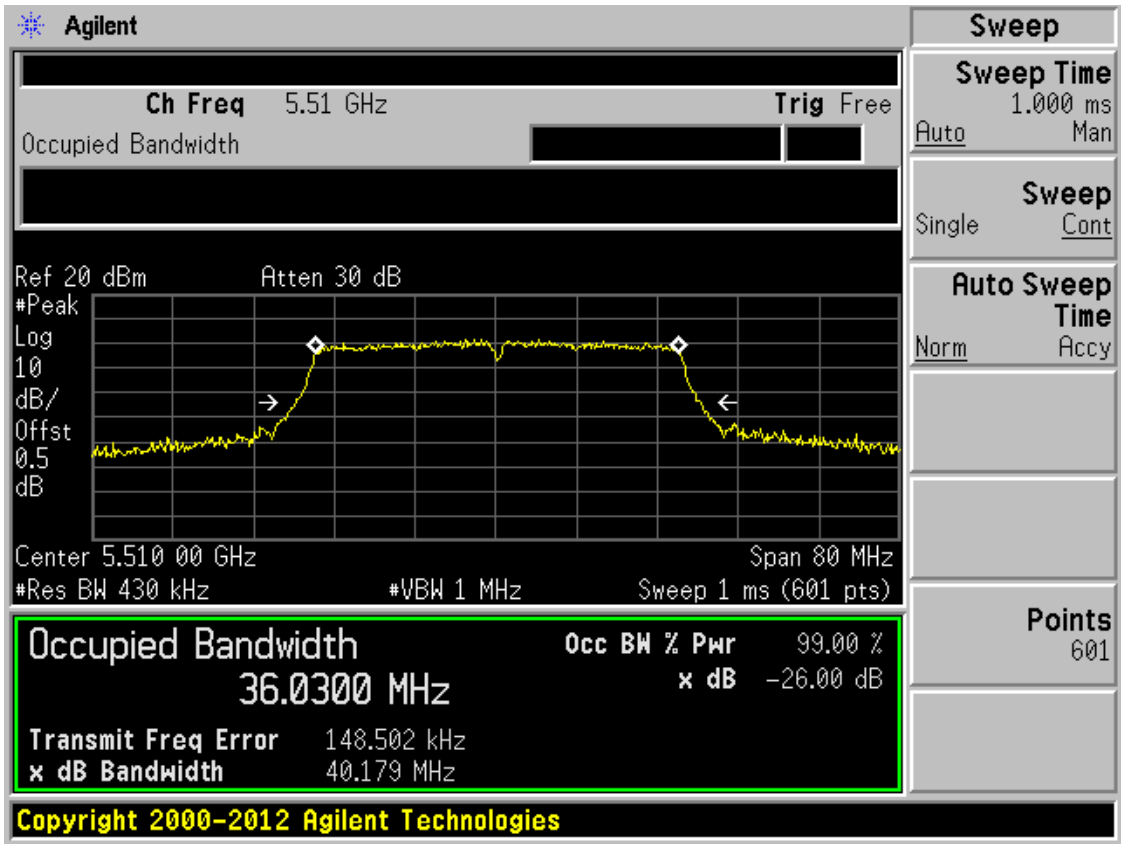

Band III 11ac(HT20) CH116



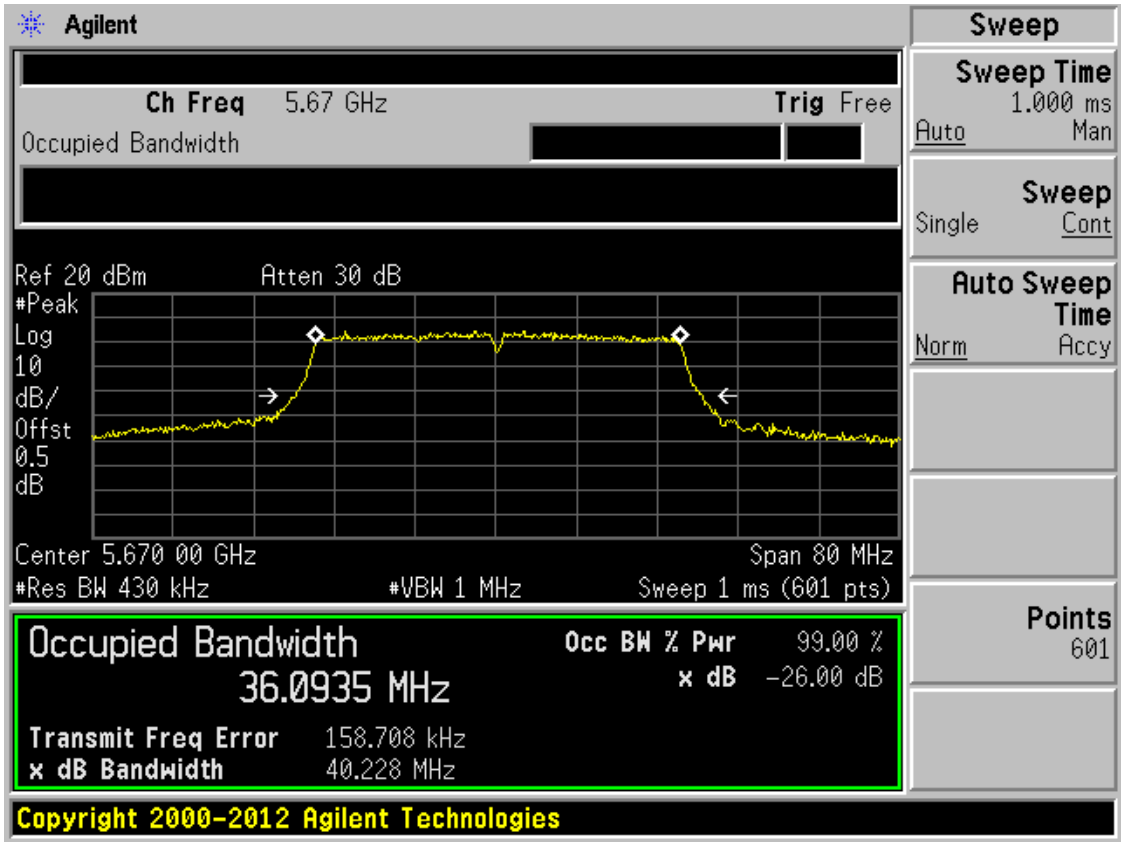
Band III 11ac(HT20) CH140



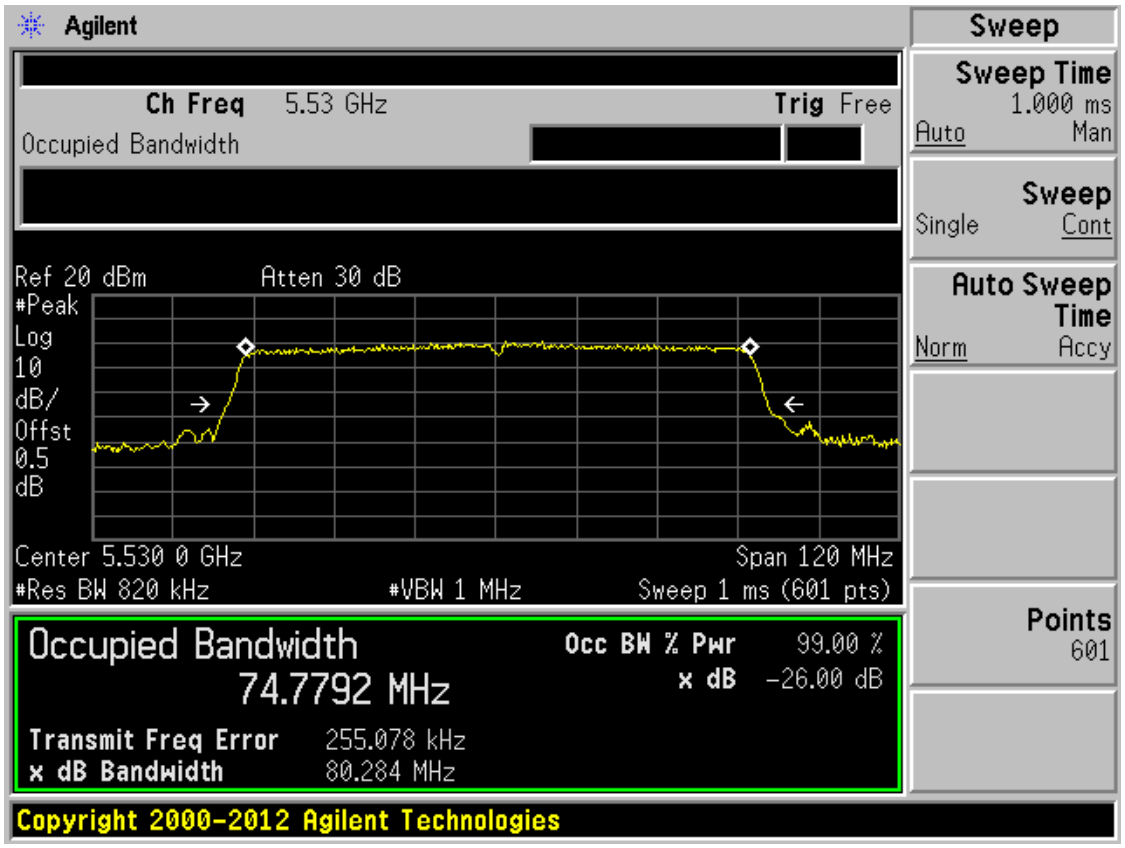

Band III 11ac(HT40) CH102



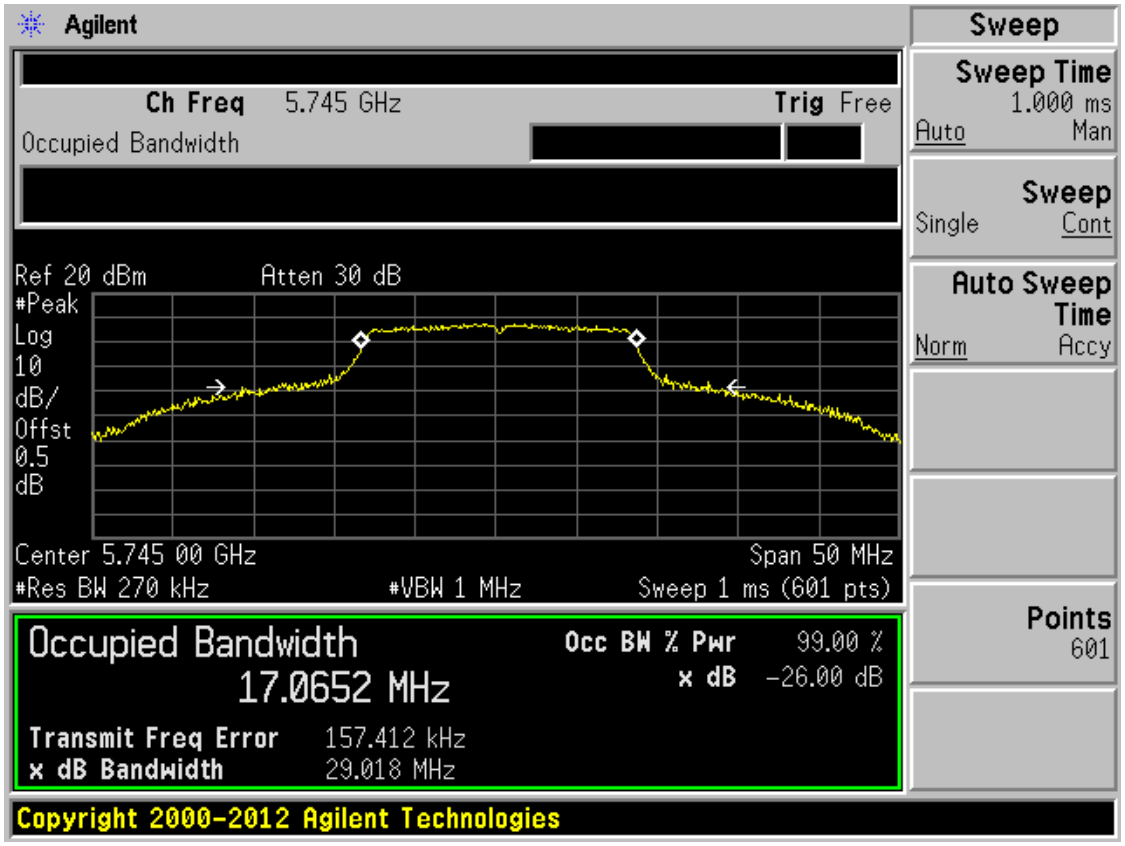
Band III 11ac(HT40) CH134



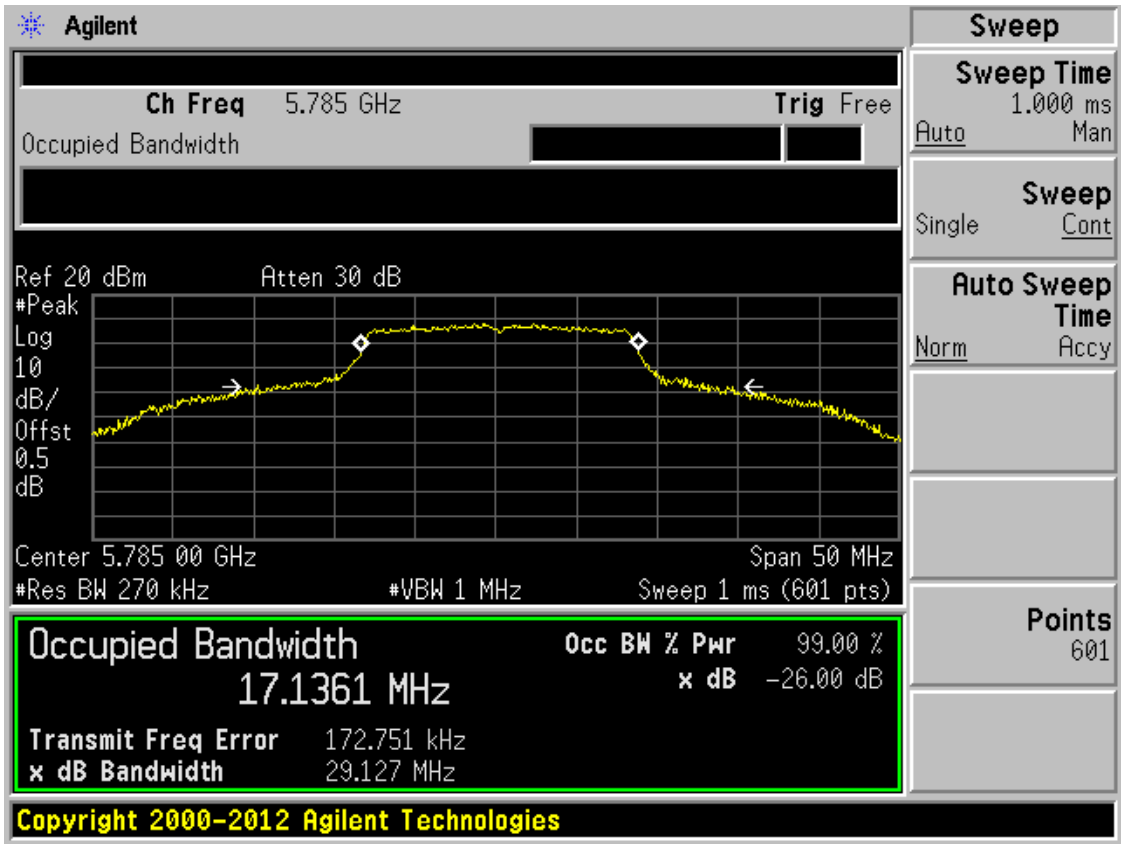

Band III 11ac(HT80) CH106



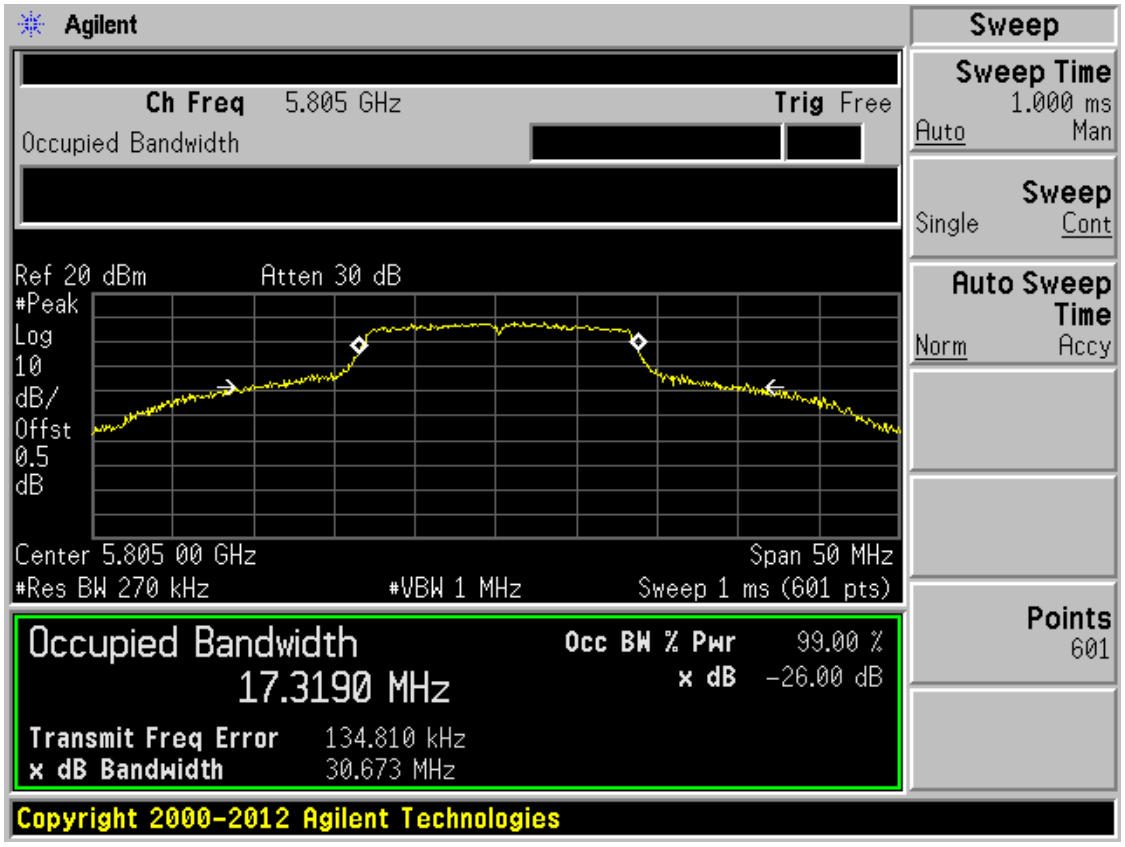
## Band IV 11a CH149



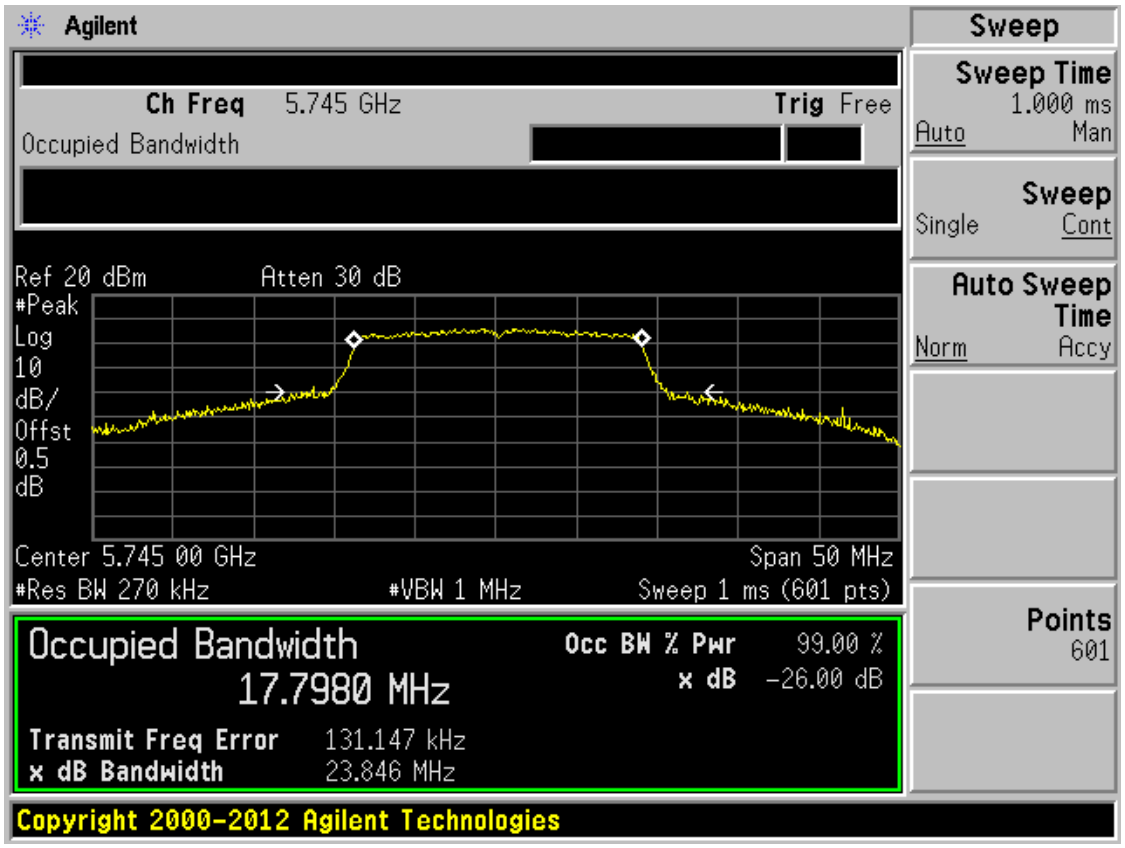

## Band IV 11a CH157



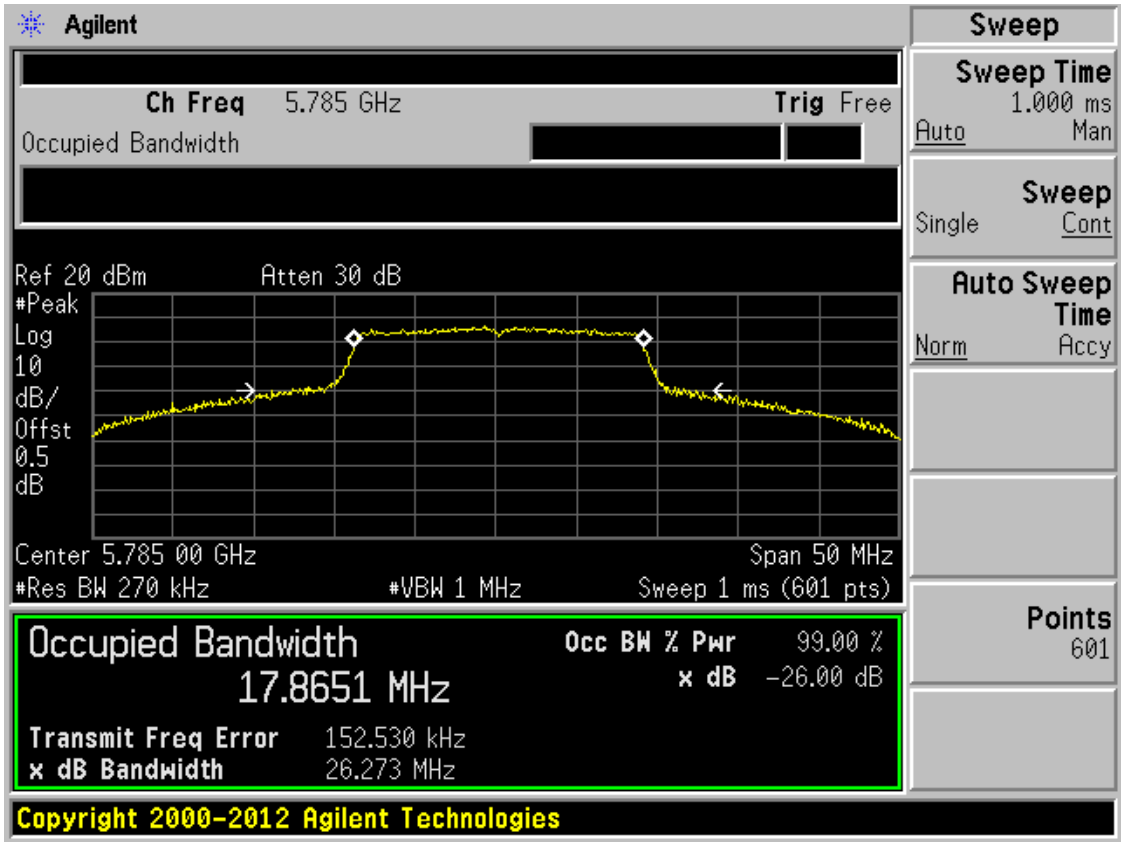
## Band IV 11a CH161



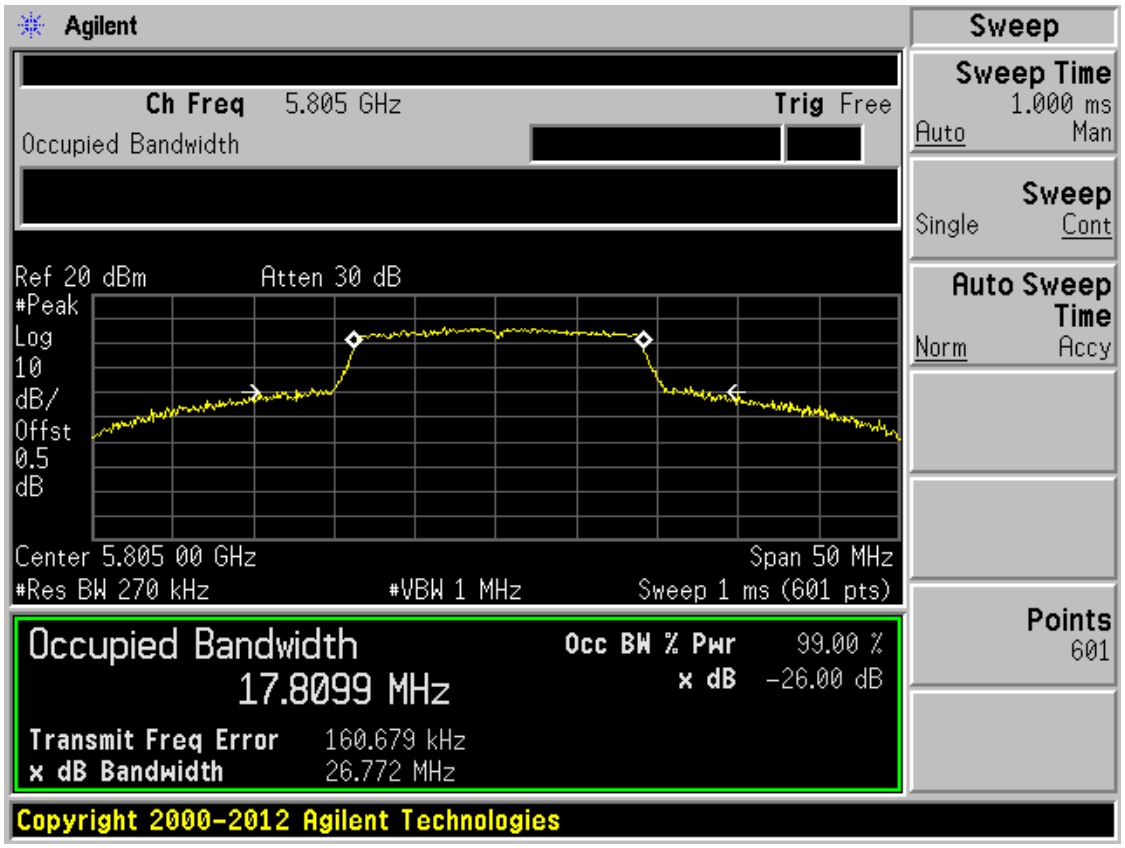

## Band IV 11n(HT20) CH149



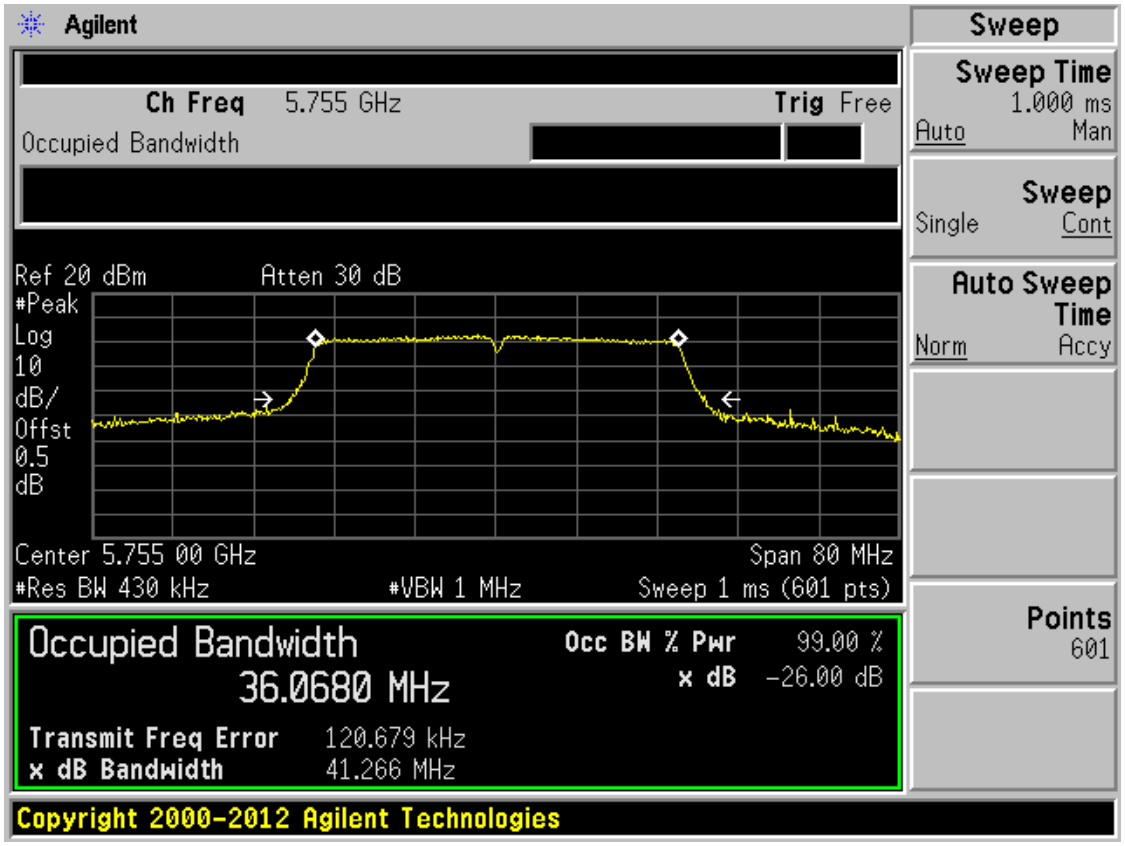
Band IV 11n(HT20) CH157



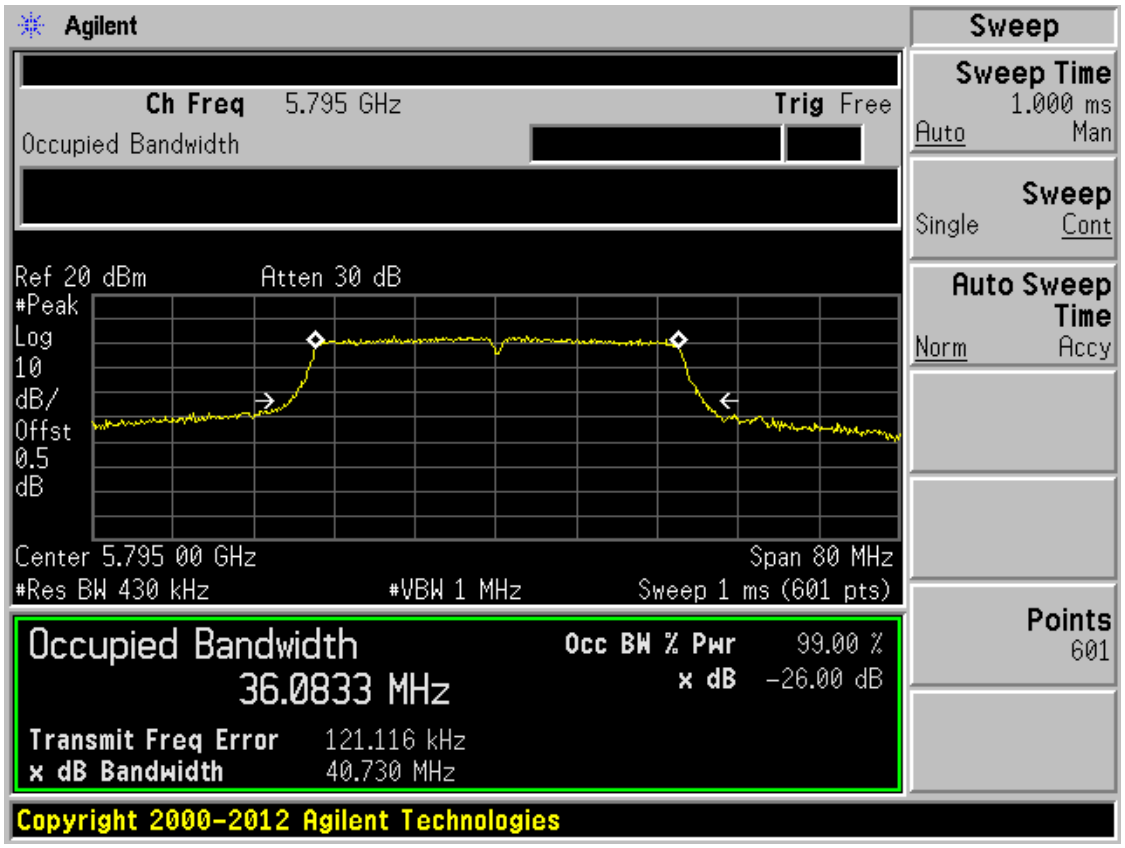

Band IV 11n(HT20) CH161



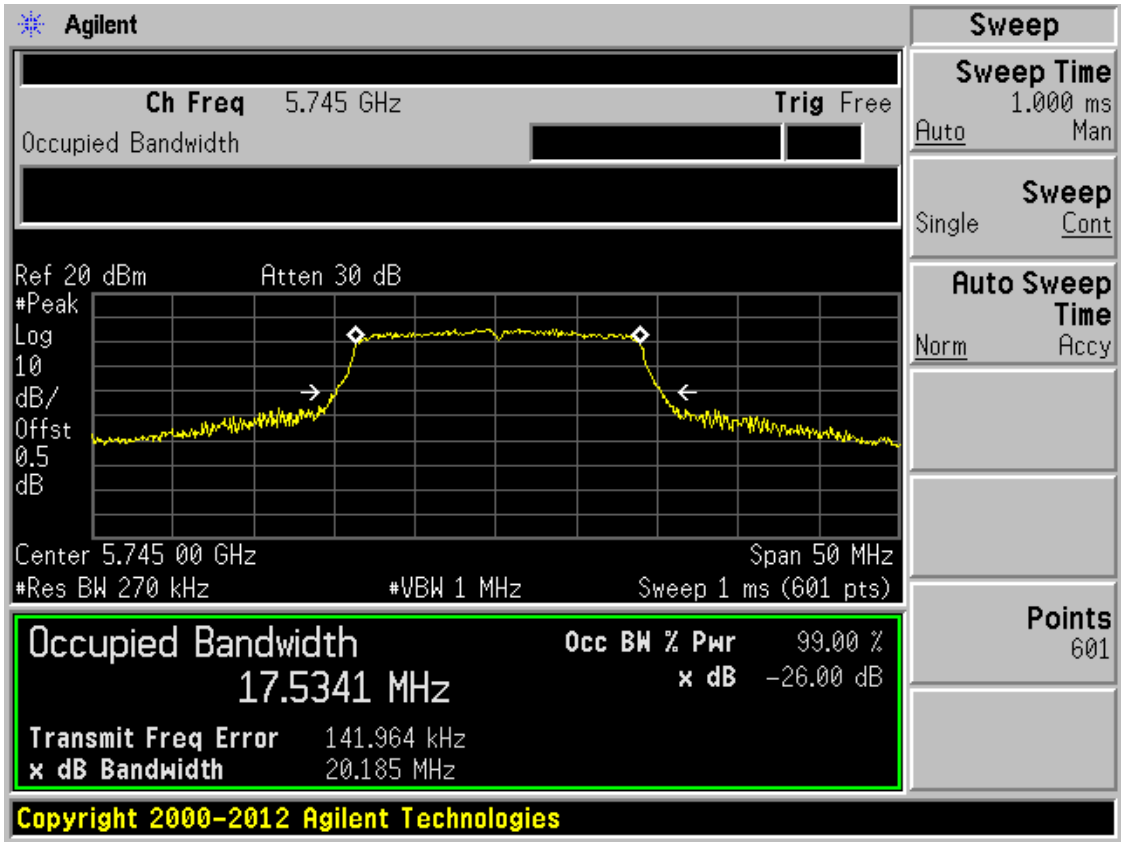
Band IV 11n(HT40) CH151



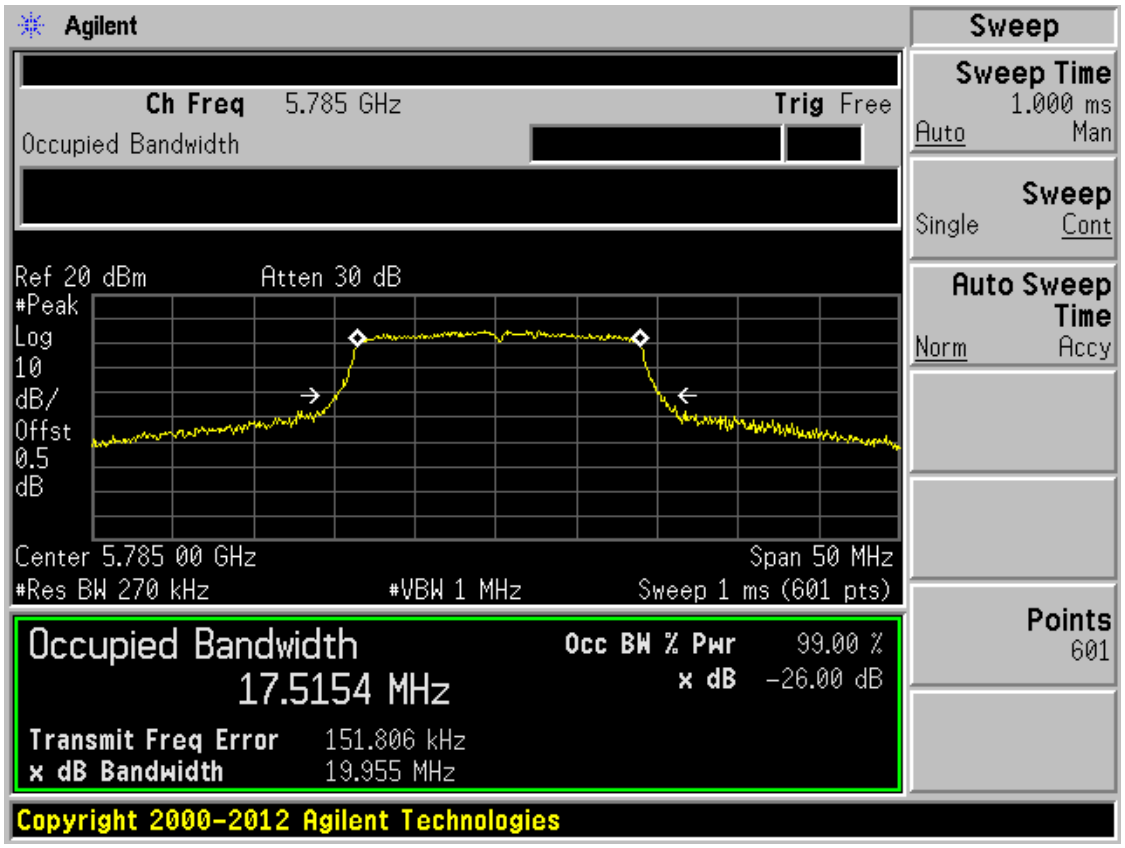

Band IV 11n(HT40) CH159



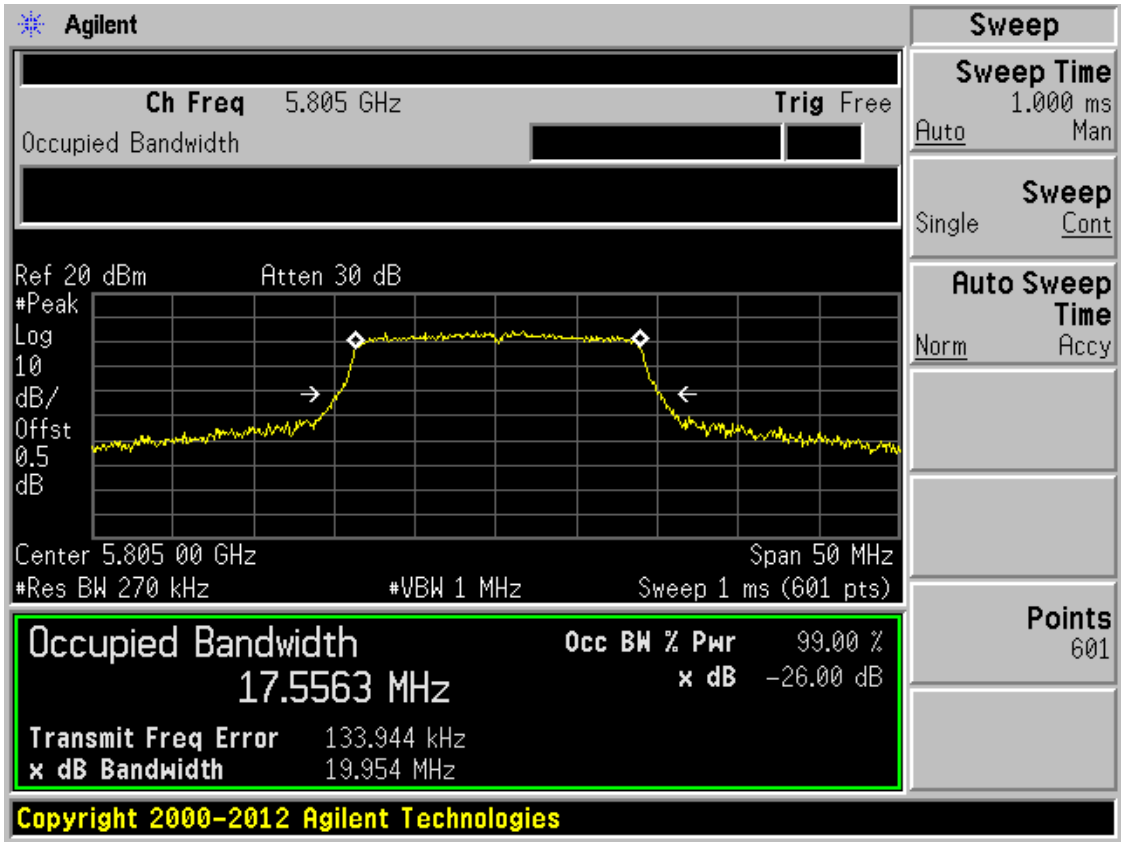
Band IV 11ac(HT20) CH149



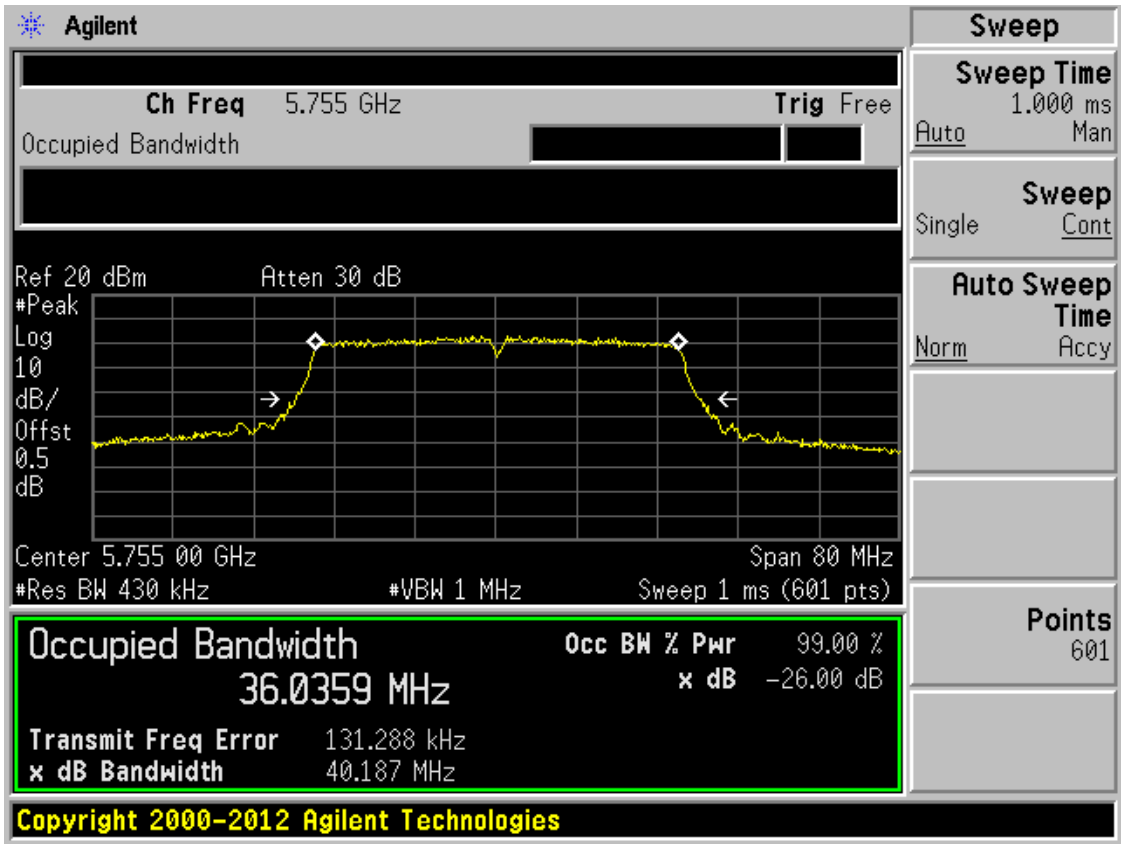

Band IV 11ac(HT20) CH157



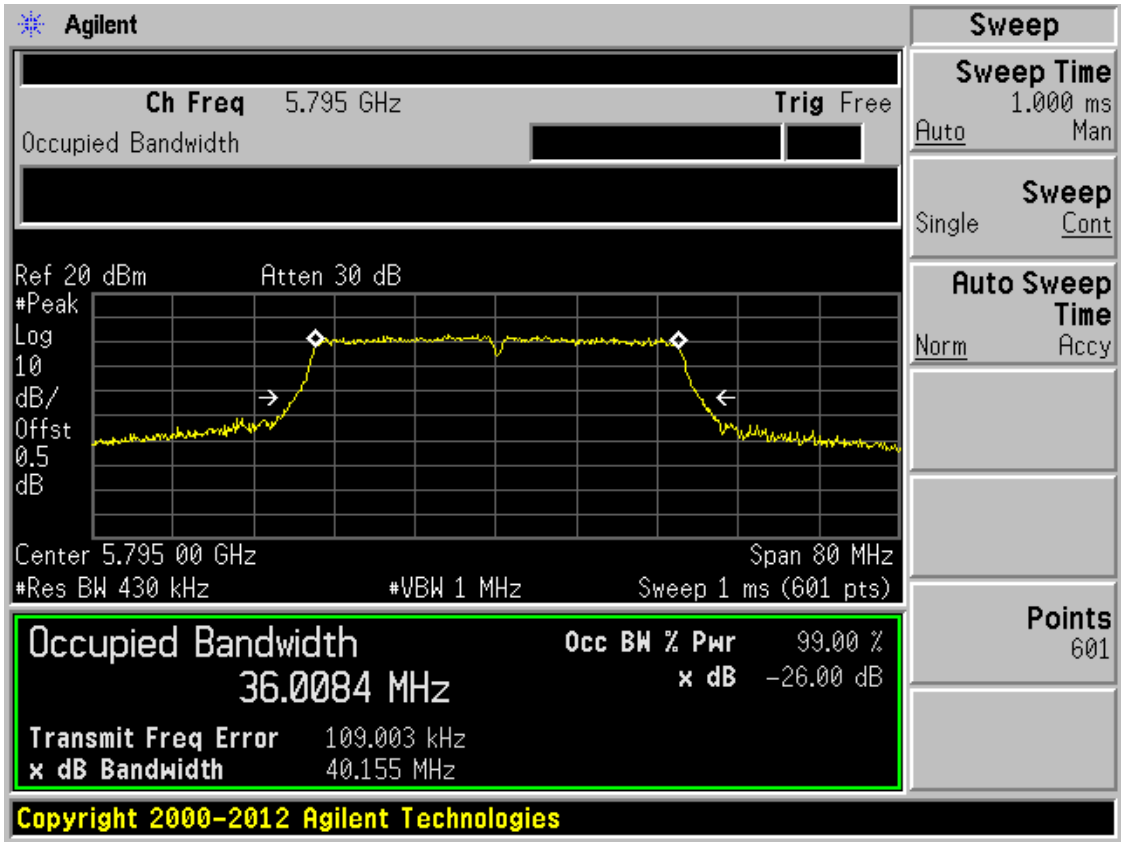
Band IV 11ac(HT20) CH161




Band IV 11ac(HT40) CH151



Band IV 11ac(HT40) CH159




Band IV 11ac(HT80) CH155