



MRT Technology (Suzhou) Co., Ltd
Phone: +86-512-66308358
Fax: +86-512-66308368
Web: www.mrt-cert.com

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MEASUREMENT REPORT

FCC PART 15.407 WLAN 802.11a/n/ac

FCC ID: QISAP4030DN

APPLICANT: HUAWEI TECHNOLOGIES CO., LTD

Application Type: Certification

Product: Wireless LAN Access Point

Model No.: AP4030DN

Trademark: Huawei

FCC Classification: Unlicensed National Information Infrastructure (UNII)

FCC Rule Part(s): Part 15.407

Test Procedure(s): ANSI C63.10-2013, KDB 789033 D02v01r01,
KDB 662911 D01v02r01, KDB 644545 D03v01

Test Date: December 20, 2014 ~ April 08, 2015

Reviewed By : Robin Wu
(Robin Wu)

Approved By : Marlin Chen
(Marlin Chen)



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB 789033 D02v01r01. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date
1501RSU02605	Rev. 01	Initial report	01-19-2016

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§2.1033 General Information

Applicant:	HUAWEI TECHNOLOGIES CO., LTD.
Applicant Address:	Administration Building, Huawei Base, Bantian, Longgang District, Shenzhen
Manufacturer:	HUAWEI TECHNOLOGIES CO., LTD.
Manufacturer Address:	Administration Building, Huawei Base, Bantian, Longgang District, Shenzhen
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
MRT FCC Registration No.:	809388
FCC Rule Part(s):	Part 15.407
Model No.:	AP4030DN
FCC ID:	QISAP4030DN
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering
FCC Classification:	Unlicensed National Information Infrastructure (UNII)

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- MRT facility is a FCC registered (MRT Reg. No. 809388) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.
- MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.
- MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.



1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	Wireless LAN Access Point
Model No.	AP4030DN
Frequency Range	For 802.11a/n-HT20: 5180~5320MHz, 5500~5700MHz, 5745~5825MHz For 802.11ac-VHT20: 5180~5320MHz, 5500~5720MHz, 5745~5825MHz For 802.11n-HT40: 5190~5310MHz, 5510~5670MHz, 5755~5795MHz For 802.11ac-VHT40: 5190~5310MHz, 5510~5710MHz, 5755~5795MHz For 802.11ac-VHT80: 5210MHz, 5290MHz, 5530MHz, 5610MHz, 5690MHz, 5775MHz
Maximum Average Output Power	802.11a: 23.81dBm 802.11n-HT20: 23.70dBm 802.11n-HT40: 21.05dBm 802.11ac-VHT20: 23.61dBm 802.11ac-VHT40: 20.74dBm 802.11ac-VHT80: 20.24dBm
Type of Modulation	802.11a/n/ac: OFDM

2.2. Working Frequencies

Channel List for 802.11a/n-HT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180 MHz	40	5200 MHz	44	5220 MHz
48	5240 MHz	52	5260 MHz	56	5280 MHz
60	5300 MHz	64	5320 MHz	100	5500 MHz
104	5520 MHz	108	5540 MHz	112	5560 MHz
116	5580 MHz	120	5600 MHz	124	5620 MHz
128	5640 MHz	132	5660 MHz	136	5680 MHz
140	5700 MHz	149	5745 MHz	153	5765 MHz
157	5785 MHz	161	5805 MHz	165	5825 MHz

Channel List for 802.11n-HT40

Channel	Frequency	Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz	54	5270 MHz
62	5310 MHz	102	5510 MHz	110	5550 MHz
118	5590 MHz	126	5630 MHz	134	5670 MHz
151	5755 MHz	159	5795 MHz	--	--

Channel List for 802.11ac-VHT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180 MHz	40	5200 MHz	44	5220 MHz
48	5240 MHz	52	5260 MHz	56	5280 MHz
60	5300 MHz	64	5320 MHz	100	5500 MHz
104	5520 MHz	108	5540 MHz	112	5560 MHz
116	5580 MHz	120	5600 MHz	124	5620 MHz
128	5640 MHz	132	5660 MHz	136	5680 MHz
140	5700 MHz	144	5720 MHz	149	5745 MHz
153	5765 MHz	157	5785 MHz	161	5805 MHz
165	5825 MHz	--	--	--	--

Channel List for 802.11ac-VHT40

Channel	Frequency	Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz	54	5270 MHz
62	5310 MHz	102	5510 MHz	110	5550 MHz
118	5590 MHz	126	5630 MHz	134	5670 MHz
142	5710 MHz	151	5755 MHz	159	5795 MHz

Channel List for 802.11ac-VHT80

Channel	Frequency	Channel	Frequency	Channel	Frequency
42	5210 MHz	58	5290 MHz	106	5530 MHz
122	5610 MHz	138	5690 MHz	155	5775 MHz

2.3. Description of Available Antennas

Antenna Type	Frequency Band (GHz)	Max Peak Gain (dBi)	Beam-forming Gain (dBi)	CDD Directional Gain (dBi)	
				For Power	For PSD
PIFA Antenna	2.4	Ant 1: 4.2, Ant 2: 4.4	7.31	7.31	7.31
	5	Ant 1: 6.3, Ant 2: 6.4	9.36	9.36	9.36

Note:

- The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.

For CDD transmissions, directional gain is calculated as follows, $N_{ANT} = 2$, $N_{SS} = 1$.

- 1) If all antennas have the same gain, G_{ANT} , Directional gain = $G_{ANT} + \text{Array Gain}$, where Array Gain is as follows.

- For power spectral density (PSD) measurements on all devices,
Array Gain = $10 \log (N_{ANT} / N_{SS})$ dB = 3.01;
- For power measurements on IEEE 802.11 devices,
Array Gain = 0 dB for $N_{ANT} \leq 4$;

- 2) If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream:

- Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain;

$$\bullet \text{ DirectionalGain} = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

$g_{j,k} = 10^{G_k/20}$ if the kth antenna is being fed by spatial stream j, or zero if it is not;

G_k is the gain in dBi of the kth antenna.

- The EUT also supports Beam Forming mode, and the Beam Forming support 802.11n, not include 802.11a/ac.

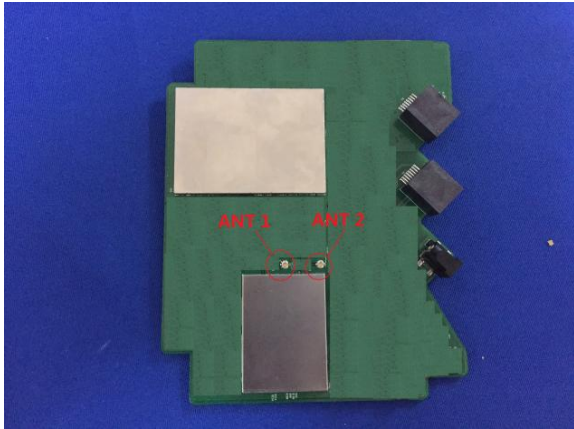
Correlated signals include, but are not limited to, signals transmitted in any of the following modes:

- Any transmit Beam Forming mode, whether fixed or adaptive (e.g., phased array modes, closed loop MIMO modes, Transmitter Adaptive Antenna modes, Maximum Ratio Transmission (MRT) modes, and Statistical Eigen Beam Forming (EBF) modes).

Unequal antenna gains, with equal transmit powers. For antenna gains given by $G_1, G_2, \dots, G_N$ dBi.

- transmit signals are correlated, then
- Directional gain = $10 \cdot \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}]$ dBi [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

2.4. Description of Antenna RF Port

Antenna RF Port				
--	2.4GHz RF Port		5GHz RF Port	
Software Control Port	Ant 1	Ant 2	Ant 1	Ant 2
Antenna RF Port Plot 				

2.5. Test Mode

Test Mode	Mode 1: Transmit by 802.11a
	Mode 2: Transmit by 802.11n-HT20
	Mode 3: Transmit by 802.11n-HT40
	Mode 4: Transmit by 802.11ac-VHT20
	Mode 5: Transmit by 802.11ac-VHT40
	Mode 6: Transmit by 802.11ac-VHT80

2.6. Test Software

The test utility software used during testing was “Cart.exe”.

Final Power Parameter Values of the test software.

Test Mode	Test Freq. (MHz)	Power Parameter Value	Test Mode	Test Freq. (MHz)	Power Parameter Value
802.11a	5180	20	802.11n-HT20	5180	20.0
	5220	20		5220	20.0
	5240	20		5240	20.0
	5260	20		5260	20.0
	5300	20		5300	20.0
	5320	20		5320	20.0
	5500	20		5500	20.0
	5600	19.5		5600	19.5
	5700	19.5		5700	19.5
	5745	20		5745	20.0
	5785	20		5785	20.0
	5825	20		5825	20.0
802.11n-HT40	5190	17.0	802.11ac- VHT20	5180	20.0
	5230	18.0		5220	20.0
	5270	19.0		5240	20.0
	5310	19.0		5260	20.0
	5510	20.0		5300	20.0
	5590	20.0		5320	20.0
	5670	20.0		5500	20.0
	5755	20.0		5600	19.5
	5795	20.0		5700	20.0
802.11ac- VHT40	5190	17.0		5720	20.0
	5230	18.0		5745	20.0
	5270	18.0		5785	20.0
	5310	17.0		5825	20.0
	5510	20.0	802.11ac- VHT80	5210	16.0
	5590	20.0		5290	17.0
	5670	20.0		5530	17.5
	5710	20.0		5610	19.0
	5755	20.0		5690	20.0
	5795	20.0		5775	20.0

2.7. Device Capabilities

This device contains the following capabilities:

2.4GHz WLAN (DTS) & 5GHz WLAN (UNII).

Note: 5GHz (UNII) operation is possible in 20MHz, 40MHz and 80MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section B)2)b) of KDB 789033 D02v01r01. The RBW and VBW were both greater than $50/T$, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

- 802.11a 20MHz Bandwidth - 95.0%
- 802.11n 20MHz Bandwidth - 94.7%
- 802.11n 40MHz Bandwidth - 89.4%
- 802.11ac 20MHz Bandwidth - 94.6%
- 802.11ac 40MHz Bandwidth - 89.9%
- 802.11ac 80MHz Bandwidth - 82.1%

2.8. Test Configuration

The **Wireless LAN Access Point FCC ID: QISAP4030DN** was tested per the guidance of KDB 789033 D02v01r01. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.9. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.10. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013), and the guidance provided in KDB 789033 D02v01r01 were used in the measurement of the **Wireless LAN Access Point FCC ID: QISAP4030DN**.

Deviation from measurement procedure.....None

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50 Ω /50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2013.

Line conducted emissions test results are shown in Section 7.10.

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up for frequencies below 1GHz was placed on top of the 0.8 meter high, 1 x 1.5 meter table; and test set-up for frequencies 1-40GHz was placed on top of the 1.5 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB Beam-Width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

4. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- The internal antenna of **Wireless LAN Access Point** is permanently attached.
- There are no provisions for connection to an external antenna.

Conclusion:

The **Wireless LAN Access Point FCC ID: QISAP4030DN** unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2016/11/03
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2016/11/03
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2016/11/03
Temperature/Humidity Meter	Ouleinuo	N/A	MRTSUE06114	1 year	2016/11/20

Radiated Emission

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	E4447A	MRTSUE06028	1 year	2016/12/08
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2016/11/03
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2016/04/16
Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2016/03/29
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2016/12/14
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2016/11/07
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2016/11/07
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2016/01/05
Temperature/Humidity Meter	Ouleinuo	N/A	MRTSUE06115	1 year	2016/11/20

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2016/05/08
USB Wideband Power Sensor	Boonton	55006	MRTSUE06109	1 year	2016/05/08
Temperature/Humidity Meter	Ouleinuo	N/A	MRTSUE06112	1 year	2016/11/20

6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

AC Conducted Emission Measurement - SR2
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 150kHz~30MHz: $\pm 3.46\text{dB}$
Radiated Emission Measurement - AC1
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 9kHz ~ 1GHz: $\pm 4.18\text{dB}$ 1GHz ~ 40GHz: $\pm 4.76\text{dB}$

7. TEST RESULT

7.1. Summary

Product Name: Wireless LAN Access Point
FCC ID: QISAP4030DN
FCC Classification: Unlicensed National Information Infrastructure (UNII)
Data Rate(s) Tested: 6Mbps ~ 54Mbps (a);
6.5/7.2Mbps ~ 260/288.8Mbps (n-HT20MHz BW);
13.5/15.0Mbps ~ 540/600Mbps (n-HT40MHz BW);
6.5/7.2Mbps ~ 312/346.7Mbps (ac-VHT20MHz BW);
13.5/15Mbps ~ 720/800Mbps (ac-VHT40MHz BW);
29.3/32.5Mbps ~ 1560/1733.3Mbps (ac-VHT80MHz BW)

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.407(a)	26dB Bandwidth	N/A	Conducted	Pass	Section 7.2
15.407(e)	6dB Bandwidth	≥ 500kHz		Pass	Section 7.3
15.407(a)(1)(ii), (2), (3)	Maximum Conducted Output Power	< 26.64 dBm U-NII-1 < 20.64 dBm U-NII-2a < 20.64 dBm U-NII-2b < 26.64 dBm U-NII-3		Pass	Section 7.4
15.407(h)(1)	Transmit Power Control	< 24 dBm		Pass	Section 7.5
15.407(a)(1)(ii), (2), (3), (5)	Peak Power Spectral Density	< 13.64 dBm/MHz U-NII-1 < 7.64 dBm/MHz U-NII-2a < 7.64 dBm/MHz U-NII-2b < 26.64 dBm/500kHz U-NII-3		Pass	Section 7.6
15.407(g)	Frequency Stability	N/A		Pass	Section 7.7
15.407(b)(1), (2), (3), (4)	Undesirable Emissions	< -27dBm/MHz EIRP < -17dBm/MHz EIRP	Radiated	Pass	Section 7.8 & 7.9
15.205, 15.209 15.407(b)(5), (6), (7)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		Pass	
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.10

Notes:

- 1) All channels, modes, and modulations/data rates were investigated among all UNII bands. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.
- 4) For the “26dB Bandwidth” & “6dB Bandwidth” items, we just evaluate worst mode (per chain).

7.2. 26dB Bandwidth Measurement

7.2.1. Test Limit

N/A

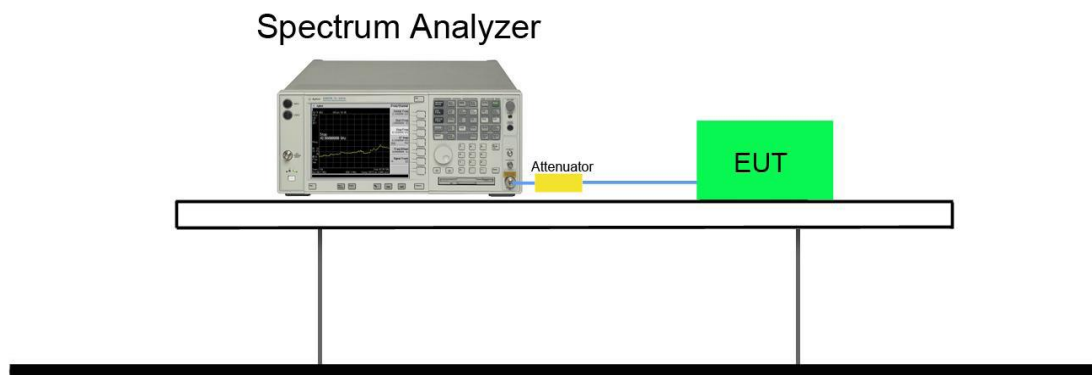
7.2.2. Test Procedure used

KDB 789033 D02v01r01 - Section C.1

7.2.3. Test Setting

1. The analyzers' automatic bandwidth measurement capability was used to perform the 26dB bandwidth measurement. The "X" dB bandwidth parameter was set to $X = 26$. The automatic bandwidth measurement function also has the capability of simultaneously measuring the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediated power nulls in the fundamental emission.
2. RBW = approximately 1% of the emission bandwidth.
3. $VBW \geq 3 \times RBW$.
4. Detector = Peak.
5. Trace mode = max hold.

7.2.4. Test Setup



7.2.5. Test Result

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)	Result
Ant 1						
802.11a	6	36	5180	16.654	21.512	Pass
802.11a	6	44	5220	16.627	22.226	Pass
802.11a	6	48	5240	16.674	22.180	Pass
802.11a	6	52	5260	16.691	22.349	Pass
802.11a	6	60	5300	16.688	21.741	Pass
802.11a	6	64	5320	16.658	22.238	Pass
802.11a	6	100	5500	16.680	22.702	Pass
802.11a	6	120	5600	16.631	21.836	Pass
802.11a	6	140	5700	16.643	21.943	Pass
802.11a	6	149	5745	16.648	21.707	Pass
802.11a	6	157	5785	16.692	21.882	Pass
802.11a	6	165	5825	16.698	22.697	Pass
802.11n-HT20	6.5	36	5180	17.803	22.248	Pass
802.11n-HT20	6.5	44	5220	17.779	22.105	Pass
802.11n-HT20	6.5	48	5240	17.781	22.644	Pass
802.11n-HT20	6.5	52	5260	17.796	22.369	Pass
802.11n-HT20	6.5	60	5300	17.822	22.354	Pass
802.11n-HT20	6.5	64	5320	17.811	22.560	Pass
802.11n-HT20	6.5	100	5500	17.791	23.176	Pass
802.11n-HT20	6.5	120	5600	17.787	22.933	Pass
802.11n-HT20	6.5	140	5700	17.806	22.753	Pass
802.11n-HT20	6.5	149	5745	17.769	22.241	Pass
802.11n-HT20	6.5	157	5785	17.773	23.530	Pass
802.11n-HT20	6.5	165	5825	17.807	13.124	Pass
802.11n-HT40	13.5	38	5190	36.386	44.716	Pass
802.11n-HT40	13.5	46	5230	36.427	44.096	Pass
802.11n-HT40	13.5	54	5270	36.451	44.439	Pass
802.11n-HT40	13.5	62	5310	36.437	44.500	Pass
802.11n-HT40	13.5	102	5510	36.388	44.737	Pass
802.11n-HT40	13.5	118	5590	36.443	42.254	Pass
802.11n-HT40	13.5	134	5670	36.398	43.701	Pass
802.11n-HT40	13.5	151	5755	36.440	44.889	Pass



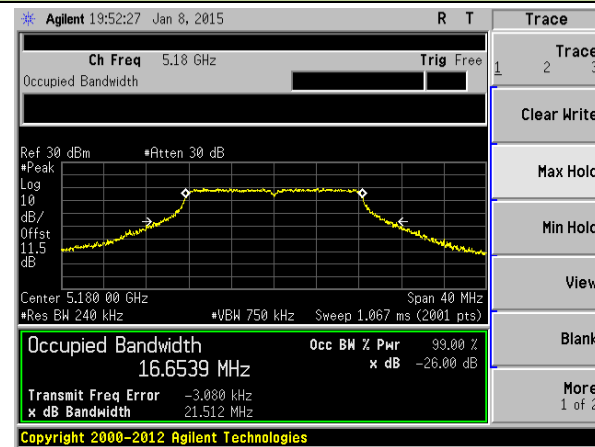
802.11n-HT40	13.5	159	5795	36.396	44.140	Pass
802.11ac-VHT20	6.5	36	5180	17.798	22.624	Pass
802.11ac-VHT20	6.5	44	5220	17.822	23.174	Pass
802.11ac-VHT20	6.5	48	5240	17.804	22.757	Pass
802.11ac-VHT20	6.5	52	5260	17.807	22.927	Pass
802.11ac-VHT20	6.5	60	5300	17.828	22.993	Pass
802.11ac-VHT20	6.5	64	5320	17.828	23.563	Pass
802.11ac-VHT20	6.5	100	5500	17.812	22.844	Pass
802.11ac-VHT20	6.5	120	5600	17.805	23.018	Pass
802.11ac-VHT20	6.5	140	5700	17.784	22.919	Pass
802.11ac-VHT20	6.5	144	5720	17.792	22.940	Pass
802.11ac-VHT20	6.5	149	5745	17.772	22.318	Pass
802.11ac-VHT20	6.5	157	5785	17.767	22.471	Pass
802.11ac-VHT20	6.5	165	5825	17.832	22.901	Pass
802.11ac-VHT40	13.5	38	5190	36.347	44.175	Pass
802.11ac-VHT40	13.5	46	5230	36.315	43.984	Pass
802.11ac-VHT40	13.5	54	5270	36.386	45.106	Pass
802.11ac-VHT40	13.5	62	5310	36.380	44.143	Pass
802.11ac-VHT40	13.5	102	5510	36.419	45.358	Pass
802.11ac-VHT40	13.5	118	5590	36.384	44.467	Pass
802.11ac-VHT40	13.5	134	5670	36.347	44.651	Pass
802.11ac-VHT40	13.5	142	5710	36.307	43.381	Pass
802.11ac-VHT40	13.5	151	5755	36.428	44.225	Pass
802.11ac-VHT40	13.5	159	5795	36.426	45.176	Pass
802.11ac-VHT80	29.3	42	5210	75.703	85.285	Pass
802.11ac-VHT80	29.3	58	5290	75.908	87.142	Pass
802.11ac-VHT80	29.3	106	5530	75.813	87.012	Pass
802.11ac-VHT80	29.3	122	5610	75.545	85.148	Pass
802.11ac-VHT80	29.3	138	5690	75.660	86.812	Pass
802.11ac-VHT80	29.3	155	5775	75.965	89.287	Pass

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)	Result
Ant 2						
802.11a	6	36	5180	16.680	22.554	Pass
802.11a	6	44	5220	16.638	21.871	Pass
802.11a	6	48	5240	16.646	21.589	Pass
802.11a	6	52	5260	16.677	21.472	Pass
802.11a	6	60	5300	16.629	21.981	Pass
802.11a	6	64	5320	16.675	22.040	Pass
802.11a	6	100	5500	16.717	22.879	Pass
802.11a	6	120	5600	16.669	21.828	Pass
802.11a	6	140	5700	16.666	22.063	Pass
802.11a	6	149	5745	16.630	21.016	Pass
802.11a	6	157	5785	16.635	21.435	Pass
802.11a	6	165	5825	16.613	22.874	Pass
802.11n-HT20	6.5	36	5180	17.777	22.600	Pass
802.11n-HT20	6.5	44	5220	17.799	23.194	Pass
802.11n-HT20	6.5	48	5240	17.775	22.747	Pass
802.11n-HT20	6.5	52	5260	17.822	22.867	Pass
802.11n-HT20	6.5	60	5300	17.797	22.764	Pass
802.11n-HT20	6.5	64	5320	17.779	22.221	Pass
802.11n-HT20	6.5	100	5500	17.800	22.398	Pass
802.11n-HT20	6.5	120	5600	17.804	23.271	Pass
802.11n-HT20	6.5	140	5700	17.799	22.800	Pass
802.11n-HT20	6.5	149	5745	17.786	22.262	Pass
802.11n-HT20	6.5	157	5785	17.793	23.419	Pass
802.11n-HT20	6.5	165	5825	17.787	22.516	Pass
802.11n-HT40	13.5	38	5190	36.417	44.259	Pass
802.11n-HT40	13.5	46	5230	36.433	44.108	Pass
802.11n-HT40	13.5	54	5270	36.432	44.108	Pass
802.11n-HT40	13.5	62	5310	36.463	44.425	Pass
802.11n-HT40	13.5	102	5510	36.472	44.822	Pass
802.11n-HT40	13.5	118	5590	36.409	43.812	Pass
802.11n-HT40	13.5	134	5670	36.421	43.574	Pass
802.11n-HT40	13.5	151	5755	36.462	43.157	Pass
802.11n-HT40	13.5	159	5795	36.428	44.716	Pass
802.11ac-VHT20	6.5	36	5180	17.793	23.581	Pass

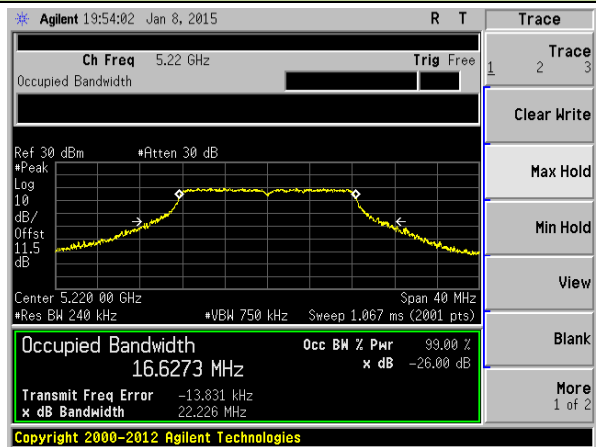
802.11ac-VHT20	6.5	44	5220	17.783	23.009	Pass
802.11ac-VHT20	6.5	48	5240	17.806	22.905	Pass
802.11ac-VHT20	6.5	52	5260	17.782	22.729	Pass
802.11ac-VHT20	6.5	60	5300	17.798	23.422	Pass
802.11ac-VHT20	6.5	64	5320	17.809	22.209	Pass
802.11ac-VHT20	6.5	100	5500	17.806	22.458	Pass
802.11ac-VHT20	6.5	120	5600	17.787	22.901	Pass
802.11ac-VHT20	6.5	140	5700	17.787	23.247	Pass
802.11ac-VHT20	6.5	144	5720	17.813	23.043	Pass
802.11ac-VHT20	6.5	149	5745	17.800	22.793	Pass
802.11ac-VHT20	6.5	157	5785	17.797	22.720	Pass
802.11ac-VHT20	6.5	165	5825	17.753	22.391	Pass
802.11ac-VHT40	13.5	38	5190	36.337	43.487	Pass
802.11ac-VHT40	13.5	46	5230	36.364	43.067	Pass
802.11ac-VHT40	13.5	54	5270	36.434	43.914	Pass
802.11ac-VHT40	13.5	62	5310	36.396	44.567	Pass
802.11ac-VHT40	13.5	102	5510	36.384	43.760	Pass
802.11ac-VHT40	13.5	118	5590	36.429	43.799	Pass
802.11ac-VHT40	13.5	134	5670	36.436	45.443	Pass
802.11ac-VHT40	13.5	142	5710	36.450	44.820	Pass
802.11ac-VHT40	13.5	151	5755	36.379	44.262	Pass
802.11ac-VHT40	13.5	159	5795	36.468	44.543	Pass
802.11ac-VHT80	29.3	42	5210	75.789	88.031	Pass
802.11ac-VHT80	29.3	58	5290	75.896	88.173	Pass
802.11ac-VHT80	29.3	106	5530	75.891	87.284	Pass
802.11ac-VHT80	29.3	122	5610	75.881	87.496	Pass
802.11ac-VHT80	29.3	138	5690	75.907	88.456	Pass
802.11ac-VHT80	29.3	155	5775	75.691	87.220	Pass

802.11a 26dB Bandwidth & 99% Bandwidth - Ant 1

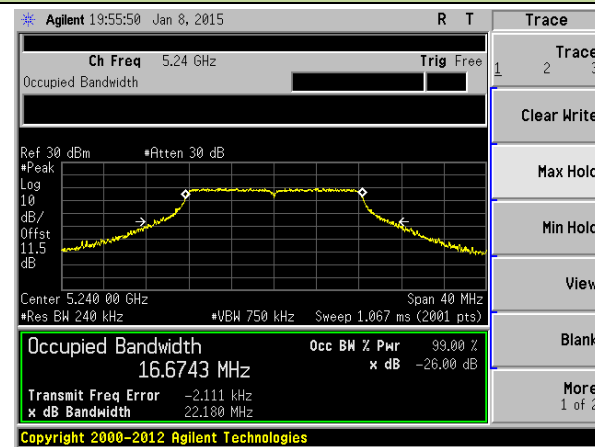
Channel 36 (5180MHz)



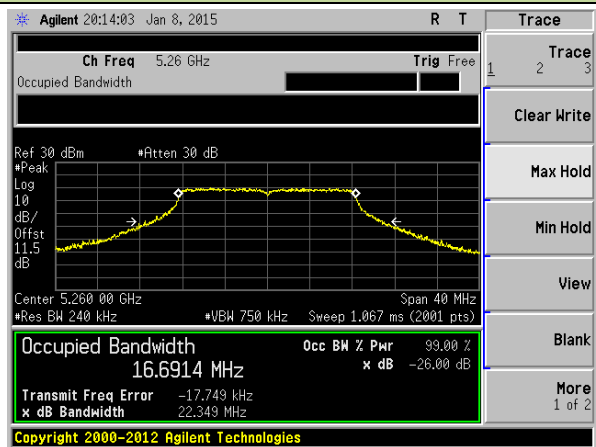
Channel 44 (5220MHz)



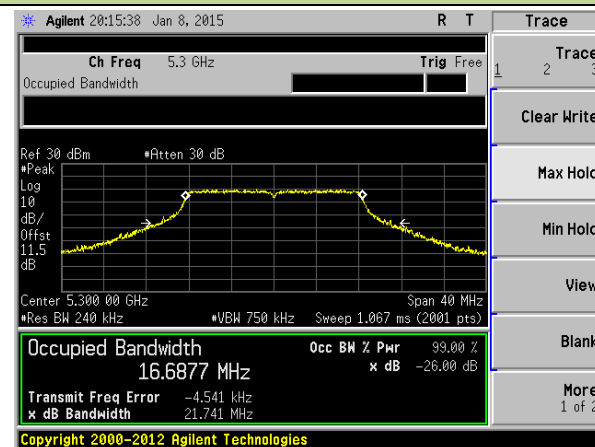
Channel 48 (5240MHz)



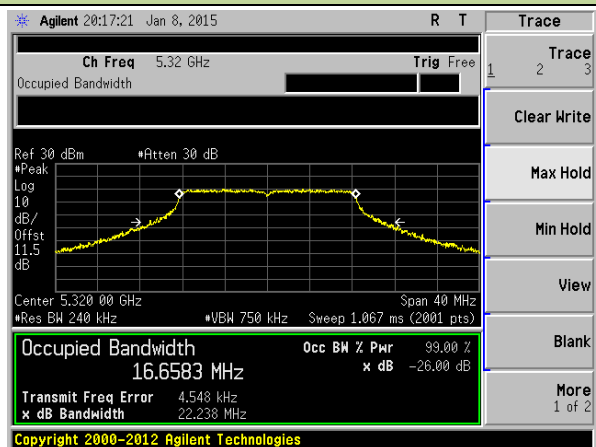
Channel 52 (5260MHz)

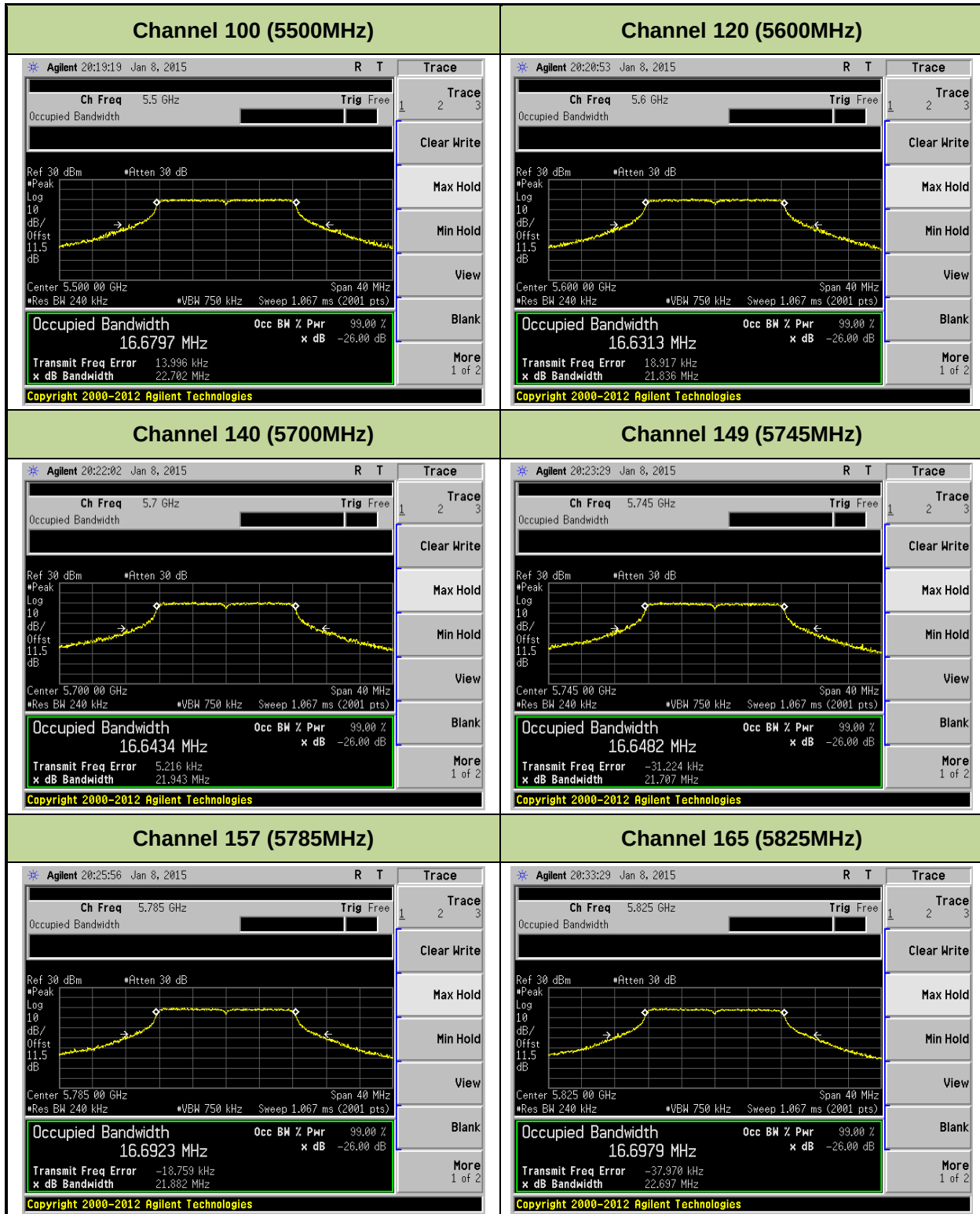


Channel 60 (5300MHz)



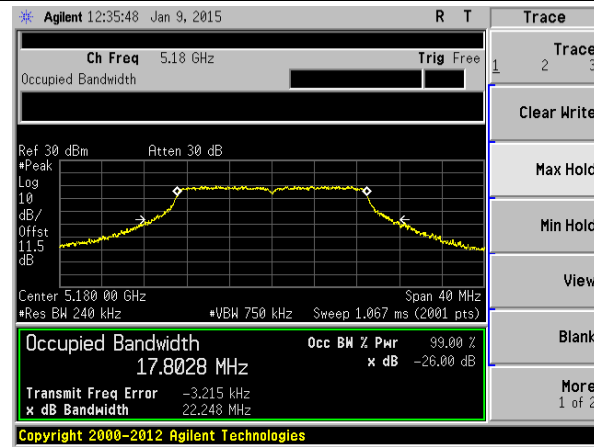
Channel 64 (5320MHz)



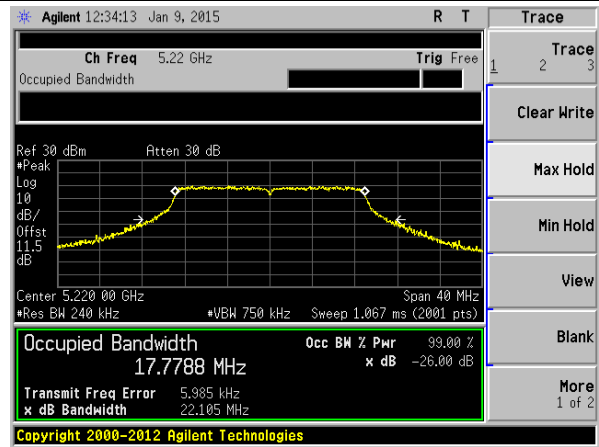


802.11n-HT20 26dB Bandwidth & 99% Bandwidth - Ant 1

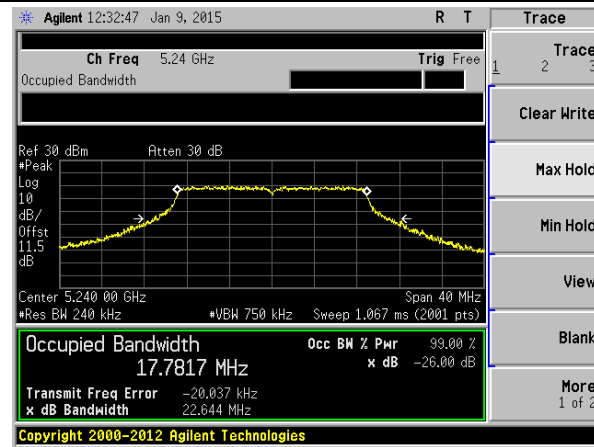
Channel 36 (5180MHz)



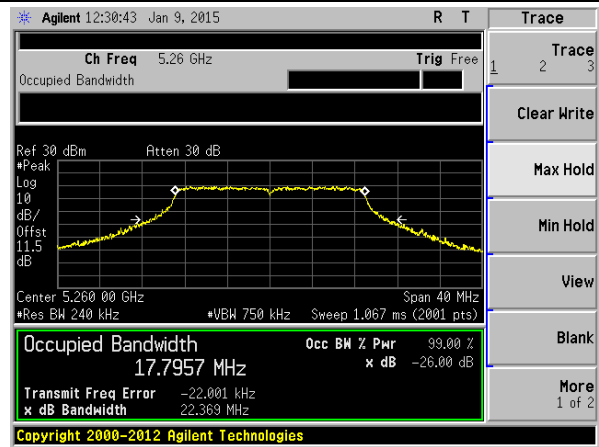
Channel 44 (5220MHz)



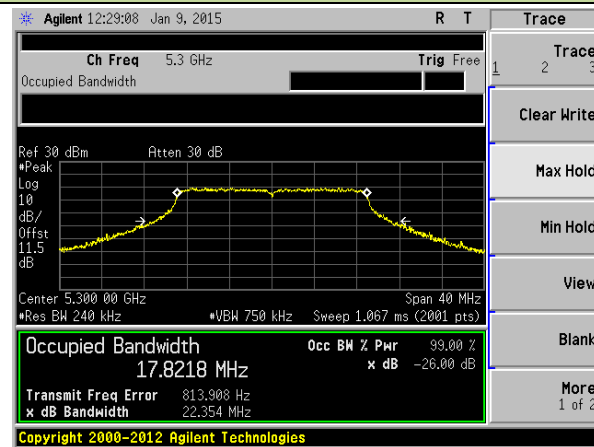
Channel 48 (5240MHz)



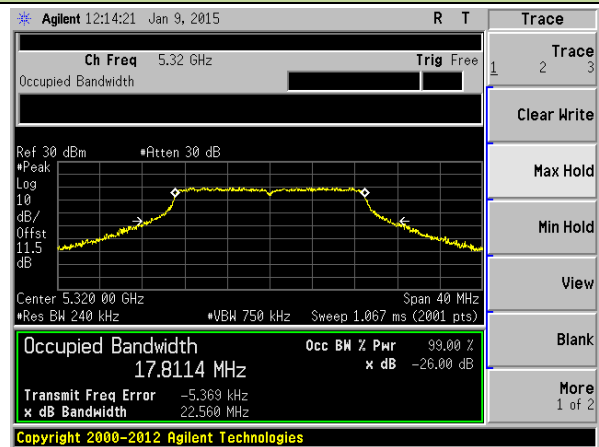
Channel 52 (5260MHz)

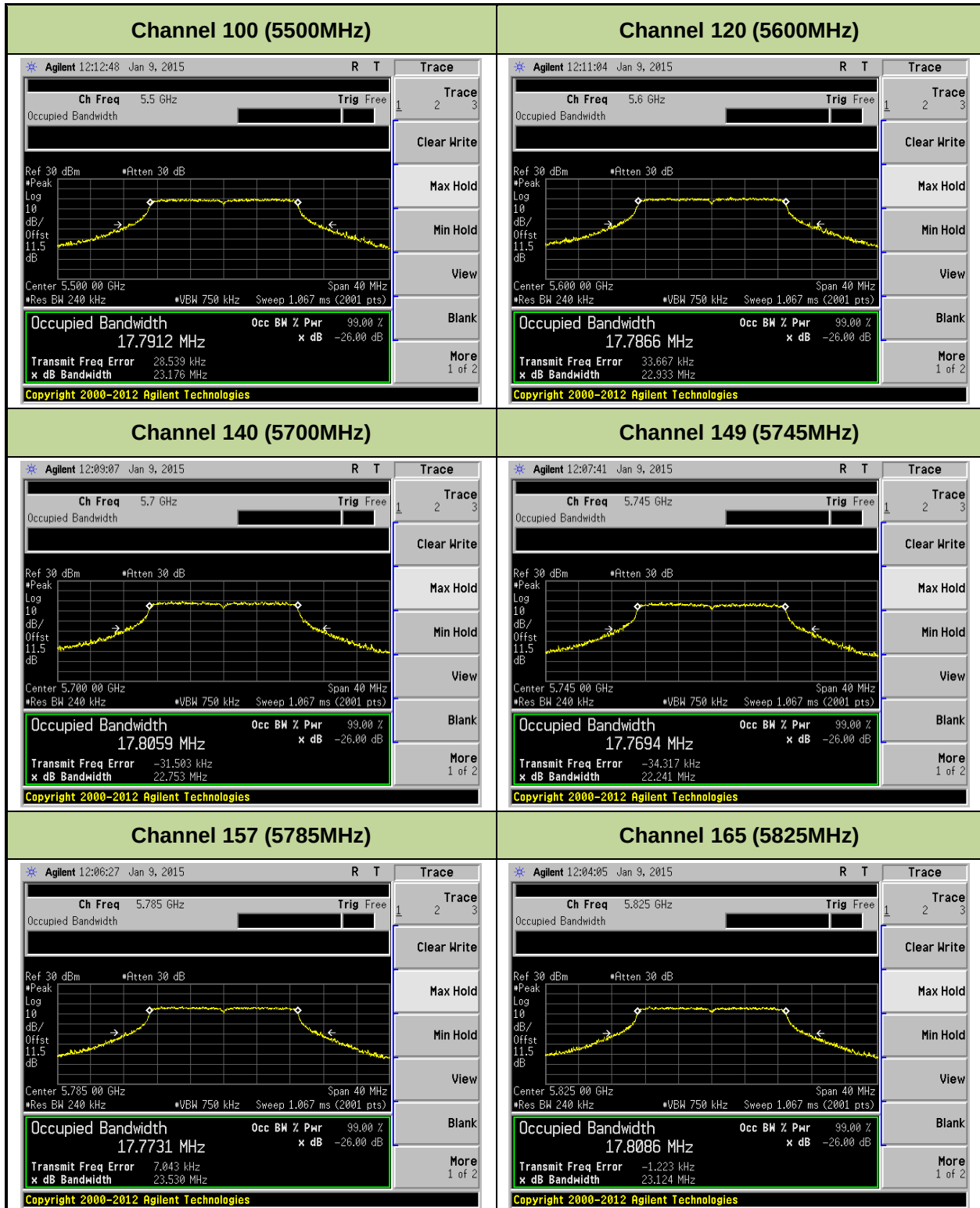


Channel 60 (5300MHz)



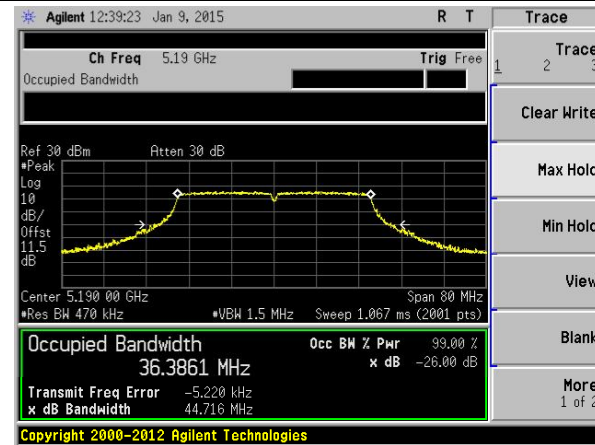
Channel 64 (5320MHz)



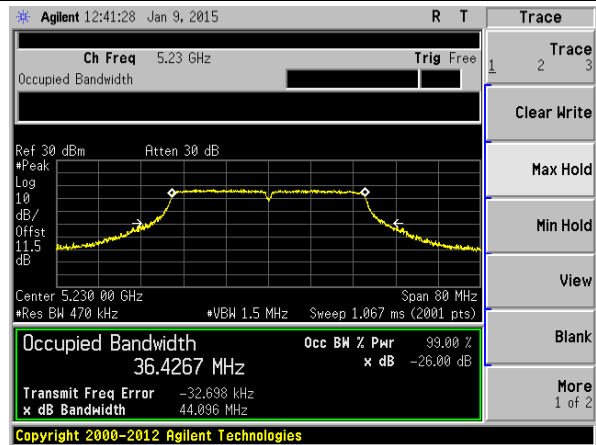


802.11n-HT40 26dB Bandwidth & 99% Bandwidth - Ant 1

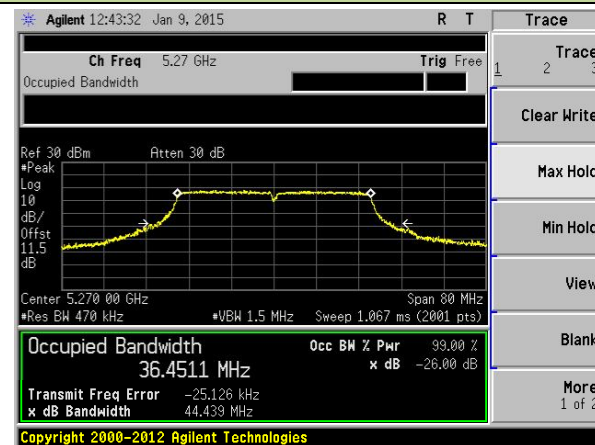
Channel 38 (5190MHz)



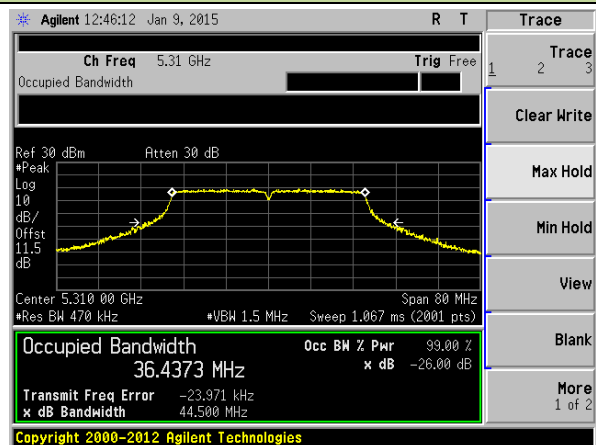
Channel 46 (5230MHz)



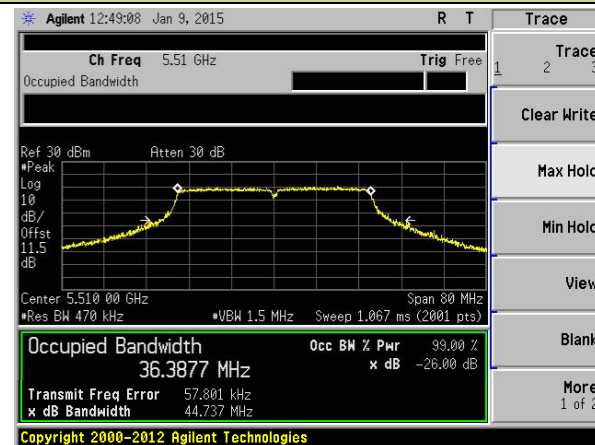
Channel 54 (5270MHz)



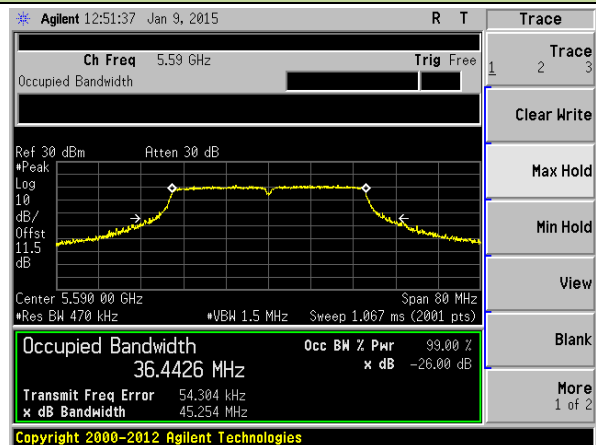
Channel 62 (5310MHz)



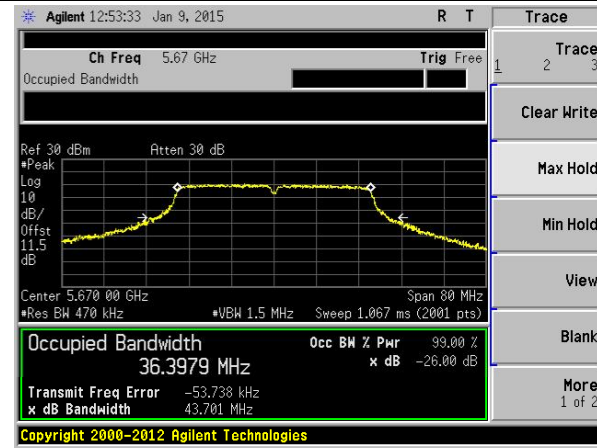
Channel 102 (5510MHz)



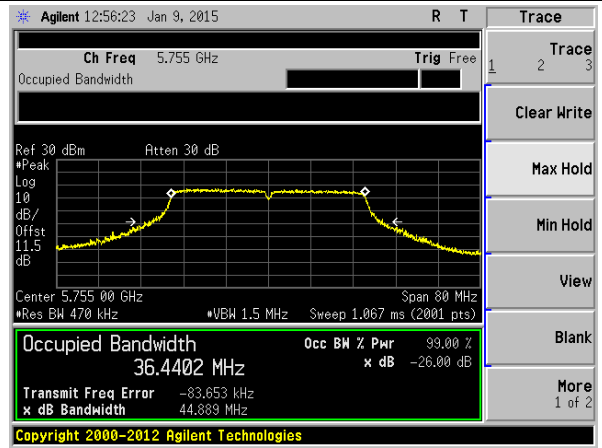
Channel 118 (5590MHz)



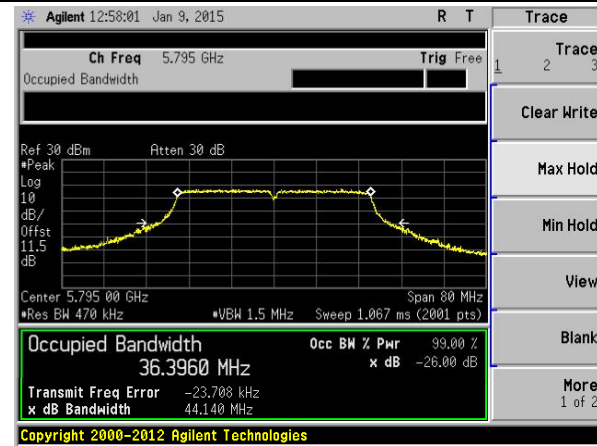
Channel 134 (5670MHz)



Channel 151 (5755 MHz)

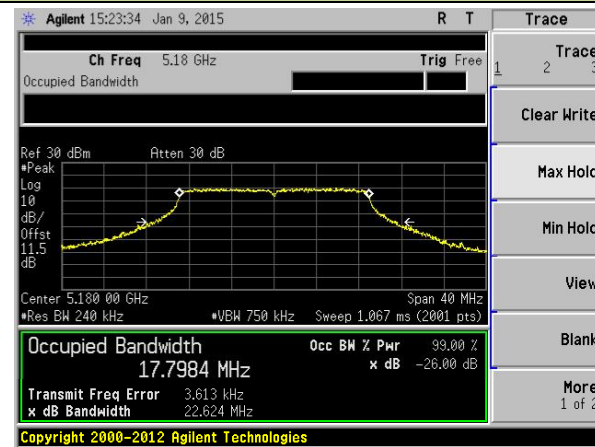


Channel 159 (5795 MHz)

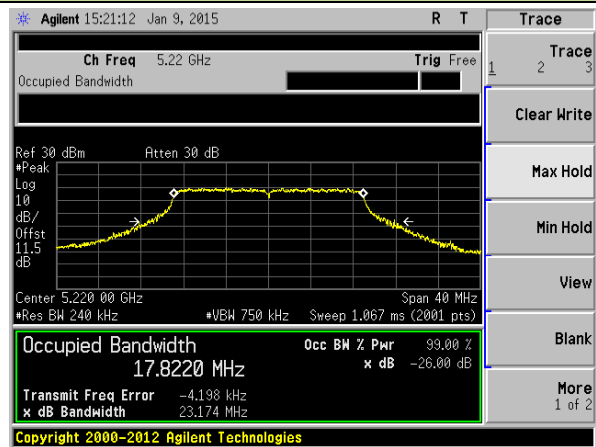


802.11ac-VHT20 26dB Bandwidth & 99% Bandwidth - Ant 1

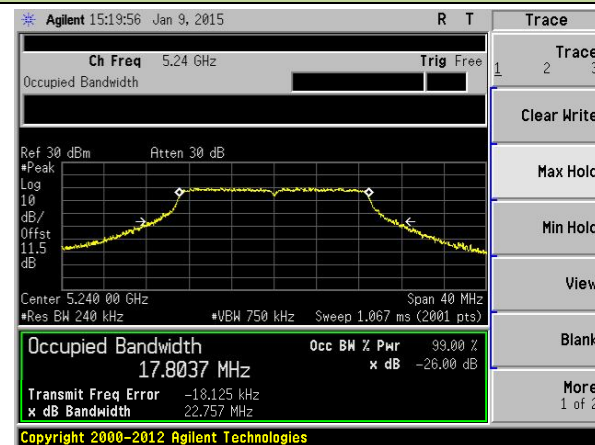
Channel 36 (5180MHz)



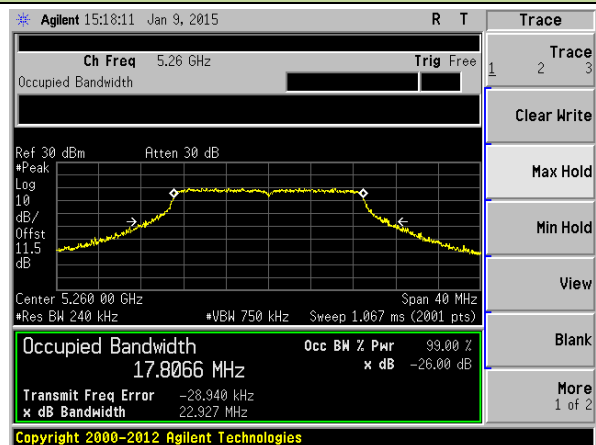
Channel 44 (5220MHz)



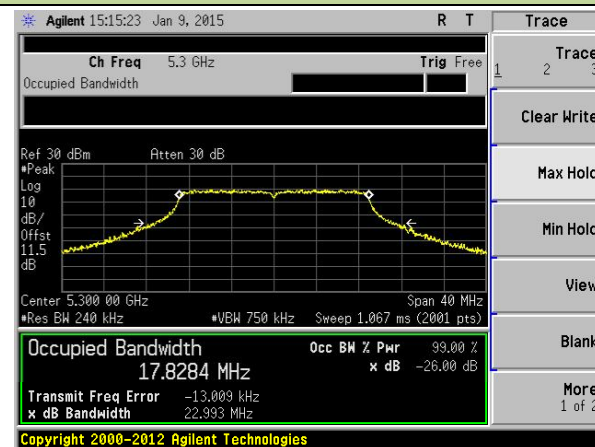
Channel 48 (5240MHz)



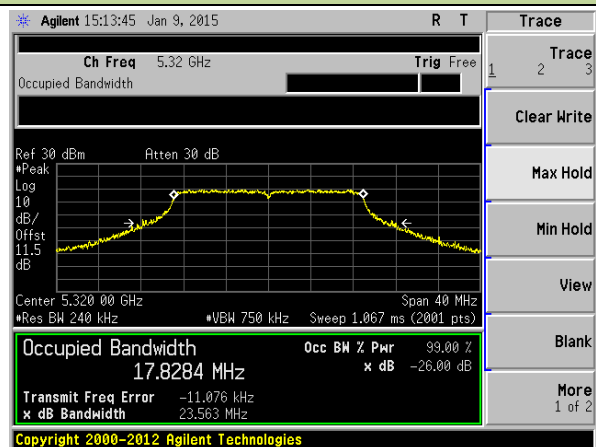
Channel 52 (5260MHz)

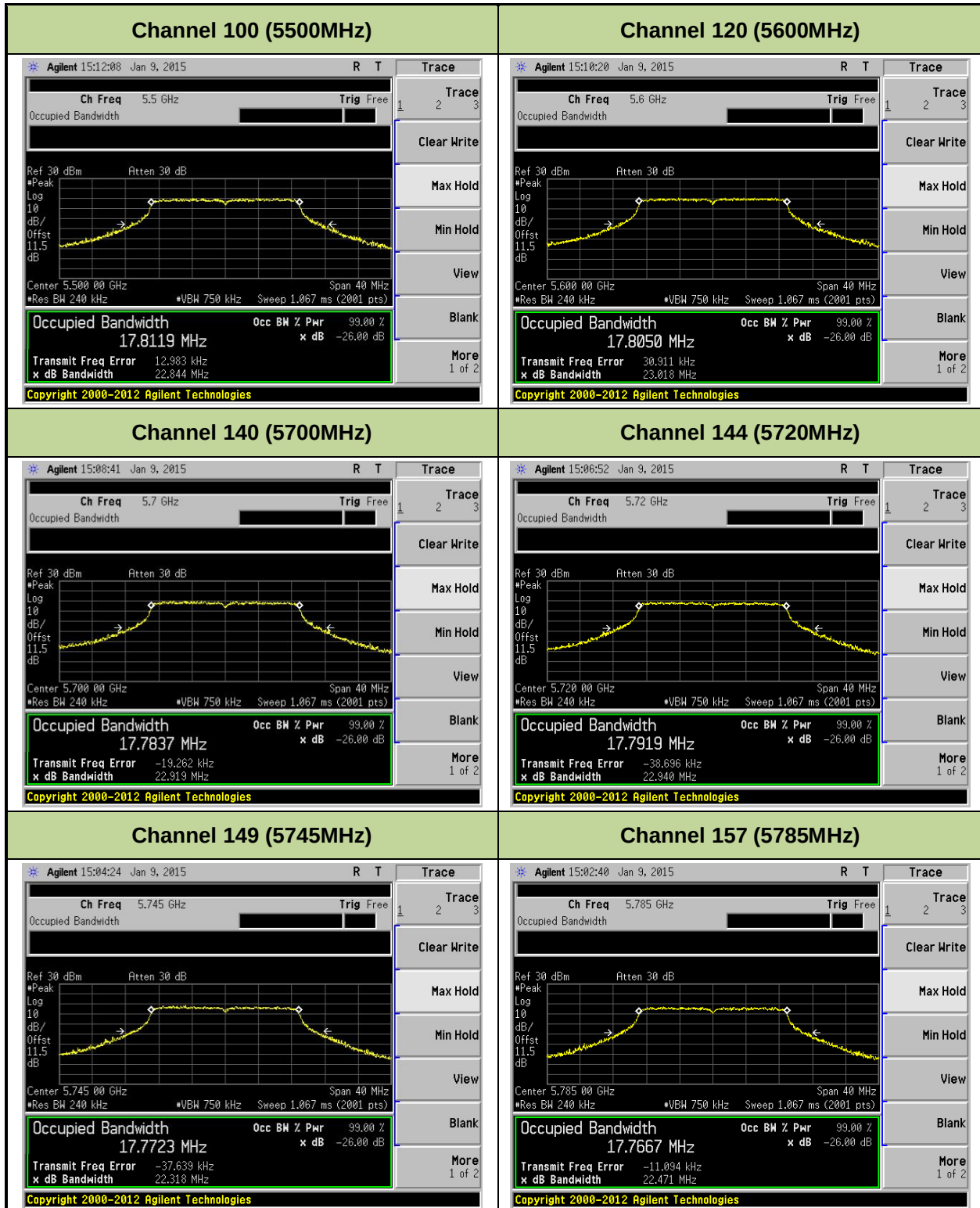


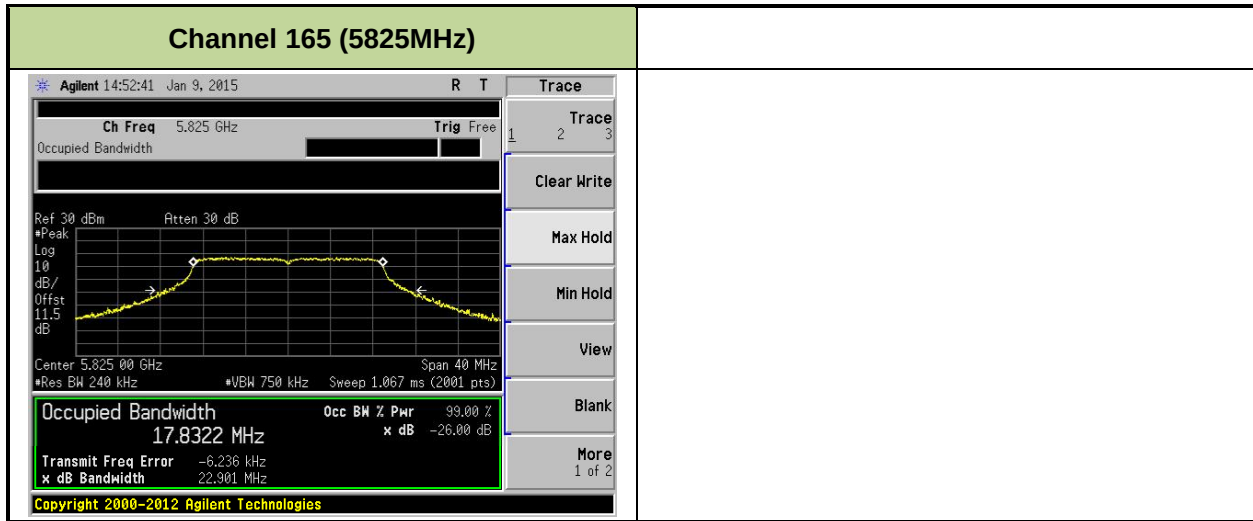
Channel 60 (5300MHz)



Channel 64 (5320MHz)

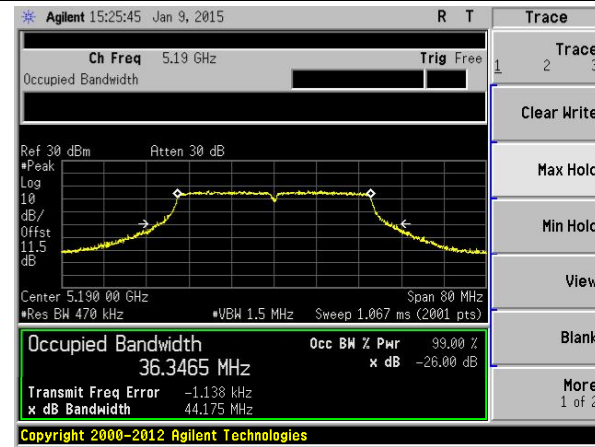




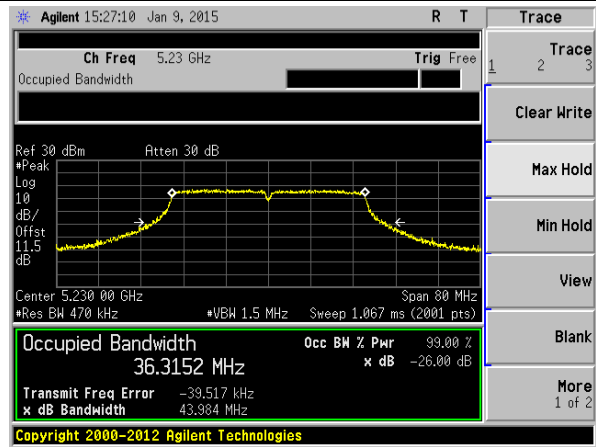


802.11ac-VHT40 26dB Bandwidth & 99% Bandwidth - Ant 1

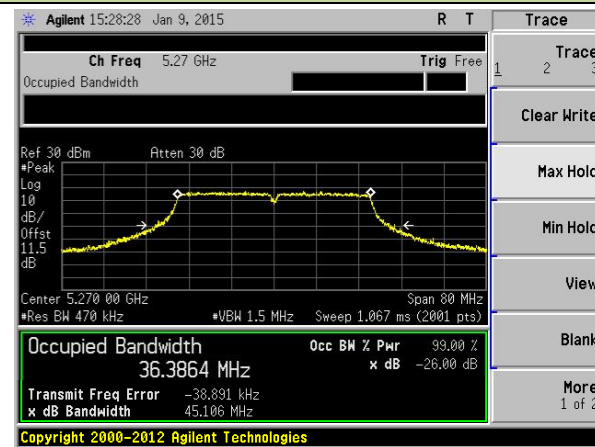
Channel 38 (5190MHz)



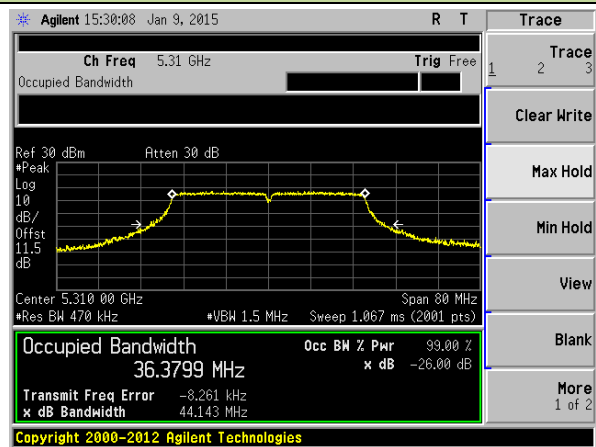
Channel 46 (5230MHz)



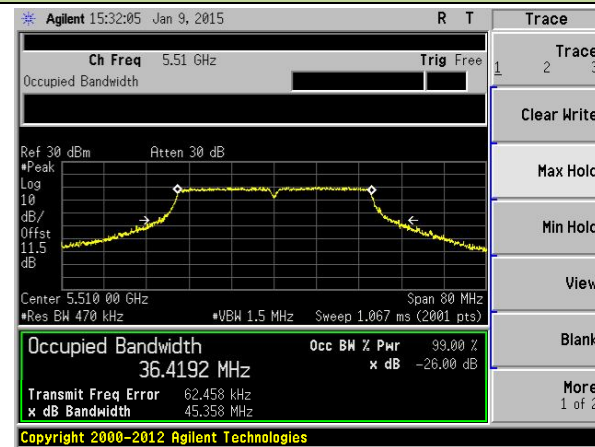
Channel 54 (5270MHz)



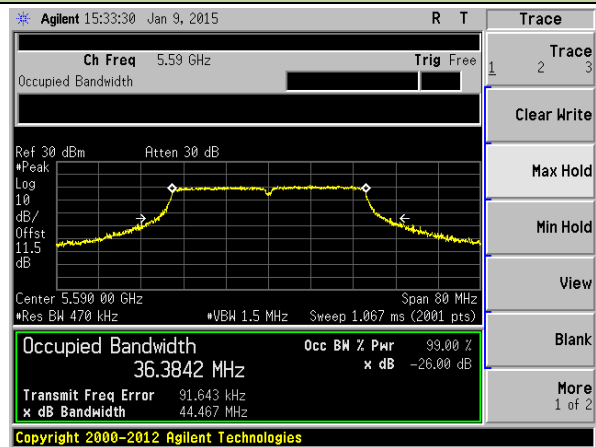
Channel 62 (5310MHz)

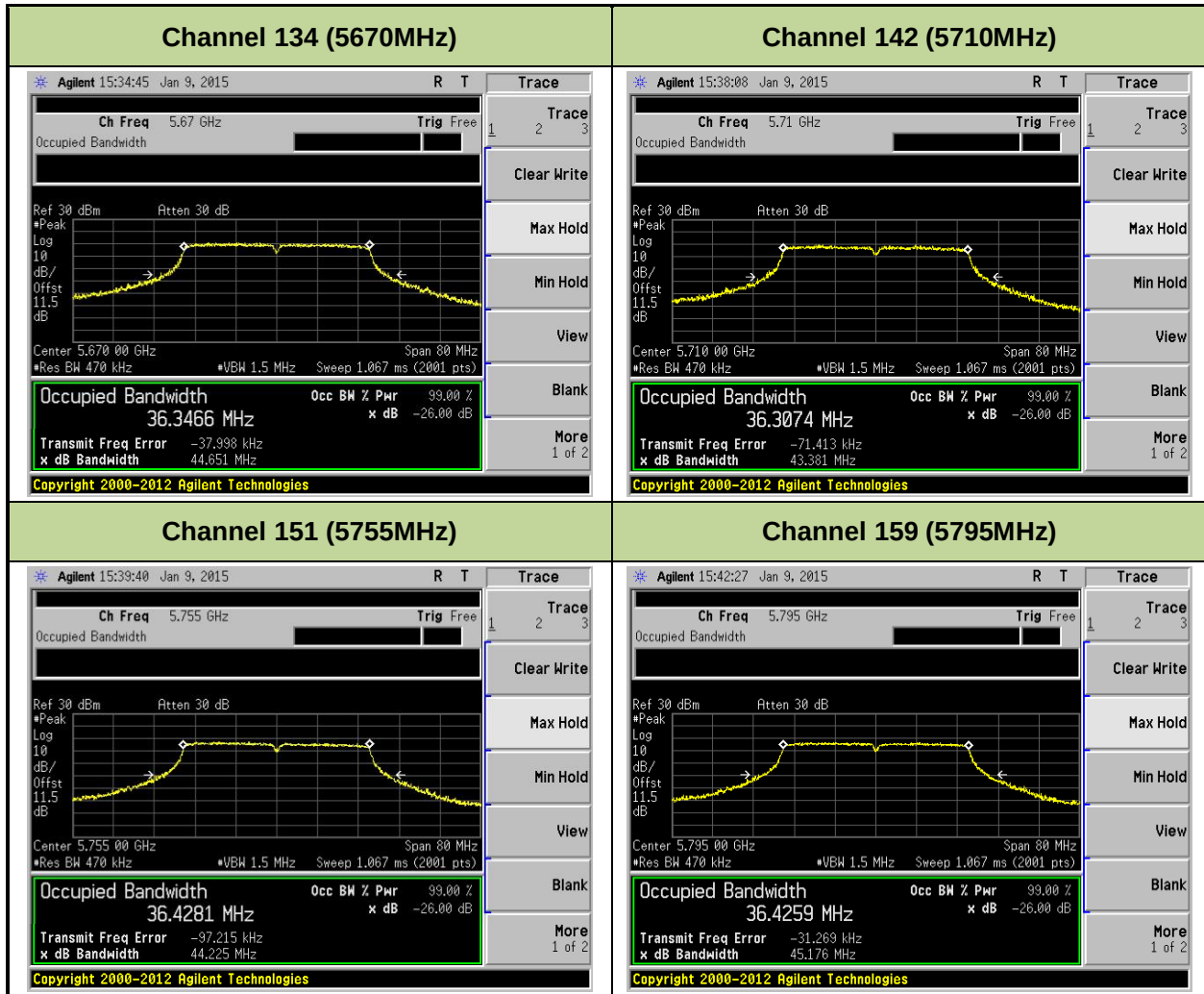


Channel 102 (5510MHz)



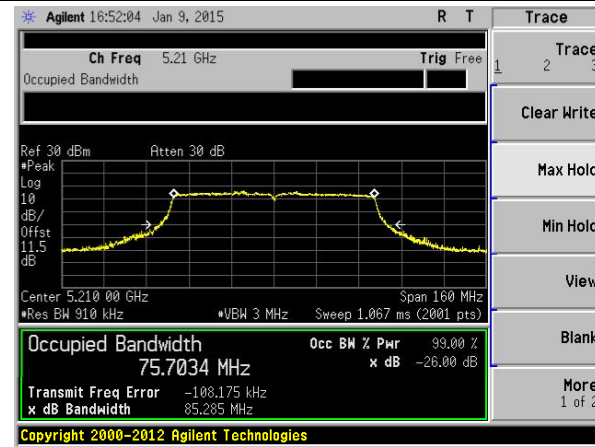
Channel 118 (5590MHz)



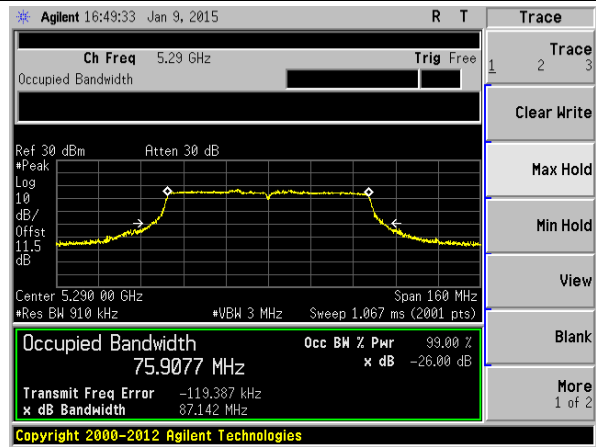


802.11ac-VHT80 26dB Bandwidth & 99% Bandwidth - Ant 1

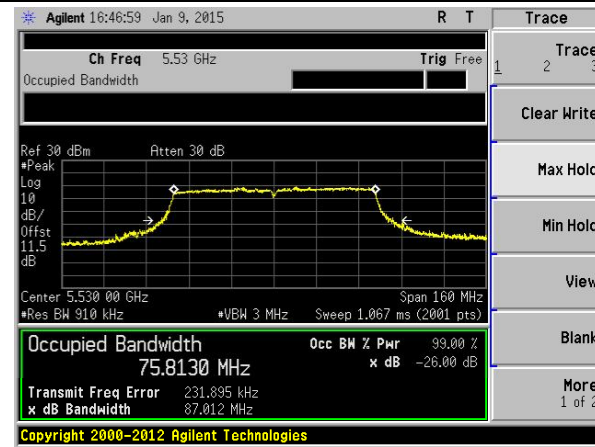
Channel 42 (5210MHz)



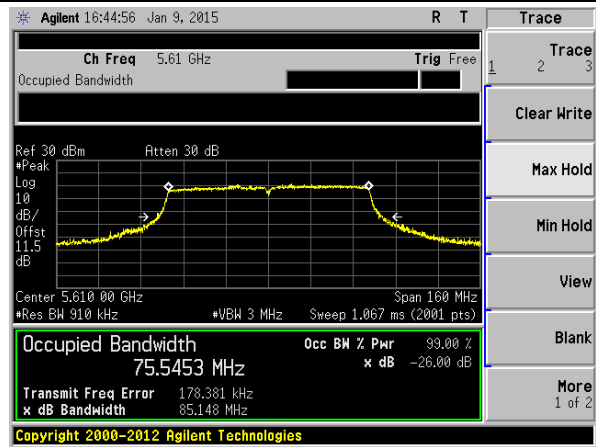
Channel 58 (5290MHz)



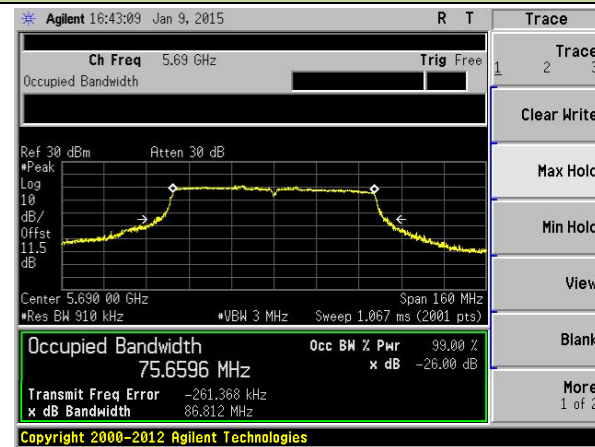
Channel 106 (5530MHz)



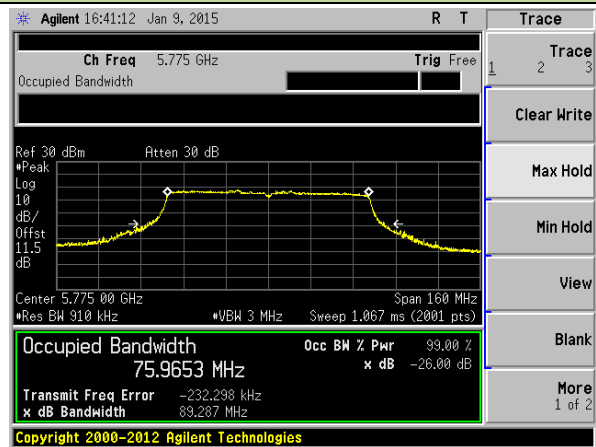
Channel 122 (5610MHz)



Channel 138 (5690MHz)

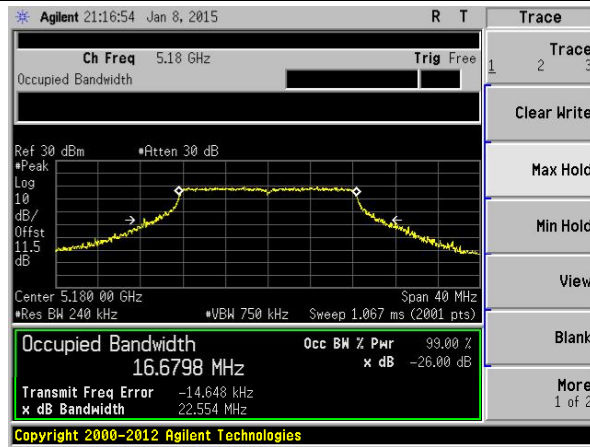


Channel 155 (5775MHz)

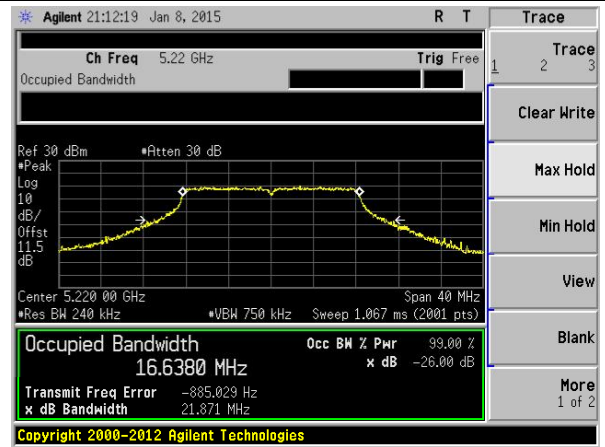


802.11a 26dB Bandwidth & 99% Bandwidth - Ant 2

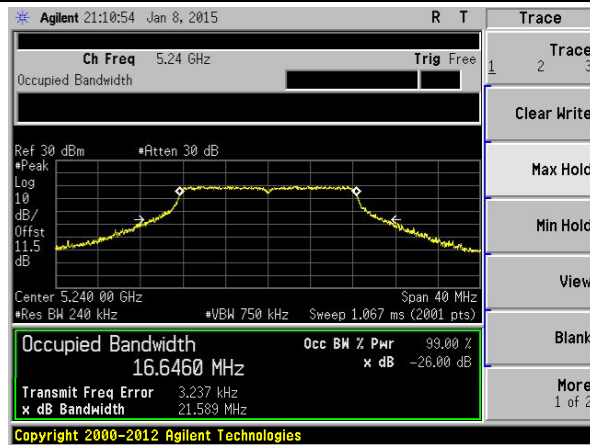
Channel 36 (5180MHz)



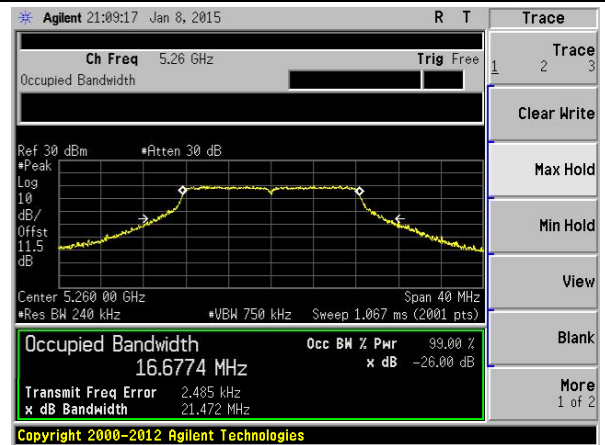
Channel 44 (5220MHz)



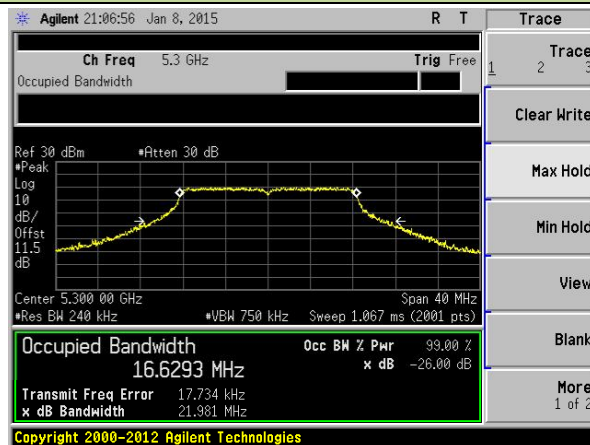
Channel 48 (5240MHz)



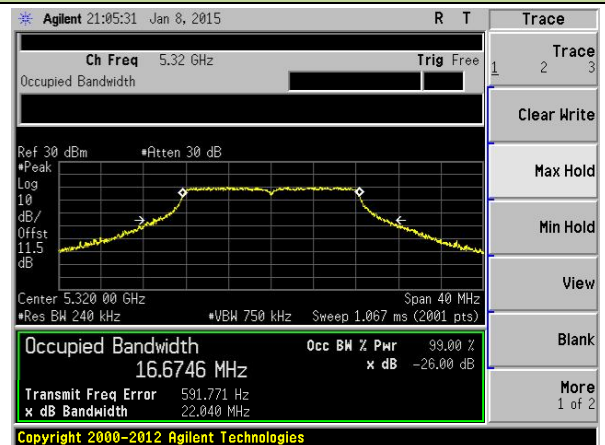
Channel 52 (5260MHz)

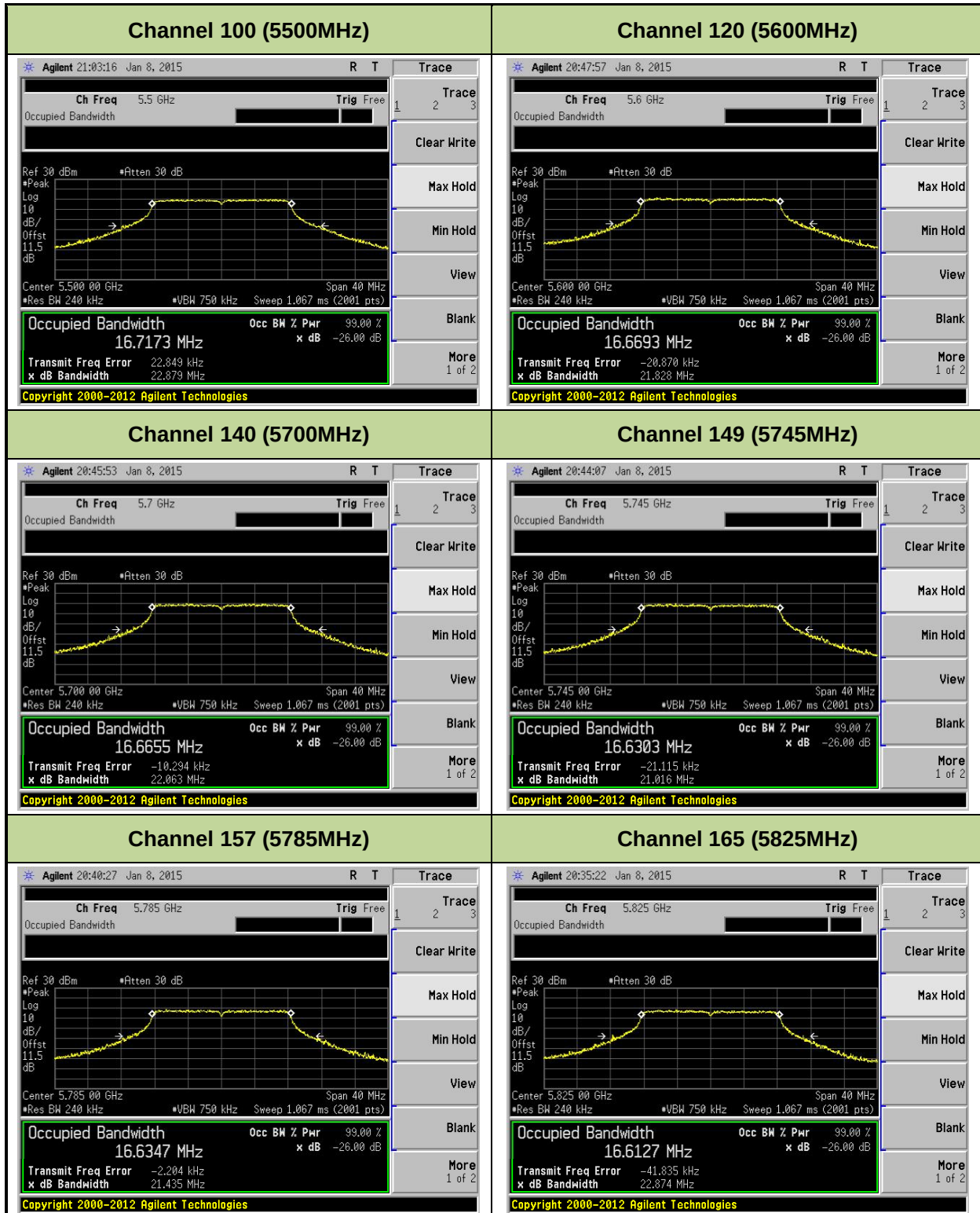


Channel 60 (5300MHz)



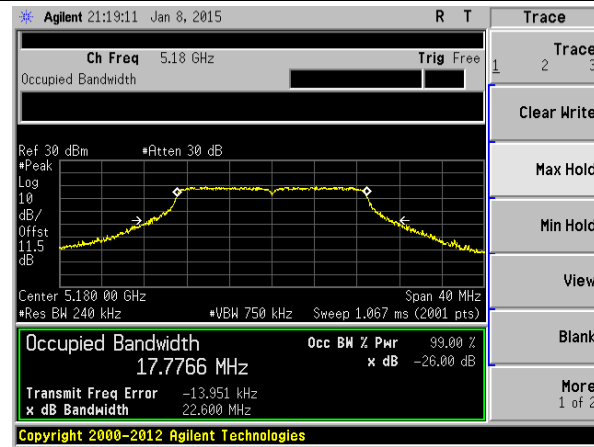
Channel 64 (5320MHz)



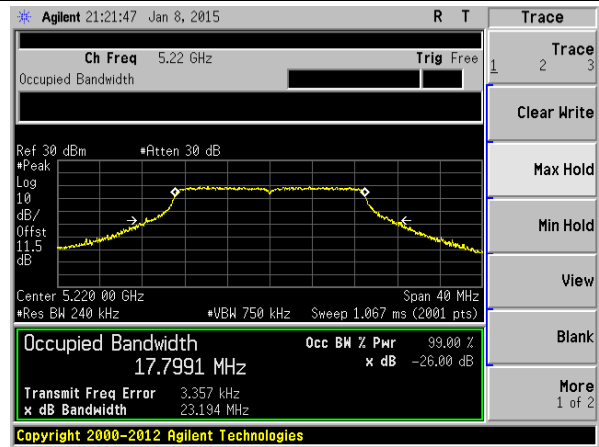


802.11n-HT20 26dB Bandwidth & 99% Bandwidth - Ant 2

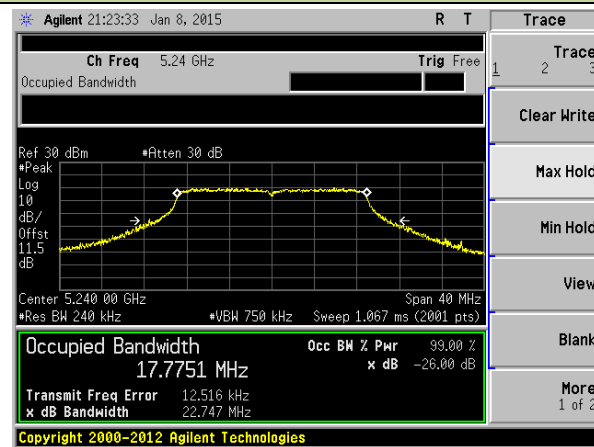
Channel 36 (5180MHz)



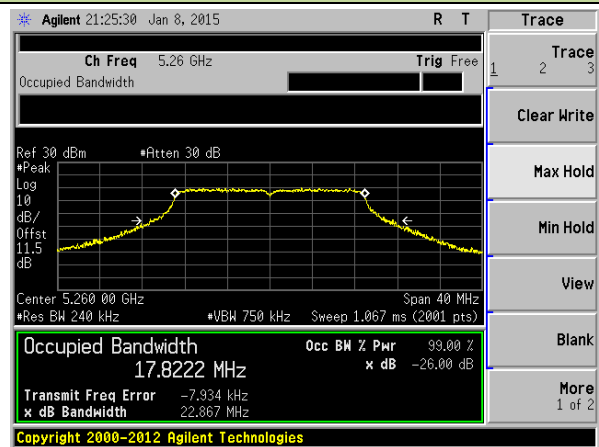
Channel 44 (5220MHz)



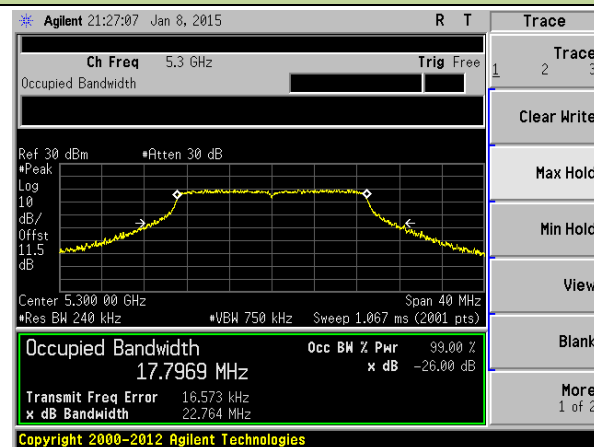
Channel 48 (5240MHz)



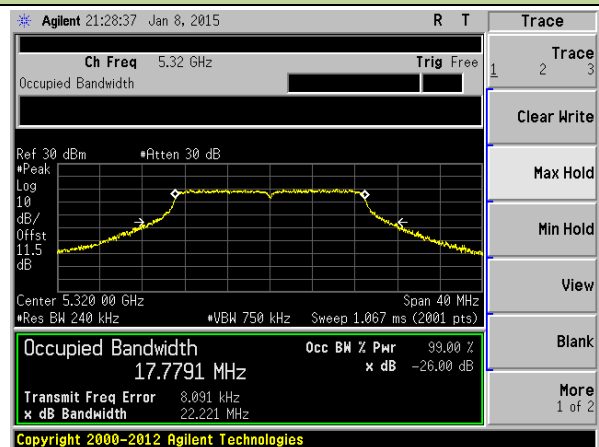
Channel 52 (5260MHz)

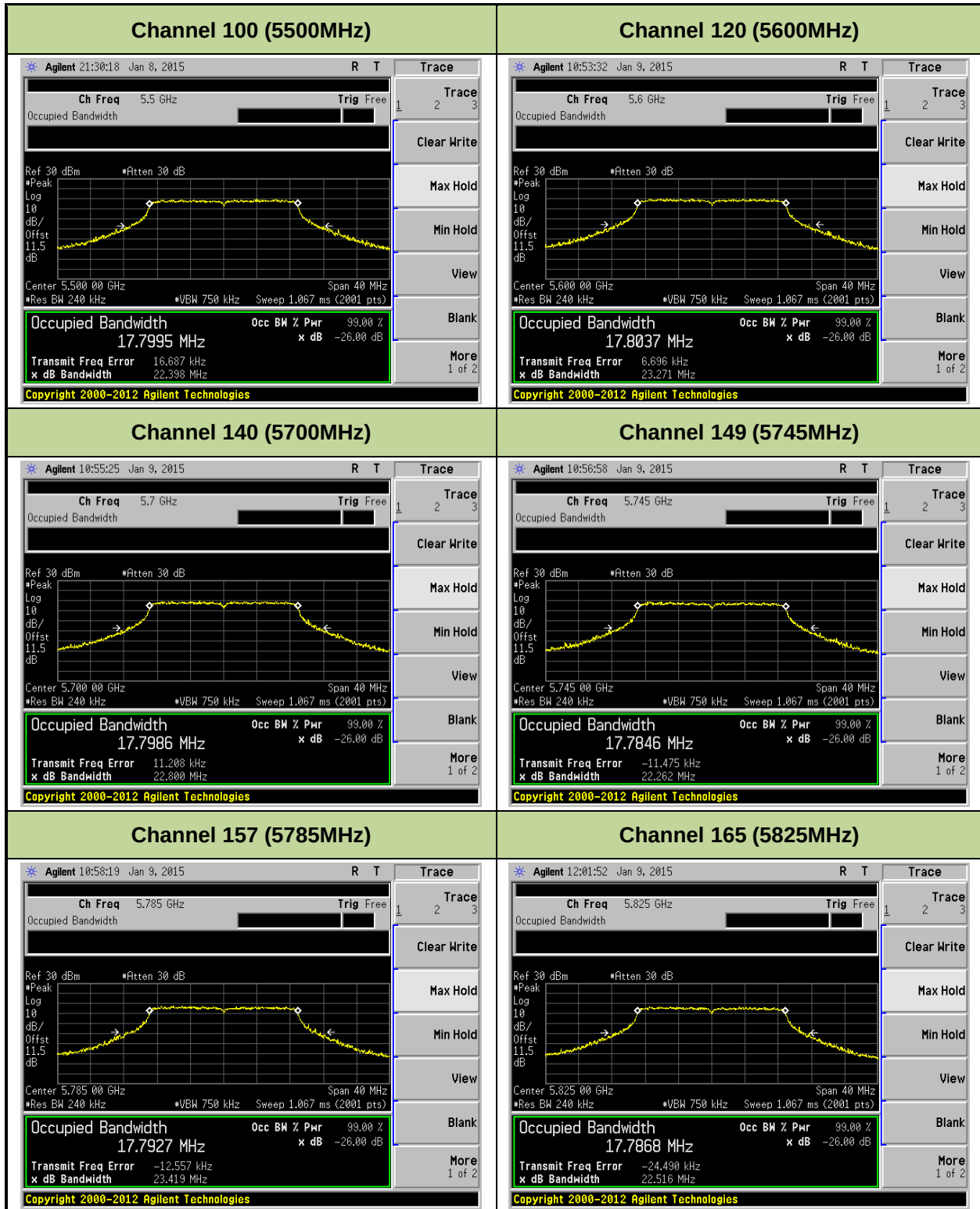


Channel 60 (5300MHz)



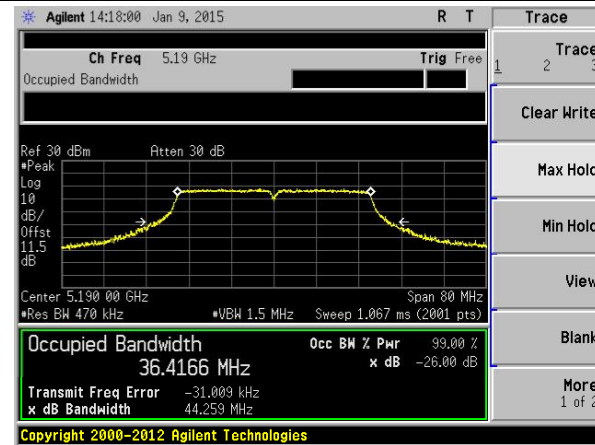
Channel 64 (5320MHz)



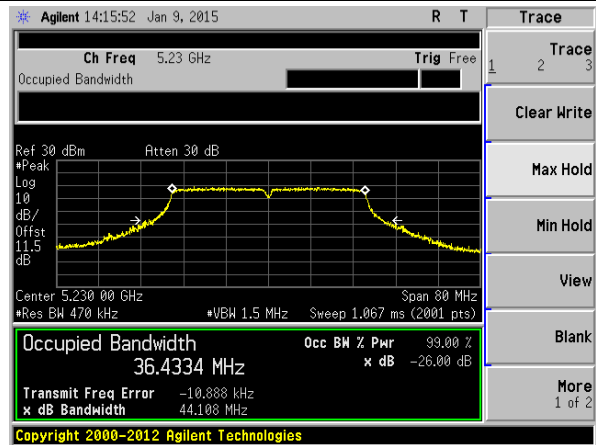


802.11n-HT40 26dB Bandwidth & 99% Bandwidth - Ant 2

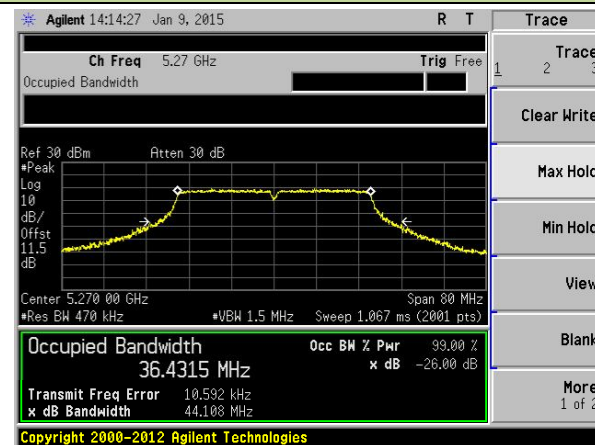
Channel 38 (5190MHz)



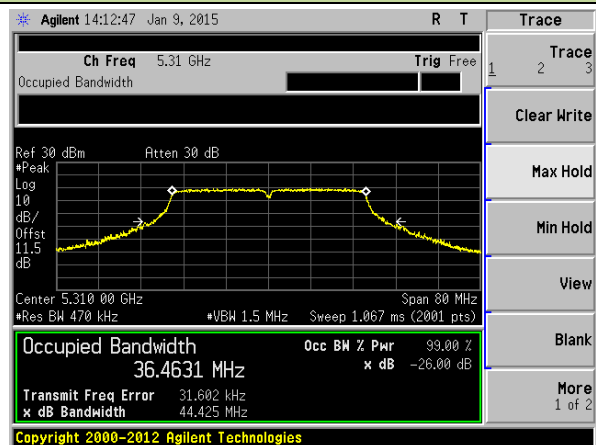
Channel 46 (5230MHz)



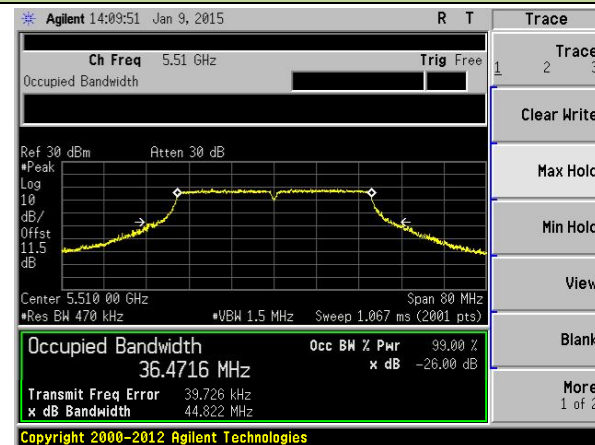
Channel 54 (5270MHz)



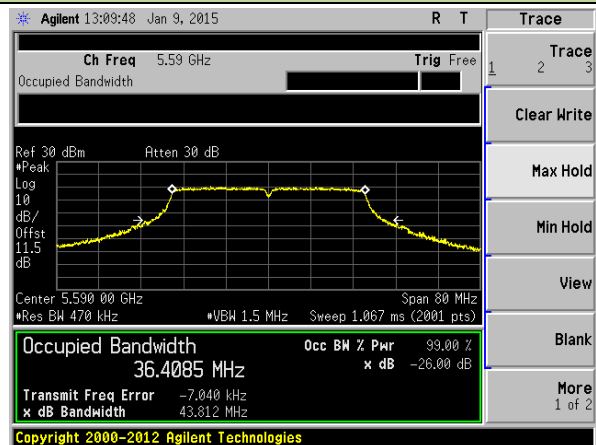
Channel 62 (5310MHz)



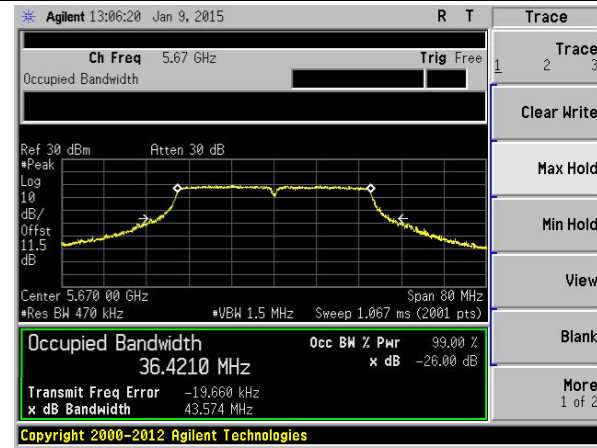
Channel 102 (5510MHz)



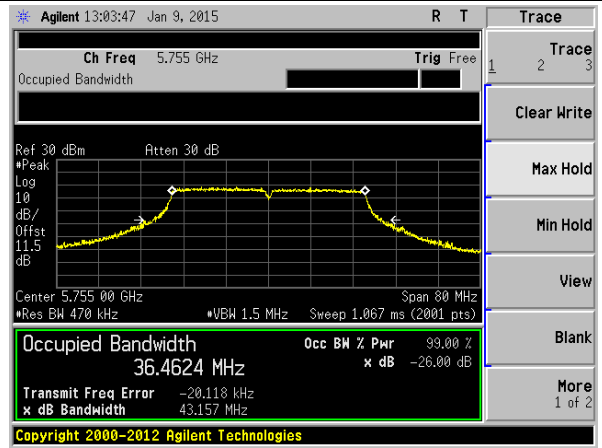
Channel 118 (5590MHz)



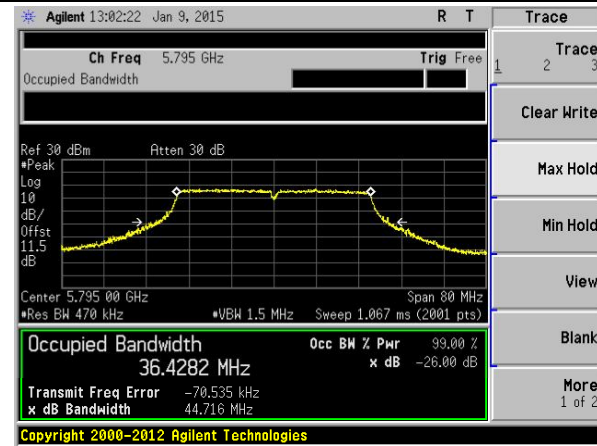
Channel 134 (5670MHz)



Channel 151 (5755 MHz)

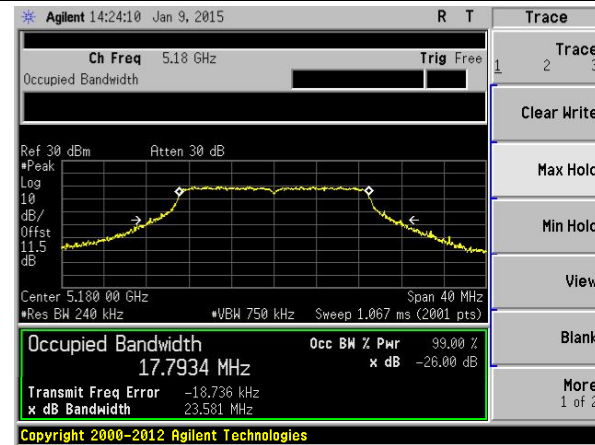


Channel 159 (5795 MHz)

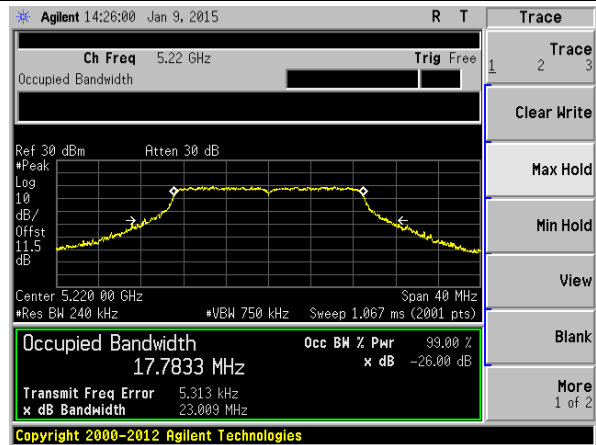


802.11ac-VHT20 26dB Bandwidth & 99% Bandwidth - Ant 2

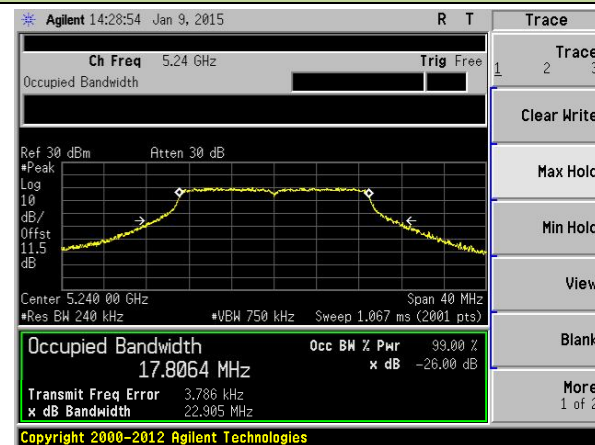
Channel 36 (5180MHz)



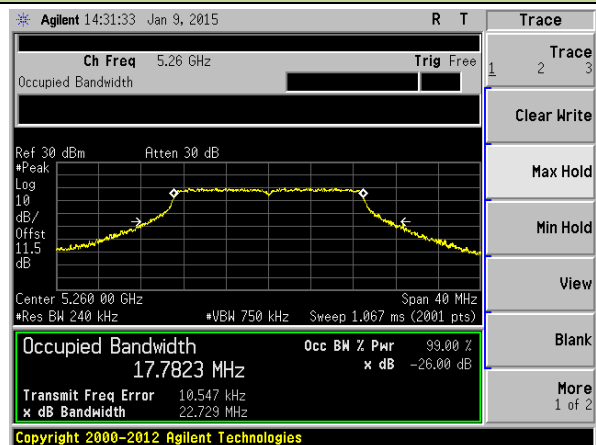
Channel 44 (5220MHz)



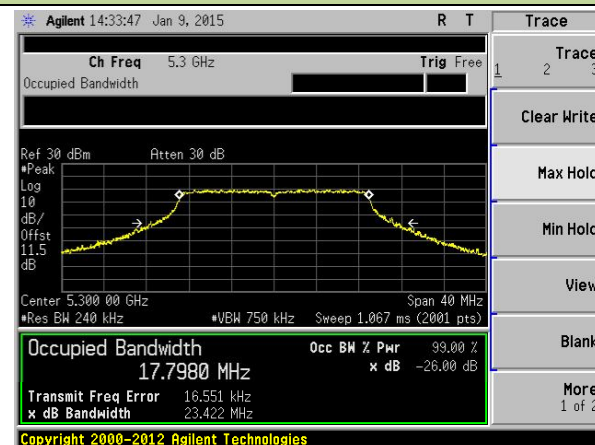
Channel 48 (5240MHz)



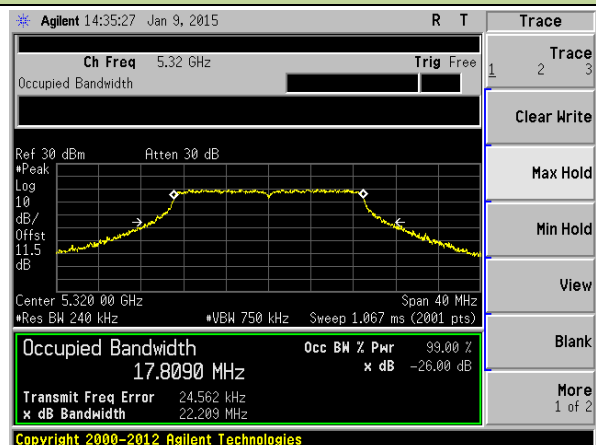
Channel 52 (5260MHz)

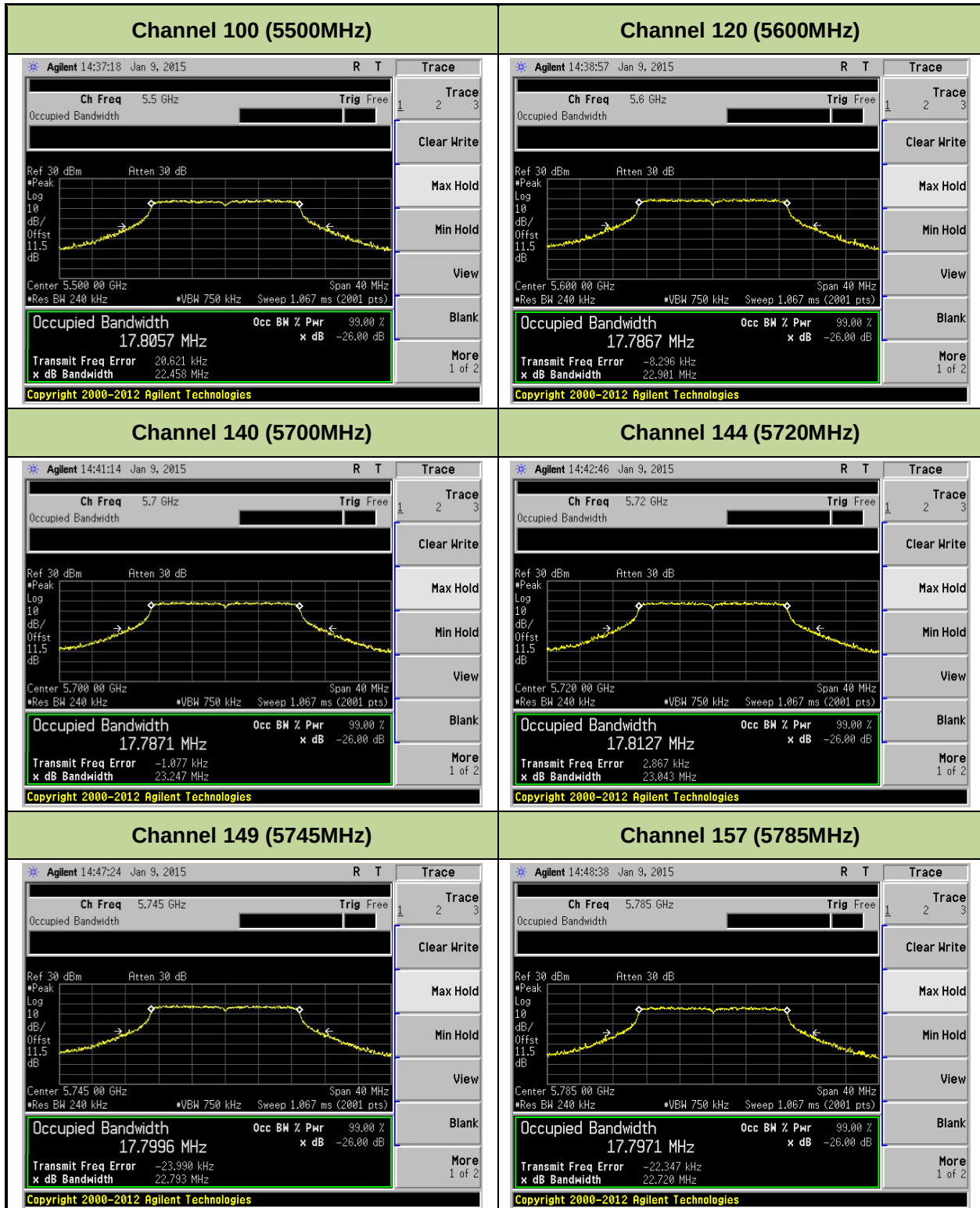


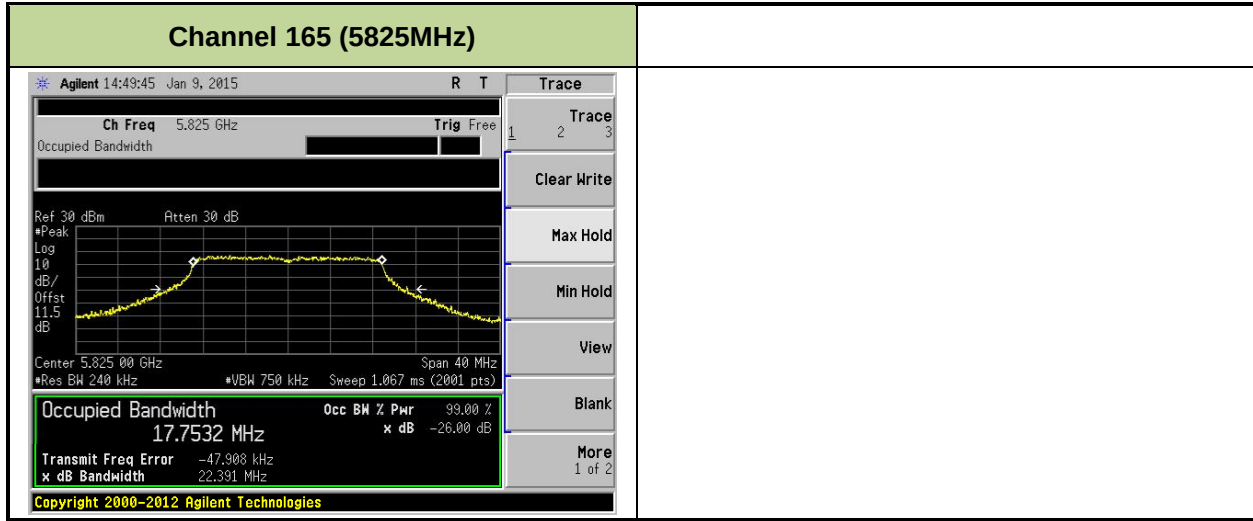
Channel 60 (5300MHz)



Channel 64 (5320MHz)

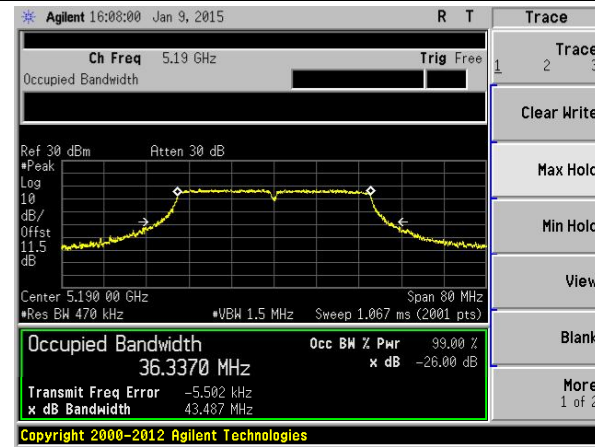




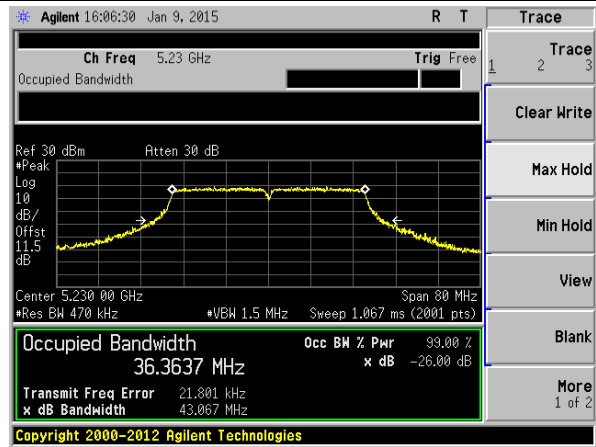


802.11ac-VHT40 26dB Bandwidth & 99% Bandwidth - Ant 2

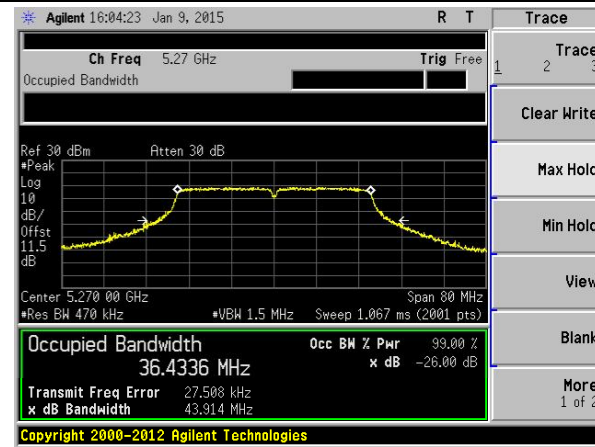
Channel 38 (5190MHz)



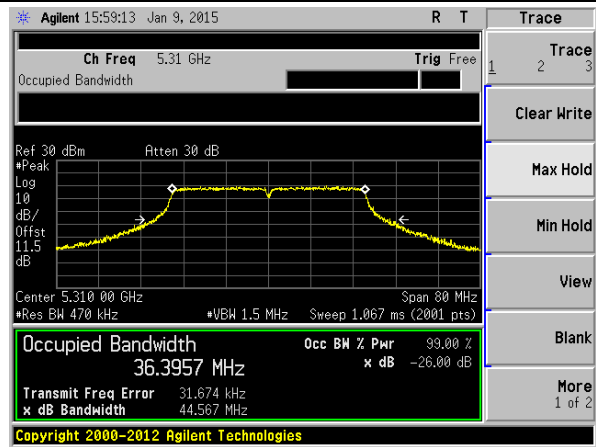
Channel 46 (5230MHz)



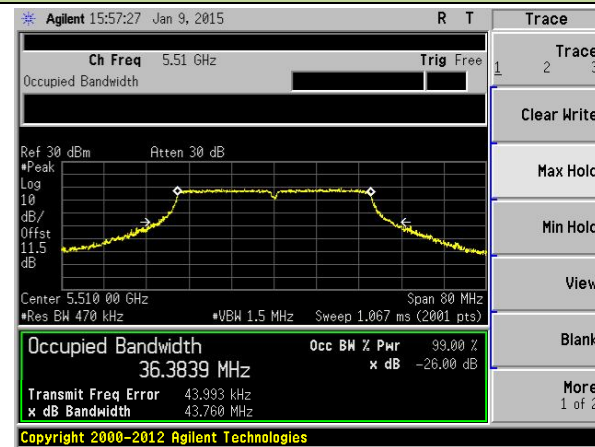
Channel 54 (5270MHz)



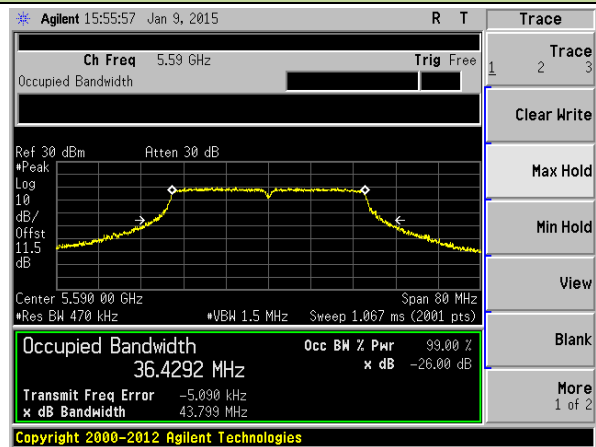
Channel 62 (5310MHz)

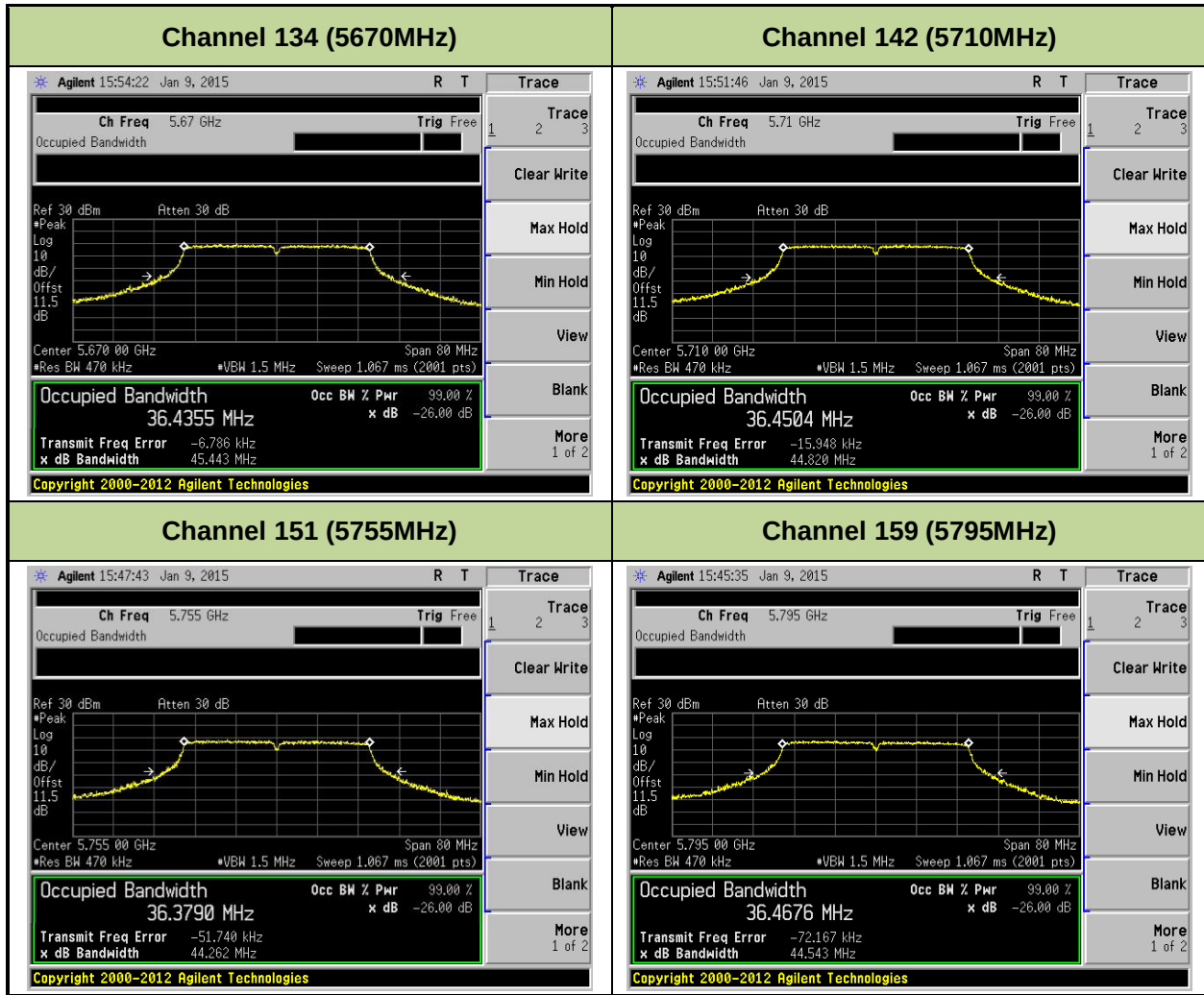


Channel 102 (5510MHz)



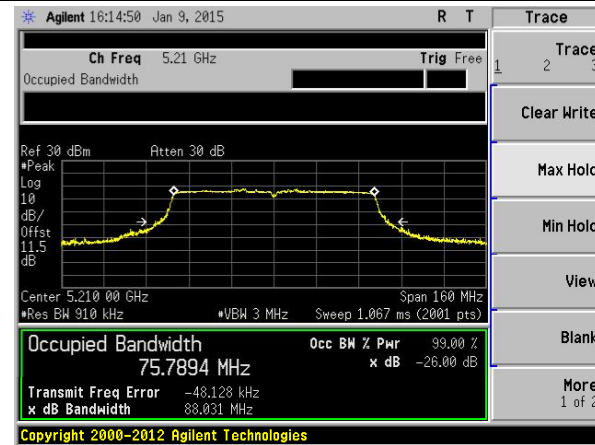
Channel 118 (5590MHz)



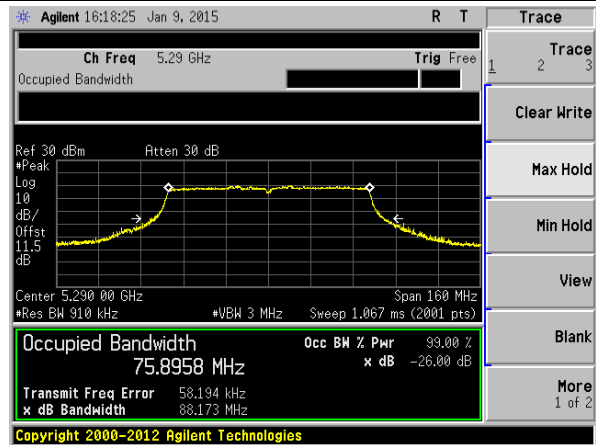


802.11ac-VHT80 26dB Bandwidth & 99% Bandwidth - Ant 2

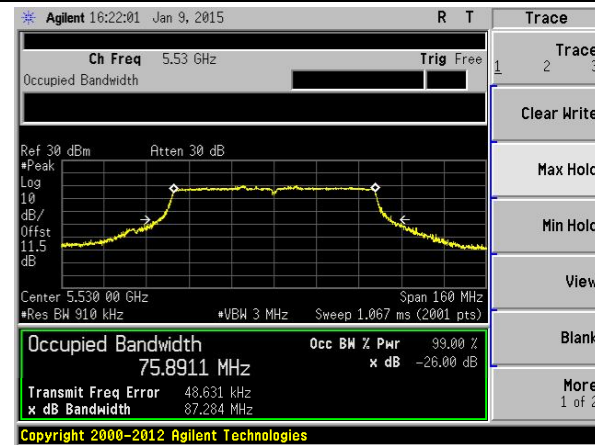
Channel 42 (5210MHz)



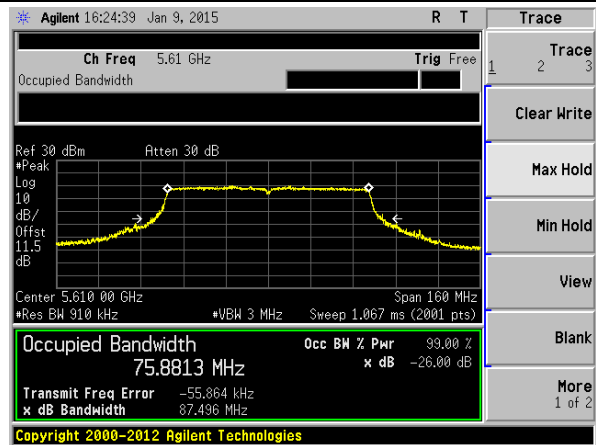
Channel 58 (5290MHz)



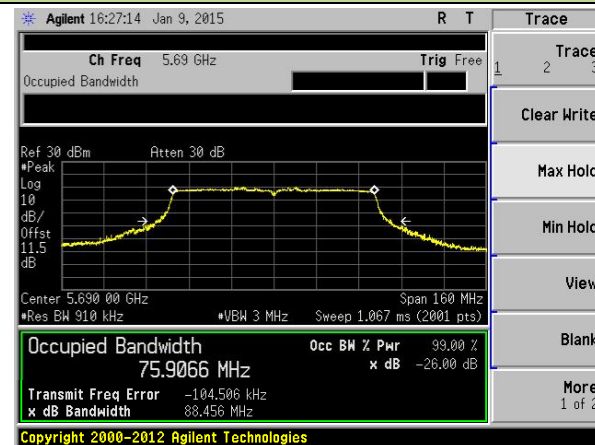
Channel 106 (5530MHz)



Channel 122 (5610MHz)



Channel 138 (5690MHz)



Channel 155 (5775MHz)

