



MEASUREMENT REPORT

FCC PART 15.407

FCC ID: O9C-BJNGAFB0004

APPLICANT: Hewlett Packard Company

Application Type: Certification

Product: Wireless LAN Access Point

Model No.: BJNGA-FB0004, JG993A

Brand Name: HP

FCC Classification: Unlicensed National Information Infrastructure (UNII)

FCC Rule Part(s): Part 15.407

Test Procedure(s): KDB 789033 D02v01, KDB 662911 D01v02r01

Test Date: June 25 ~ July 13, 2014

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 D02v01. 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
1406RSU03302	Rev. 01	Initial report	07-14-2014
1406RSU03302	Rev. 02	Added some descriptions for EUT and the antenna	07-30-2014

CONTENTS

Description	Page
§2.1033 General Information	6
1. INTRODUCTION	7
1.1. Scope	7
1.2. MRT Test Location	7
2. PRODUCT INFORMATION	8
2.1. Equipment Description.....	8
2.2. Frequency / Channel Operation.....	9
2.3. Description of Available Antennas	11
2.4. Description of Antenna RF Port	13
2.5. Test Mode	14
2.6. Test Software	15
2.7. Device Capabilities	16
2.8. Test Configuration	16
2.9. EMI Suppression Device(s)/Modifications.....	16
2.10. Labeling Requirements	16
3. DESCRIPTION OF TEST	17
3.1. Evaluation Procedure	17
3.2. AC Line Conducted Emissions	17
3.3. Radiated Emissions	18
4. ANTENNA REQUIREMENTS	19
5. TEST EQUIPMENT CALIBRATION DATA	20
6. MEASUREMENT UNCERTAINTY	21
7. TEST RESULT	22
7.1. Summary	22
7.2. 26dB Bandwidth Measurement.....	24
7.2.1. Test Limit	24
7.2.2. Test Procedure used.....	24
7.2.3. Test Setting.....	24
7.2.4. Test Setup	24
7.2.5. Test Result.....	25
7.3. 6dB Bandwidth Measurement.....	51
7.3.1. Test Limit	51
7.3.2. Test Procedure used.....	51

7.3.3. Test Setting.....	51
7.3.4. Test Setup	51
7.3.5. Test Result.....	52
7.4. Output Power Measurement.....	59
7.4.1. Test Limit	59
7.4.2. Test Procedure Used	59
7.4.3. Test Setting.....	59
7.4.4. Test Setup	60
7.4.5. Test Result.....	61
7.5. Transmit Power Control	65
7.5.1. Test Limit	65
7.5.2. Test Procedure Used	65
7.5.3. Test Setting.....	65
7.5.4. Test Setup	65
7.5.5. Test Result.....	66
7.6. Power Spectral Density Measurement	68
7.6.1. Test Limit	68
7.6.2. Test Procedure Used	68
7.6.3. Test Setting.....	68
7.6.4. Test Setup	69
7.6.5. Test Result.....	70
7.7. Frequency Stability Measurement.....	96
7.7.1. Test Limit	96
7.7.2. Test Procedure Used	96
7.7.3. Test Setup	96
7.7.4. Test Result.....	97
7.8. Radiated Spurious Emission Measurement	99
7.8.1. Test Limit	99
7.8.2. Test Procedure Used	99
7.8.3. Test Setting.....	99
7.8.4. Test Setup	100
7.8.5. Test Result.....	102
7.9. Radiated Restricted Band Edge Measurement	232
7.9.1. Test Limit	232
7.9.2. Test Result of Radiated Restricted Band Edge	234
7.10. AC Conducted Emissions Measurement.....	462
7.10.1. Test Limit	462
7.10.2. Test Procedure	462

7.10.3. Test Setup	463
7.10.4. Test Result.....	464
8. CONCLUSION.....	466

§2.1033 General Information

Applicant:	Hewlett Packard Company
Applicant Address:	153 Taylor Street Littleton Massachusetts, United States 01460-1407
Manufacturer:	Hewlett Packard Company
Manufacturer Address:	153 Taylor Street Littleton Massachusetts, United States 01460-1407
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.:	BJNGA-FB0004, JG993A
FCC ID:	O9C-BJNGAFB0004
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering
FCC Classification:	Unlicensed National Information Infrastructure (UNII)
Date(s) of Test:	June 25 ~ July 13, 2014
Test Report S/N:	1406RSU03302

Test Facility / Accreditations

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

- 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.
- 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 and Industry Canada (11384A-1).
- MRT facility is an IC registered (11384A-1) test laboratory with the site description on file at Industry Canada.



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.	BJNGA-FB0004, JG993A
Power Type	48Vdc, 0.63A (or POE input)
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: 5270~5310MHz, 5510~5710MHz, 5755~5795MHz For 802.11ac-VHT80: 5210MHz, 5290MHz, 5530MHz, 5610MHz, 5690MHz, 5775MHz
Maximum Output Power	802.11a: 20.73dBm 802.11n-HT20: 20.55dBm 802.11n-HT40: 20.35dBm 802.11ac-VHT20: 20.28dBm 802.11ac-VHT40: 20.42dBm 802.11ac-VHT80: 19.98dBm
Type of Modulation	802.11a/n/ac: OFDM
Adapter	Brand Name: DVE M/N: DSA-42D-48 2 480063 P/N: JD055B Input: 100-240V ~ 50/60Hz 1.2A Output: +48V ~ 0.63A

2.2. Frequency / Channel Operation

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 802.11ac-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 802.11n-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	--	--

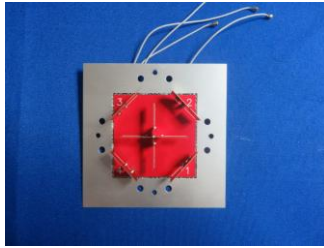
Channel List for 802.11ac-VHT40

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)	Manufacturer	Model	Tx Paths	Max Peak Gain (dBi)	Directional Gain (dBi)	
						For Power	For PSD
Internal Antenna							
	2.4	Airgain, Inc.	N2465D	2	4	4	7.01
	5.2			2	5	5	8.01
	5.5			2	4.6	4.6	7.61
	5.8			2	4.9	4.9	7.91
External Antenna							
	2.4	Laird Technologies (Beijing) Co., Ltd.	JG696A	2	L1: 4.12 L2: 3.78	6.96	6.96
	5.2			2	H1: 5.65 H2: 6.21	8.94	8.94
	5.5			2	H1: 5.47 H2: 5.86	8.68	8.68
	5.8			2	H1: 5.45 H2: 5.36	8.42	8.42

Note:

- The four antennas of the internal antenna are all the same, and the four antennas of the external antenna are different.
- The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.

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

- 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 $N_{ANT} \leq 4$;
- 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;

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

$g_{j,k} = 10^{G_k/20}$ 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.

2.4. Description of Antenna RF Port

External Antenna RF Port (Note 1)				
---	2.4GHz RF Port		5GHz RF Port	
RF Port Location	C1	C2	D1	D2
Software Control Port	Ant 0	Ant 1	Ant 1	Ant 0
Internal Antenna RF Port (Note 2)				
RF Port Location	A1	A3	A2	A4
---	2.4GHz TX			
Software Control Port	Ant 0	Ant 1	Ant 0	Ant 1
---	5GHz TX			
Software Control Port	Ant 1	Ant 0	Ant 1	Ant 0

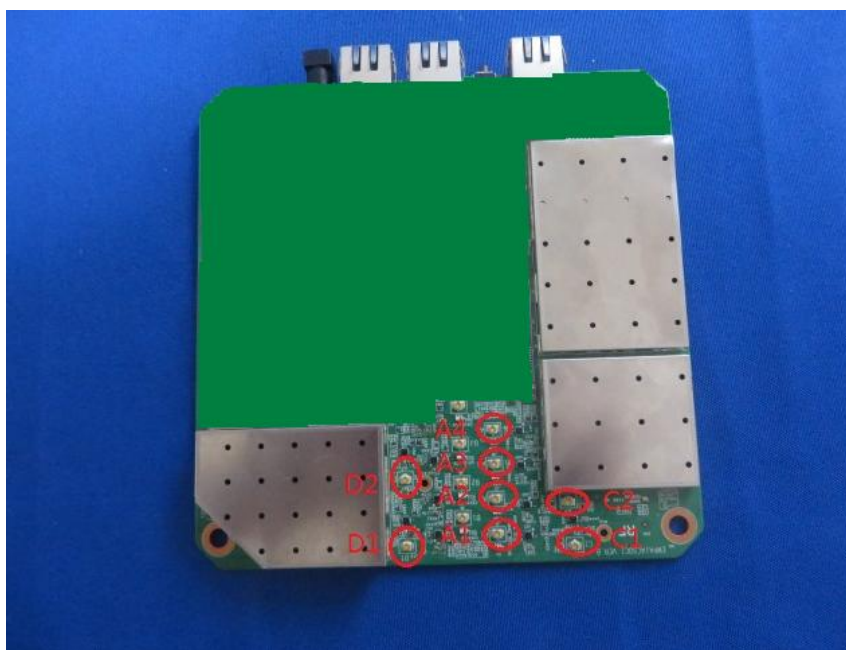
Note 1: The external antenna RF ports are divided into two groups. One group (C1 and C2) just transmit 2.4GHz, and another group (D1 and D2) just transmit 5GHz signal.

Note 2: The internal antenna RF ports are divided into two groups, one group includes A1 and A3, another group includes A2 and A4. Two groups can transmit 2.4GHz or 5GHz signal.

Note 3: When the EUT worked normally, it always used its default antenna (internal or external) and can't switch automatic unless modify the software setting through access controller (AC) or WEB page. When the product used its internal antenna, it can adjust antenna combiner (A1+A3 or A2+A4) [see as above antenna photo] automatic according to signal strength.

Note 4: After comparing as below table, we select the worst-case group (external antenna RF port) for all RF testing.

Antenna RF Port Plot



Antenna RF Port Comparison

Test Mode	Test Frequency (MHz)	Power Parameter Value	A1 + A3 Measured Level (dBm)	A2 + A4 Measured Level (dBm)	D1 + D2 Measured Level (dBm)	C1 + C2 Measured Level (dBm)
			Internal Antenna		External Antenna	
802.11a	5300	15.5	19.05	18.87	20.19	--
802.11n-HT20	5300	15.5	18.74	18.59	20.04	--
802.11n-HT40	5310	16.0	18.56	18.45	19.83	--
802.11ac-VHT20	5300	15.5	18.74	18.64	19.97	--
802.11ac-VHT40	5310	16.0	19.10	18.97	19.76	--
802.11ac-VHT80	5290	9.0	10.82	10.71	11.96	--

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 were “ART2-GUI Version: 2.3” and “CART Version: 4.9”.
Final Power Parameter Value of the test software.

Test Mode	Test Frequency	Power Parameter Value	Test Mode	Test Frequency	Power Parameter Value
802.11a	5180	16.5	802.11n-HT20	5180	16.5
	5220	16.0		5220	16.0
	5240	16.0		5240	16.0
	5260	15.5		5260	15.5
	5300	15.5		5300	15.5
	5320	15.5		5320	16.0
	5500	15.5		5500	16.0
	5600	15.5		5600	16.0
	5700	15.0		5700	15.0
	5745	15.0		5745	13.5
	5785	16.5		5785	16.5
	5825	16.0		5825	16.5
802.11ac-VHT20	5180	16.0	802.11n-HT40	5190	14.5
	5220	16.0		5230	16.5
	5240	16.0		5270	16.0
	5260	15.5		5310	16.0
	5300	15.5		5510	16.5
	5320	15.5		5590	16.5
	5500	15.5		5670	16.5
	5600	16.0		5755	16.5
	5700	15.5		5795	17.5
	5720	16.0	802.11ac-VHT40	5190	14.5
	5745	14.5		5230	16.5
	5785	16.5		5270	16.5
	5825	15.0		5310	16.0
				5510	16.5
				5590	16.5
				5670	17.0
				5710	17.0
802.11ac-VHT80	5210	9.5		5755	17.0
	5290	9.0		5795	17.5
	5530	14.5			
	5610	18.0			
	5690	18.0			
	5775	10.5			

2.7. Device Capabilities

This device contains the following capabilities:

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

Note: 5GHz (NII) 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 D02v01. 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 – 96.7%
- 802.11n 20MHz Bandwidth – 93.8%
- 802.11n 40MHz Bandwidth – 89.7%
- 802.11ac 20MHz Bandwidth – 94.2%
- 802.11ac 40MHz Bandwidth – 89.4%
- 802.11ac 80MHz Bandwidth – 81.5%

2.8. Test Configuration

The **Wireless LAN Access Point FCC ID: O9C-BJNGAFB0004** was tested per the guidance of KDB 789033 D02v01. ANSI C63.4-2009 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 trade name and 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 C63.4-2009), and the guidance provided in KDB 789033 D02v01 were used in the measurement of the **Wireless LAN Access Point FCC ID: O9C-BJNGAFB0004**.

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, 50Ω/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 C63.4-2009 at Clause 4.3.

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. An 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 was placed on top of the 0.8 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 antenna of the Wireless LAN Access Point uses a unique connector.

Conclusion:

The **Wireless LAN Access Point FCC ID: O9C-BJNGAFB0004** unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATA

Conducted Emissions

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	101209	1 year	2014/11/08
Two-Line V-Network	R&S	ENV216	101683	1 year	2014/11/08
Two-Line V-Network	R&S	ENV216	101684	1 year	2014/11/08
Temperature/ Meter Humidity	Anymetre	TH101B	SR2-01	1 year	2014/11/15

Radiated Emission

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	E4447A	MY45300136	1 year	2014/11/18
EMI Test Receiver	R&S	ESR7	101209	1 year	2014/11/08
Preamplifier	MRT	AP01G18	1310002	1 year	2014/10/07
Preamplifier	MRT	AP18G40	1310001	1 year	2014/10/07
Loop Antenna	Schwarzbeck	FMZB1519	1519-041	1 year	2014/11/24
TRILOG Antenna	Schwarzbeck	VULB9162	9162-047	1 year	2014/11/24
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1167	1 year	2014/11/24
Broadband Horn Antenna	Schwarzbeck	BBHA9170	9170-549	1 year	2014/12/11
Temperature/Humidity Meter	Anymetre	TH101B	AC1-01	1 year	2014/11/15

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9010A	MY5144016A	1 year	2015/01/04
Power Sensor	Agilent	U2021XA	MY52450003	1 year	2014/12/14
Temperature & Humidity Chamber	BAOYT	BYH-1500L	1309W043	1 year	2014/11/20
Temperature/Humidity Meter	Anymetre	TH101B	TR3-01	1 year	2014/11/15

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

7. TEST RESULT

7.1. Summary

Company Name: Hewlett Packard Company
FCC ID: O9C-BJNGAFB0004
FCC Classification: Unlicensed National Information Infrastructure (UNII)
Data Rate(s) Tested: 6Mbps ~ 54Mbps (a);
13/14.4Mbps ~ 130/144.4Mbps (n-HT20MHz BW);
27/30Mbps ~ 270/300Mbps (n-HT40MHz BW);
13/14.4Mbps ~ 156/173.4Mbps (ac-VHT20MHz BW);
27/30Mbps ~ 360/400Mbps (ac-VHT40MHz BW);
58.6/65Mbps ~ 780/866.6Mbps (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	< 27.06 dBm U-NII-1 < 21.04 dBm U-NII-2A < 21.30 dBm U-NII-2C < 27.58 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	< 14.06 dBm/MHz U-NII-1 < 8.06 dBm/MHz U-NII-2A < 8.32 dBm/MHz U-NII-2C < 27.58 dBm/MHz 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.

7.2. 26dB Bandwidth Measurement

7.2.1. Test Limit

N/A

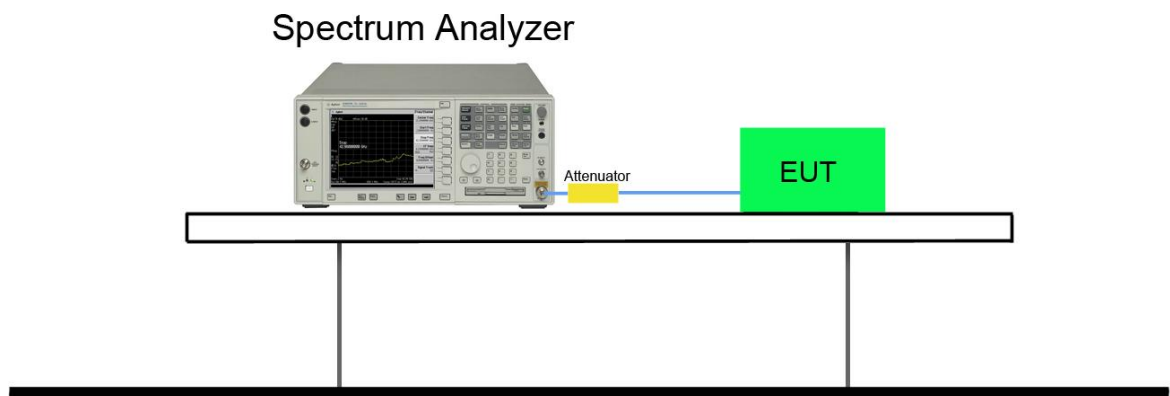
7.2.2. Test Procedure used

KDB 789033 D02v01 – 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)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
Ant 0 / Ant 0 + 1						
802.11a	6	36	5180	24.56	16.97	Pass
802.11a	6	44	5220	25.54	16.92	Pass
802.11a	6	48	5240	25.27	16.93	Pass
802.11a	6	52	5260	24.59	16.92	Pass
802.11a	6	60	5300	25.39	16.95	Pass
802.11a	6	64	5320	24.87	16.92	Pass
802.11a	6	100	5500	24.14	16.89	Pass
802.11a	6	120	5600	25.54	17.02	Pass
802.11a	6	140	5700	25.86	16.93	Pass
802.11a	6	149	5745	24.99	16.90	Pass
802.11a	6	157	5785	25.28	16.94	Pass
802.11a	6	165	5825	25.89	16.98	Pass
802.11n-HT20	13	36	5180	25.46	18.01	Pass
802.11n-HT20	13	44	5220	25.78	17.99	Pass
802.11n-HT20	13	48	5240	25.65	18.00	Pass
802.11n-HT20	13	52	5260	25.46	18.01	Pass
802.11n-HT20	13	60	5300	25.28	17.97	Pass
802.11n-HT20	13	64	5320	25.48	17.96	Pass
802.11n-HT20	13	100	5500	26.00	18.02	Pass
802.11n-HT20	13	120	5600	25.69	17.97	Pass
802.11n-HT20	13	140	5700	26.00	18.05	Pass
802.11n-HT20	13	149	5745	25.75	17.99	Pass
802.11n-HT20	13	157	5785	25.70	17.98	Pass
802.11n-HT20	13	165	5825	25.60	18.02	Pass
802.11n-HT40	27	38	5190	49.25	36.63	Pass
802.11n-HT40	27	46	5230	48.98	36.67	Pass
802.11n-HT40	27	54	5270	49.48	36.69	Pass
802.11n-HT40	27	62	5310	49.58	36.70	Pass
802.11n-HT40	27	102	5510	49.93	36.68	Pass
802.11n-HT40	27	118	5590	48.95	36.63	Pass
802.11n-HT40	27	134	5670	49.94	36.72	Pass
802.11n-HT40	27	151	5755	49.84	36.60	Pass

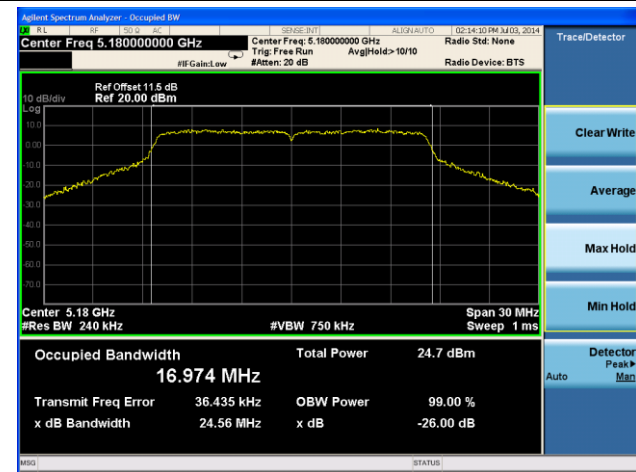
802.11n-HT40	27	159	5795	49.28	36.64	Pass
802.11ac-VHT20	13	36	5180	25.16	17.99	Pass
802.11ac-VHT20	13	44	5220	25.31	17.98	Pass
802.11ac-VHT20	13	48	5240	25.81	18.00	Pass
802.11ac-VHT20	13	52	5260	25.15	17.96	Pass
802.11ac-VHT20	13	60	5300	25.49	17.97	Pass
802.11ac-VHT20	13	64	5320	25.80	17.96	Pass
802.11ac-VHT20	13	100	5500	25.23	17.99	Pass
802.11ac-VHT20	13	120	5600	25.57	18.01	Pass
802.11ac-VHT20	13	140	5700	25.67	18.02	Pass
802.11ac-VHT20	13	144	5720	25.46	18.04	Pass
802.11ac-VHT20	13	149	5745	25.67	18.06	Pass
802.11ac-VHT20	13	157	5785	25.83	17.97	Pass
802.11ac-VHT20	13	165	5825	26.02	18.09	Pass
802.11ac-VHT40	27	38	5190	48.29	36.62	Pass
802.11ac-VHT40	27	46	5230	49.85	36.65	Pass
802.11ac-VHT40	27	54	5270	49.92	36.67	Pass
802.11ac-VHT40	27	62	5310	49.68	36.67	Pass
802.11ac-VHT40	27	102	5510	49.87	36.70	Pass
802.11ac-VHT40	27	118	5590	49.89	36.66	Pass
802.11ac-VHT40	27	134	5670	49.76	36.61	Pass
802.11ac-VHT40	27	142	5710	49.82	36.61	Pass
802.11ac-VHT40	27	151	5755	48.38	36.54	Pass
802.11ac-VHT40	27	159	5795	49.11	36.62	Pass
802.11ac-VHT80	58.6	42	5210	98.31	76.46	Pass
802.11ac-VHT80	58.6	58	5290	97.67	76.39	Pass
802.11ac-VHT80	58.6	106	5530	98.77	76.45	Pass
802.11ac-VHT80	58.6	122	5610	93.67	76.46	Pass
802.11ac-VHT80	58.6	138	5690	96.53	76.29	Pass
802.11ac-VHT80	58.6	155	5775	91.73	75.94	Pass
Ant 1 / Ant 0 + 1						
802.11a	6	36	5180	25.02	16.91	Pass
802.11a	6	44	5220	25.57	16.93	Pass
802.11a	6	48	5240	24.35	16.94	Pass
802.11a	6	52	5260	24.39	16.94	Pass
802.11a	6	60	5300	24.78	16.93	Pass

802.11a	6	64	5320	24.33	16.94	Pass
802.11a	6	100	5500	25.72	16.95	Pass
802.11a	6	120	5600	25.00	16.94	Pass
802.11a	6	140	5700	24.67	16.96	Pass
802.11a	6	149	5745	25.67	17.00	Pass
802.11a	6	157	5785	25.46	17.05	Pass
802.11a	6	165	5825	25.82	16.96	Pass
802.11n-HT20	13	36	5180	25.10	17.96	Pass
802.11n-HT20	13	44	5220	25.18	18.00	Pass
802.11n-HT20	13	48	5240	25.22	17.95	Pass
802.11n-HT20	13	52	5260	25.30	17.98	Pass
802.11n-HT20	13	60	5300	25.15	17.95	Pass
802.11n-HT20	13	64	5320	25.56	18.01	Pass
802.11n-HT20	13	100	5500	25.43	17.94	Pass
802.11n-HT20	13	120	5600	25.84	17.99	Pass
802.11n-HT20	13	140	5700	25.24	17.99	Pass
802.11n-HT20	13	149	5745	26.26	18.06	Pass
802.11n-HT20	13	157	5785	26.62	18.10	Pass
802.11n-HT20	13	165	5825	27.20	18.08	Pass
802.11n-HT40	27	38	5190	47.07	36.41	Pass
802.11n-HT40	27	46	5230	47.43	36.44	Pass
802.11n-HT40	27	54	5270	46.84	36.38	Pass
802.11n-HT40	27	62	5310	47.09	36.37	Pass
802.11n-HT40	27	102	5510	48.10	36.41	Pass
802.11n-HT40	27	118	5590	47.60	36.37	Pass
802.11n-HT40	27	134	5670	47.47	36.45	Pass
802.11n-HT40	27	151	5755	47.24	36.46	Pass
802.11n-HT40	27	159	5795	48.76	36.39	Pass
802.11ac-VHT20	13	36	5180	25.86	17.99	Pass
802.11ac-VHT20	13	44	5220	25.24	17.94	Pass
802.11ac-VHT20	13	48	5240	25.22	17.98	Pass
802.11ac-VHT20	13	52	5260	25.44	17.96	Pass
802.11ac-VHT20	13	60	5300	25.83	17.98	Pass
802.11ac-VHT20	13	64	5320	25.52	18.02	Pass
802.11ac-VHT20	13	100	5500	25.62	17.99	Pass
802.11ac-VHT20	13	120	5600	24.99	17.95	Pass

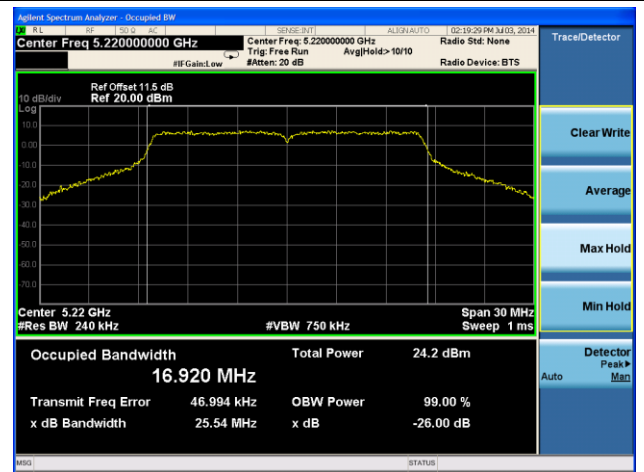
802.11ac-VHT20	13	140	5700	24.98	17.97	Pass
802.11ac-VHT20	13	144	5720	25.63	17.98	Pass
802.11ac-VHT20	13	149	5745	26.45	17.99	Pass
802.11ac-VHT20	13	157	5785	26.98	18.10	Pass
802.11ac-VHT20	13	165	5825	27.23	18.15	Pass
802.11ac-VHT40	27	38	5190	47.38	36.44	Pass
802.11ac-VHT40	27	46	5230	47.01	36.41	Pass
802.11ac-VHT40	27	54	5270	47.66	36.39	Pass
802.11ac-VHT40	27	62	5310	46.35	36.40	Pass
802.11ac-VHT40	27	102	5510	46.64	36.40	Pass
802.11ac-VHT40	27	118	5590	46.89	36.42	Pass
802.11ac-VHT40	27	134	5670	47.06	36.46	Pass
802.11ac-VHT40	27	142	5710	47.60	36.47	Pass
802.11ac-VHT40	27	151	5755	47.41	36.47	Pass
802.11ac-VHT40	27	159	5795	46.78	36.42	Pass
802.11ac-VHT80	58.6	42	5210	96.21	76.03	Pass
802.11ac-VHT80	58.6	58	5290	96.04	76.03	Pass
802.11ac-VHT80	58.6	106	5530	95.03	76.04	Pass
802.11ac-VHT80	58.6	122	5610	97.45	76.09	Pass
802.11ac-VHT80	58.6	138	5690	99.86	76.18	Pass
802.11ac-VHT80	58.6	155	5775	99.89	76.09	Pass

802.11a 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1

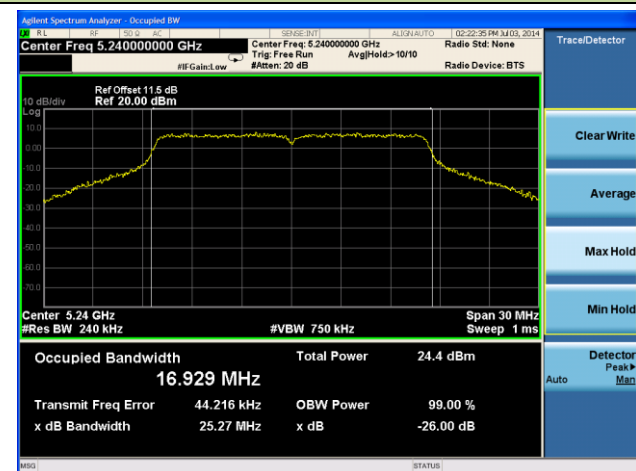
Channel 36 (5180MHz)



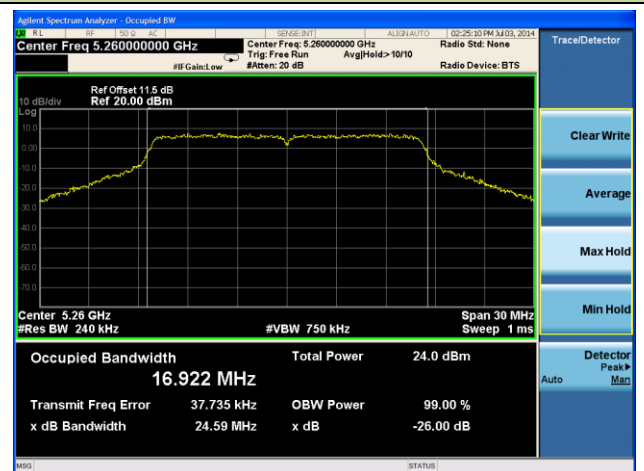
Channel 44 (5220MHz)



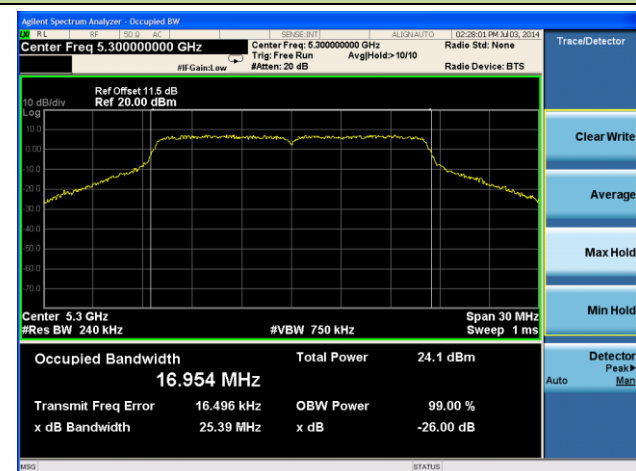
Channel 48 (5240MHz)



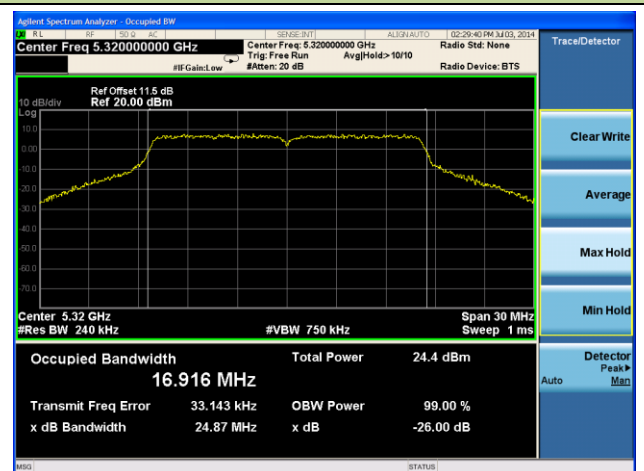
Channel 52 (5260MHz)



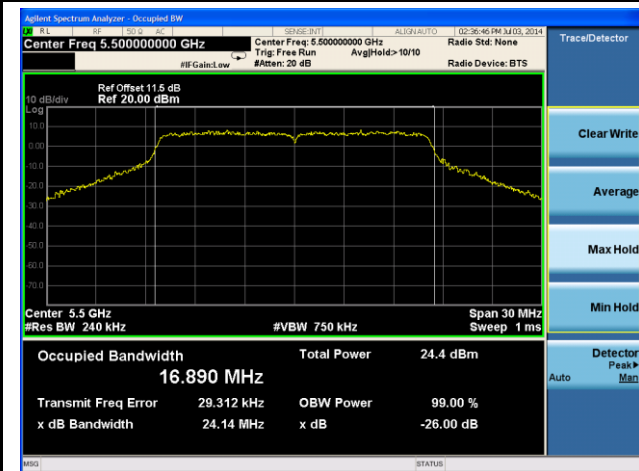
Channel 60 (5300MHz)



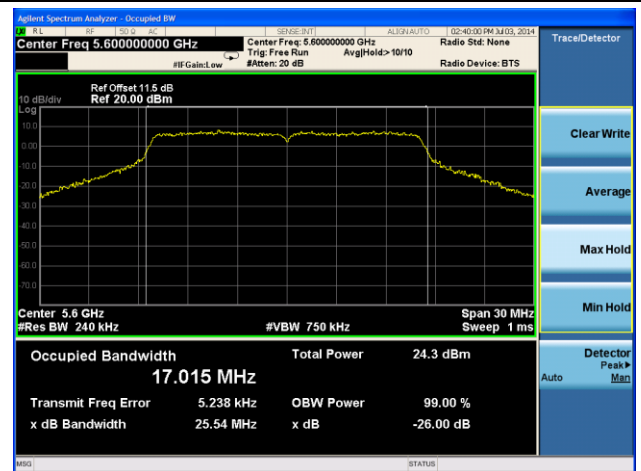
Channel 64 (5320MHz)



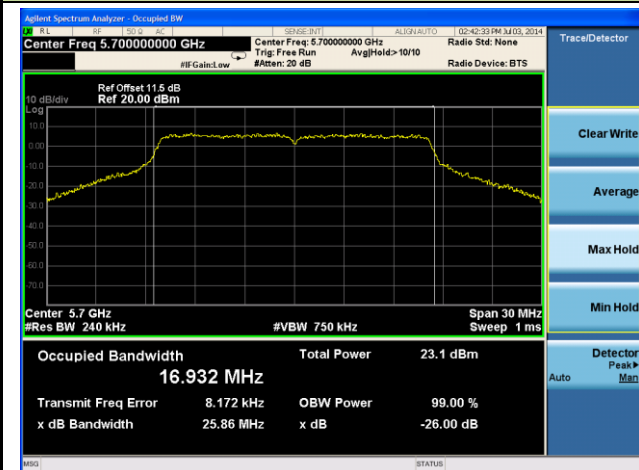
Channel 100 (5500MHz)



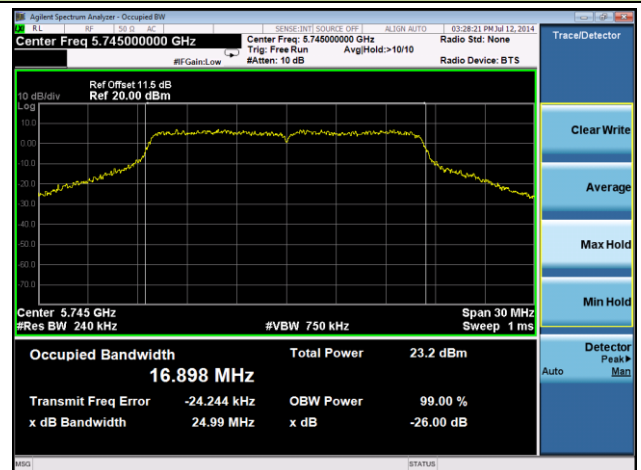
Channel 120 (5600MHz)



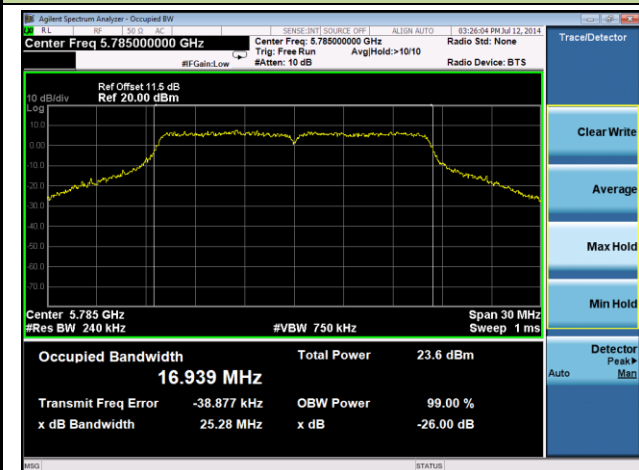
Channel 140 (5700MHz)



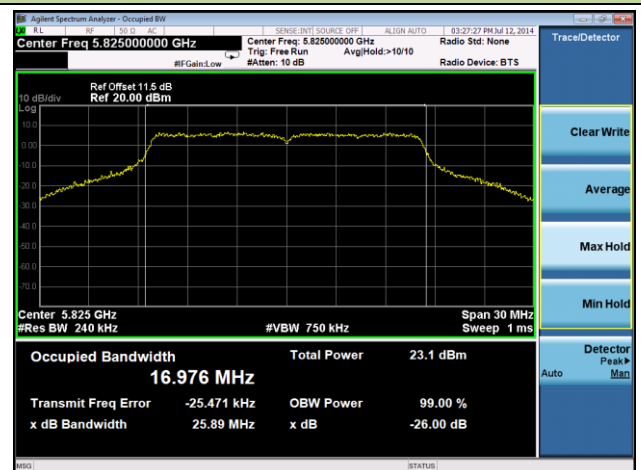
Channel 149 (5745MHz)



Channel 157 (5785MHz)

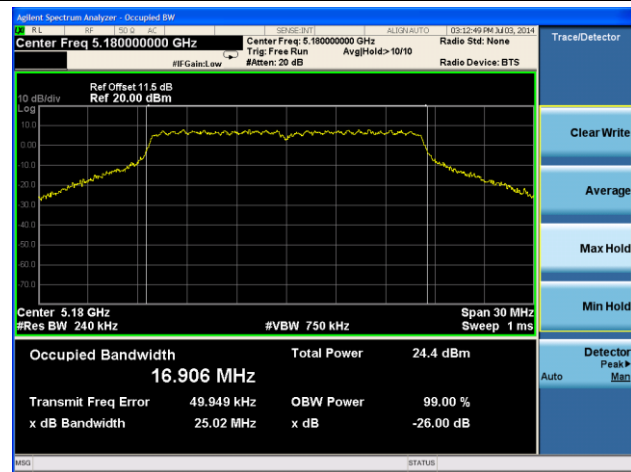


Channel 165 (5825MHz)

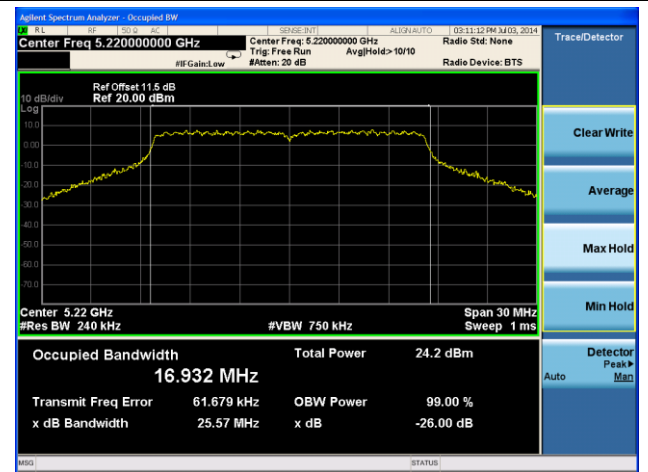


802.11a 26dB Bandwidth & 99% Bandwidth - Ant 1 / Ant 0 + 1

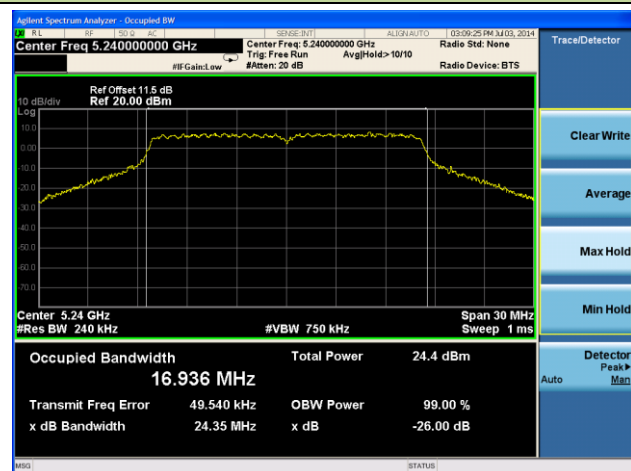
Channel 36 (5180MHz)



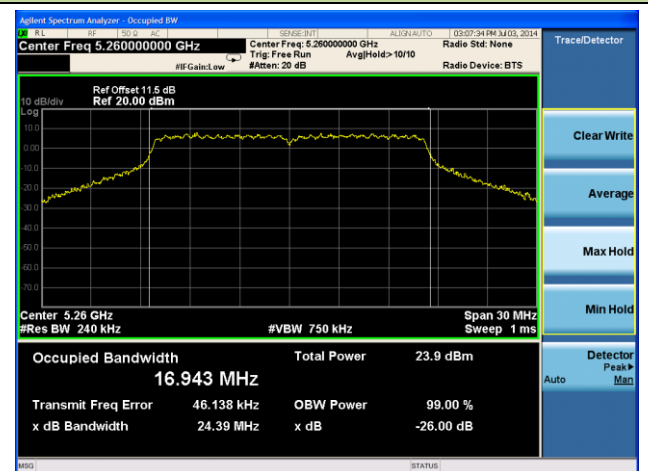
Channel 44 (5220MHz)



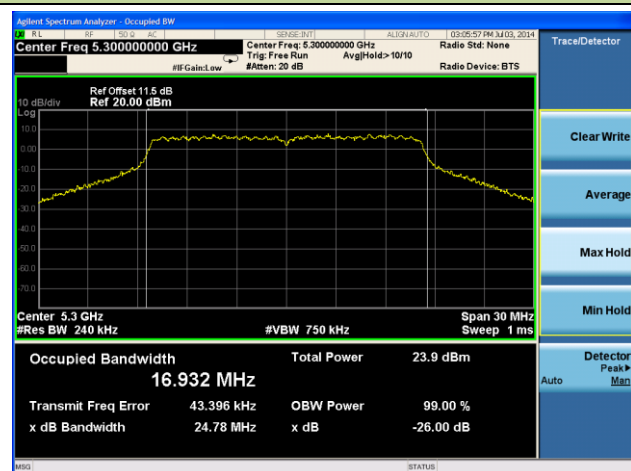
Channel 48 (5240MHz)



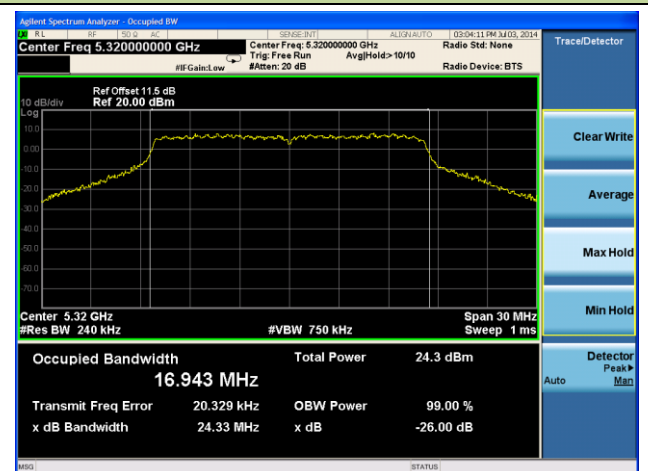
Channel 52 (5260MHz)



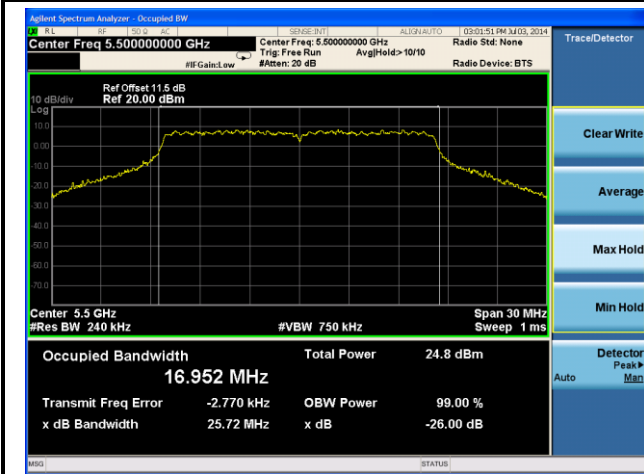
Channel 60 (5300MHz)



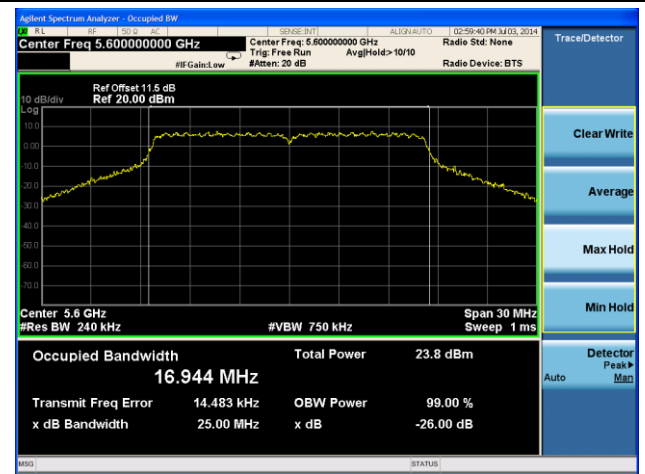
Channel 64 (5320MHz)



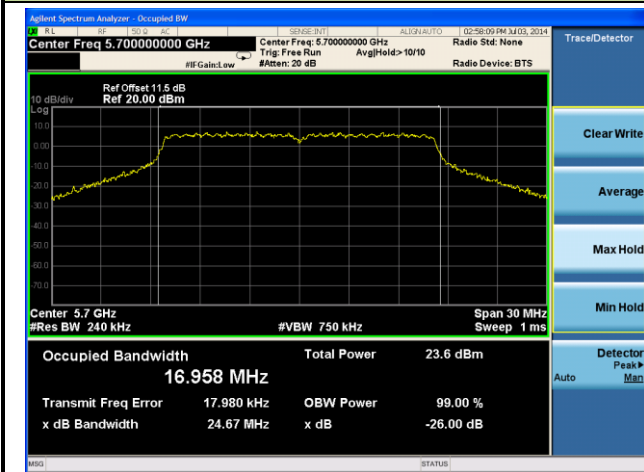
Channel 100 (5500MHz)



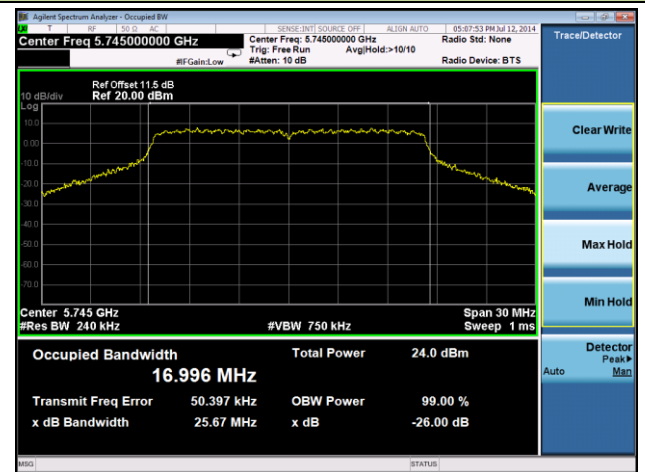
Channel 120 (5600MHz)



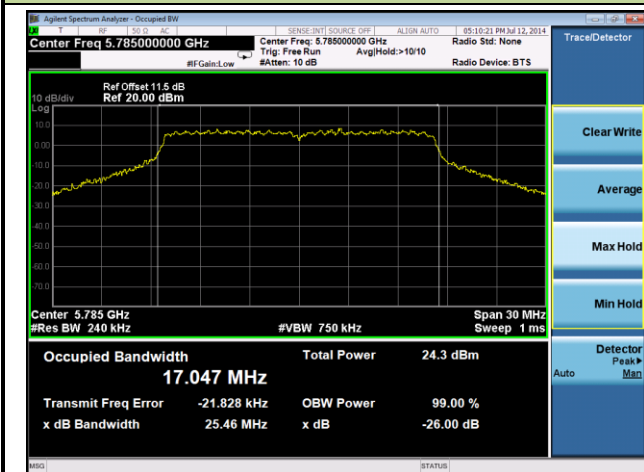
Channel 140 (5700MHz)



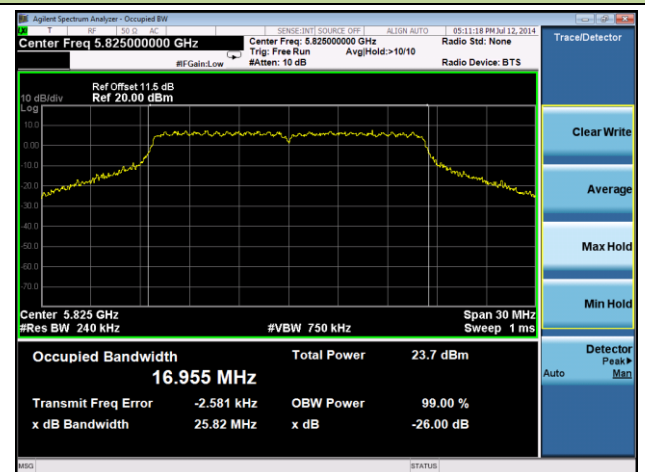
Channel 149 (5745MHz)



Channel 157 (5785MHz)

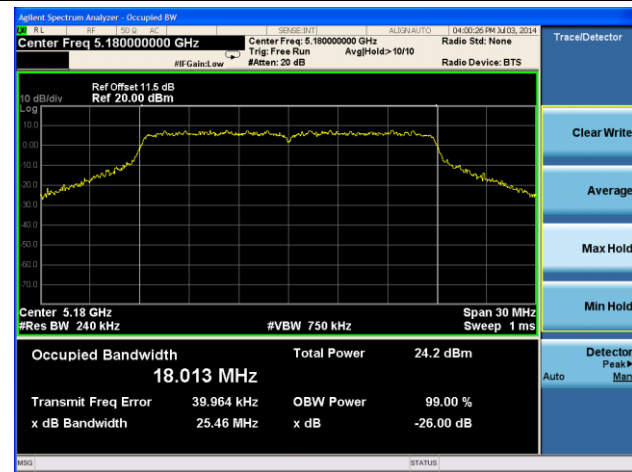


Channel 165 (5825MHz)

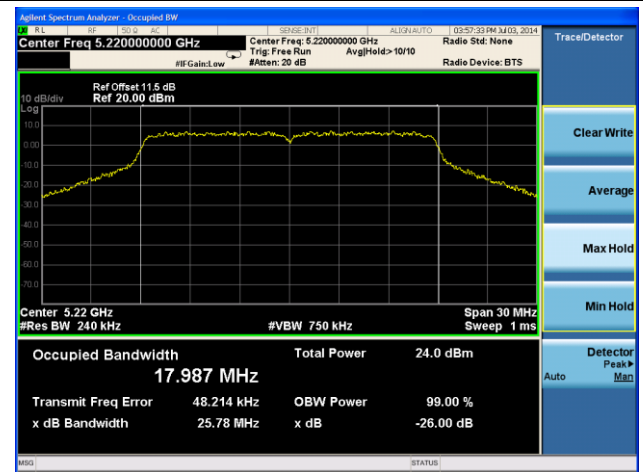


802.11n-HT20 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1

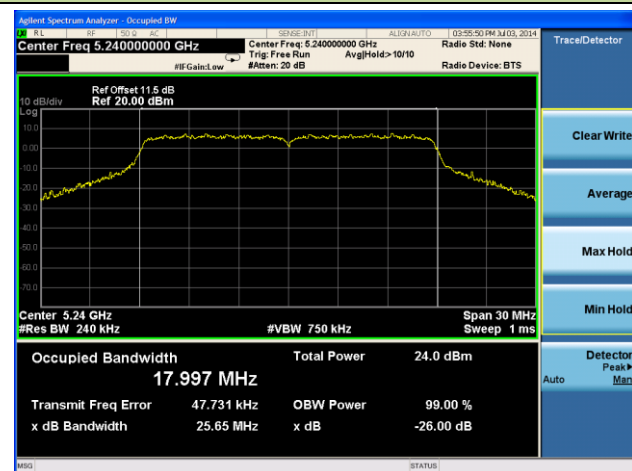
Channel 36 (5180MHz)



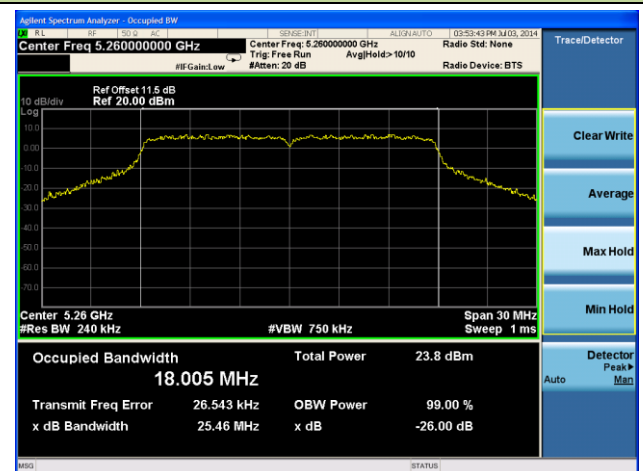
Channel 44 (5220MHz)



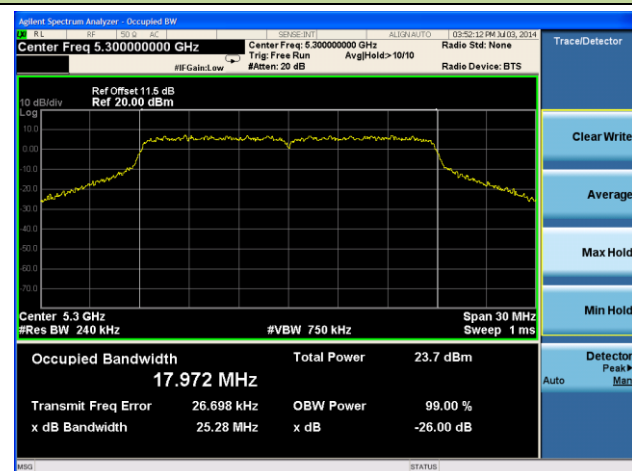
Channel 48 (5240MHz)



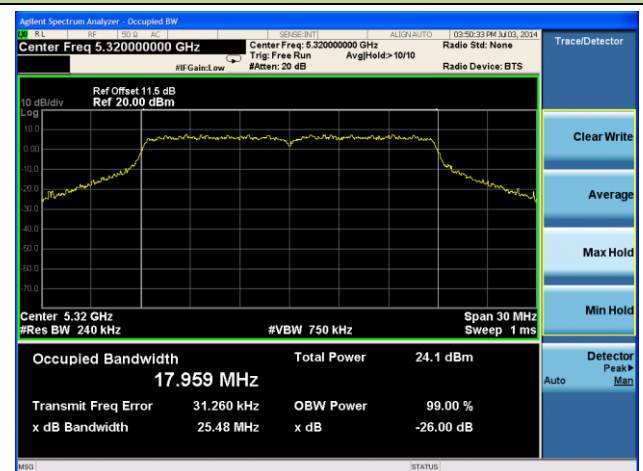
Channel 52 (5260MHz)



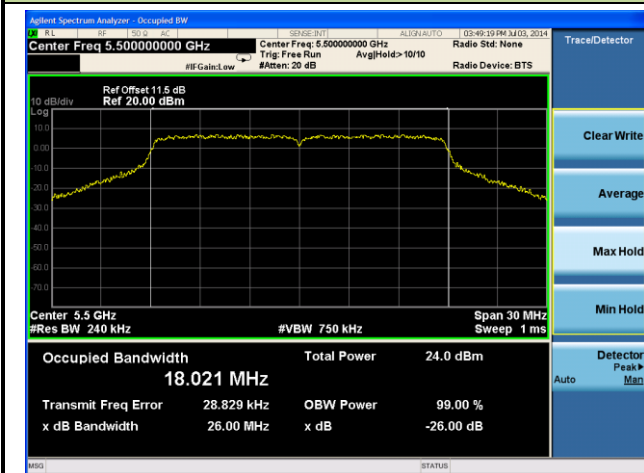
Channel 60 (5300MHz)



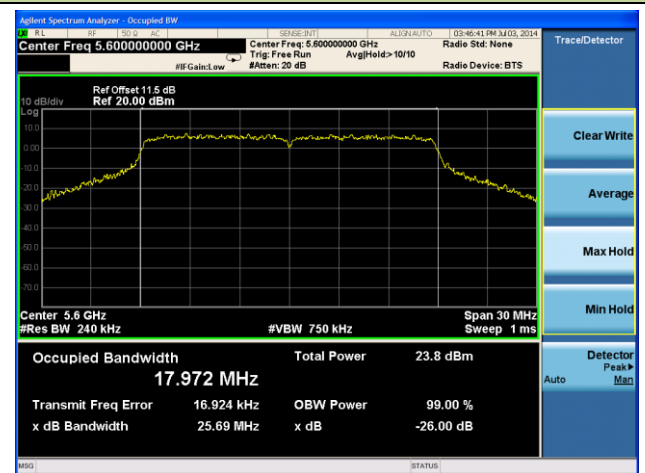
Channel 64 (5320MHz)



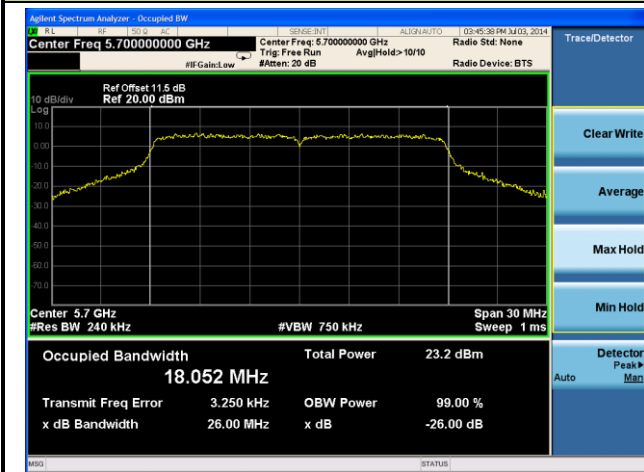
Channel 100 (5500MHz)



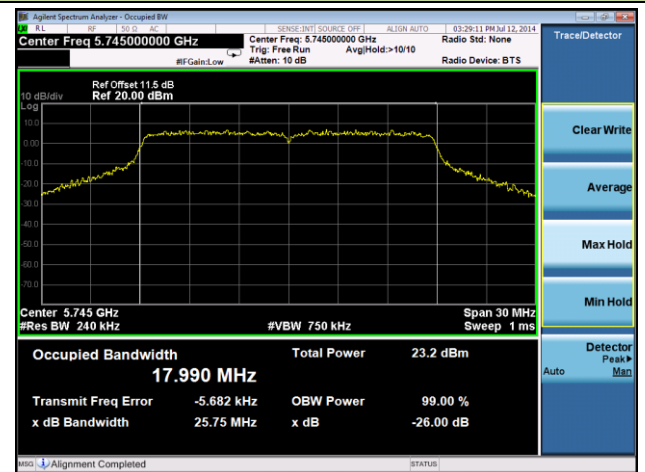
Channel 120 (5600MHz)



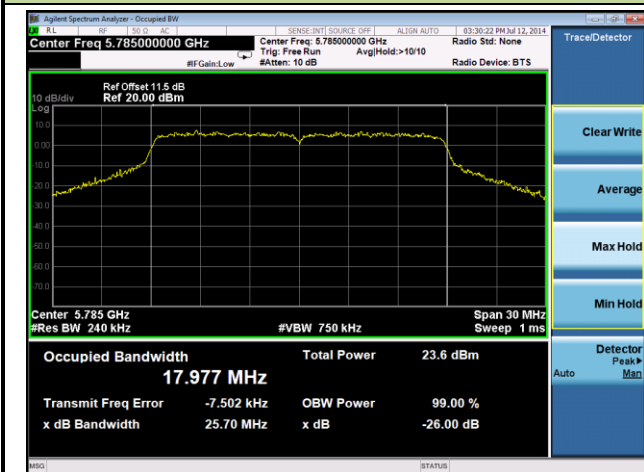
Channel 140 (5700MHz)



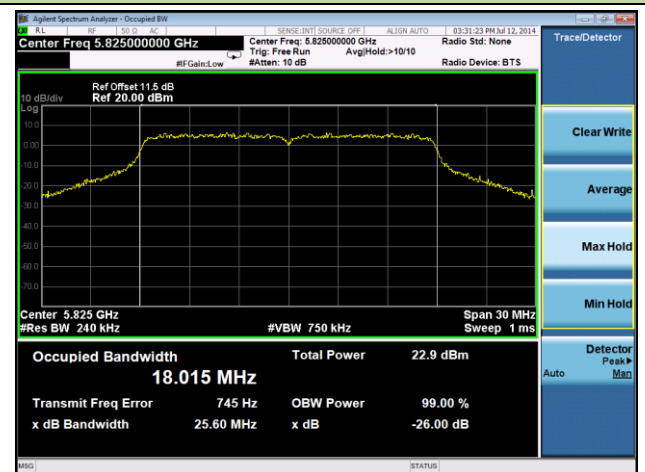
Channel 149 (5745MHz)



Channel 157 (5785MHz)

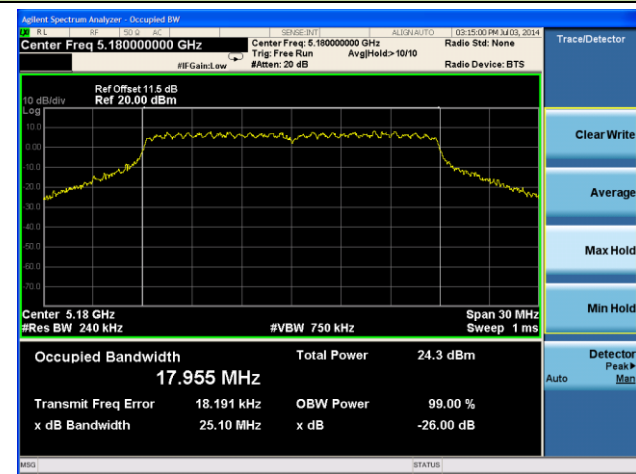


Channel 165 (5825MHz)

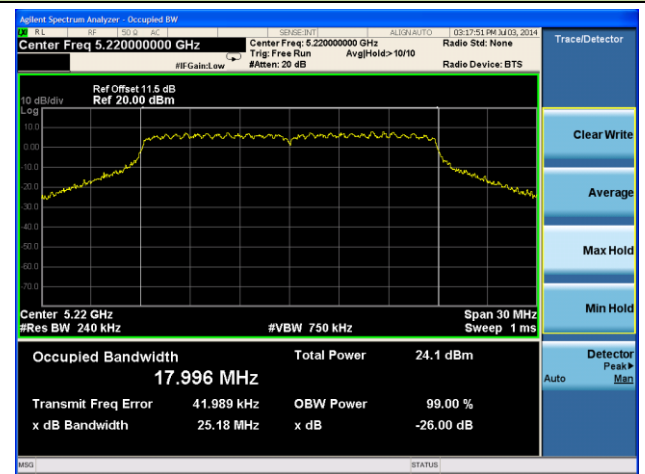


802.11n-HT20 26dB Bandwidth & 99% Bandwidth - Ant 1 / Ant 0 + 1

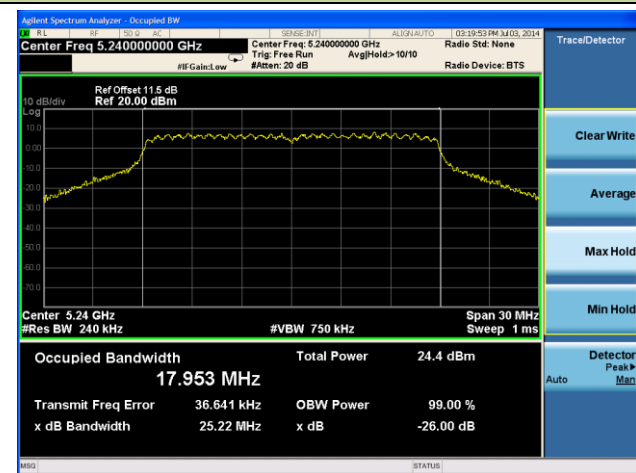
Channel 36 (5180MHz)



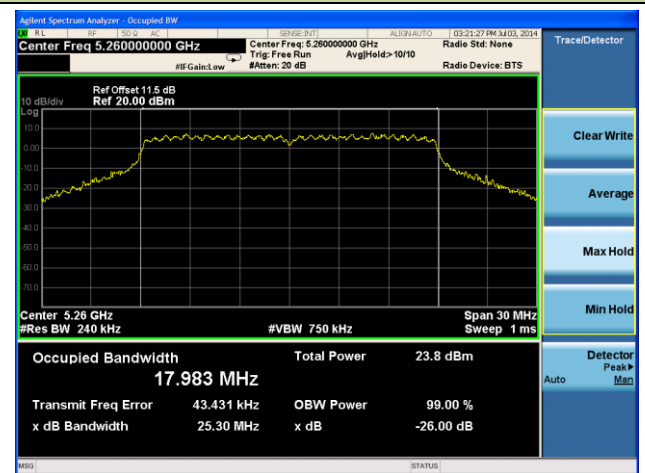
Channel 44 (5220MHz)



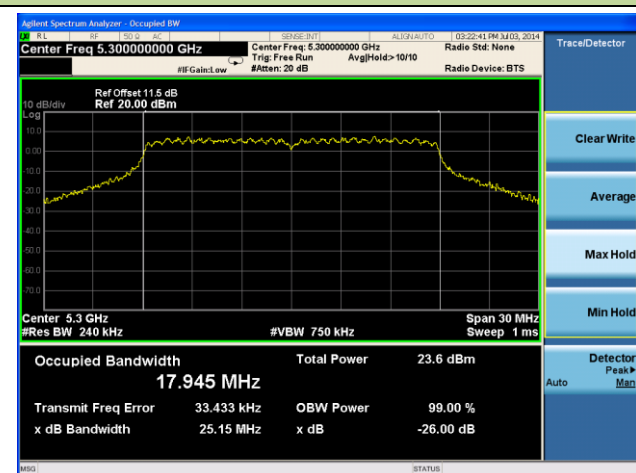
Channel 48 (5240MHz)



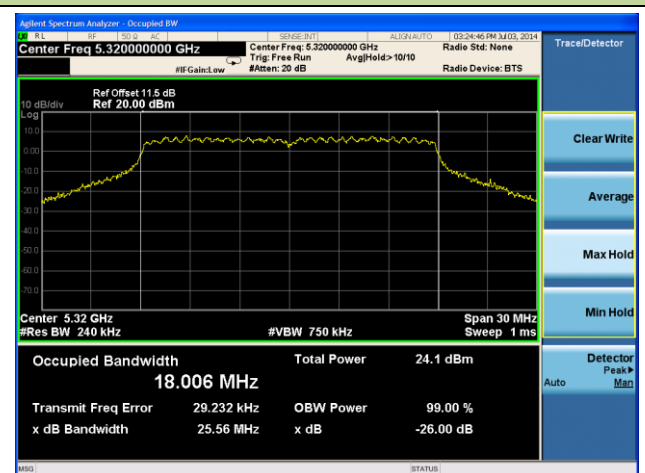
Channel 52 (5260MHz)



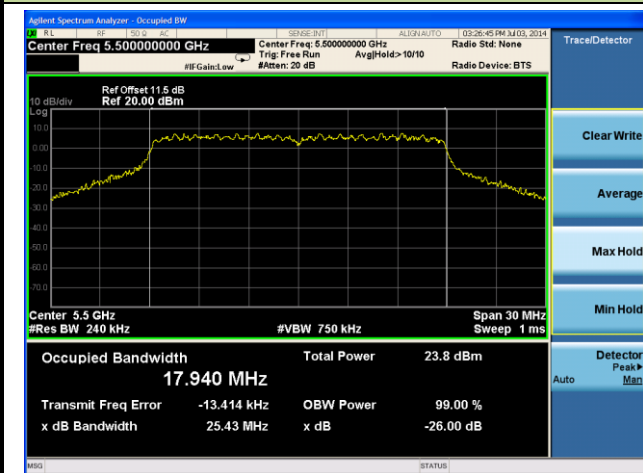
Channel 60 (5300MHz)



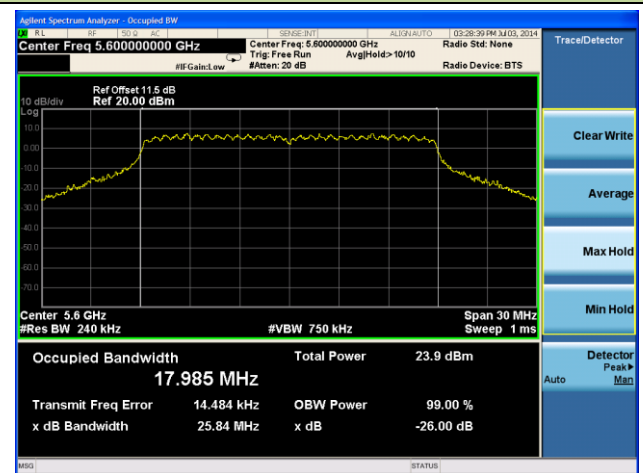
Channel 64 (5320MHz)



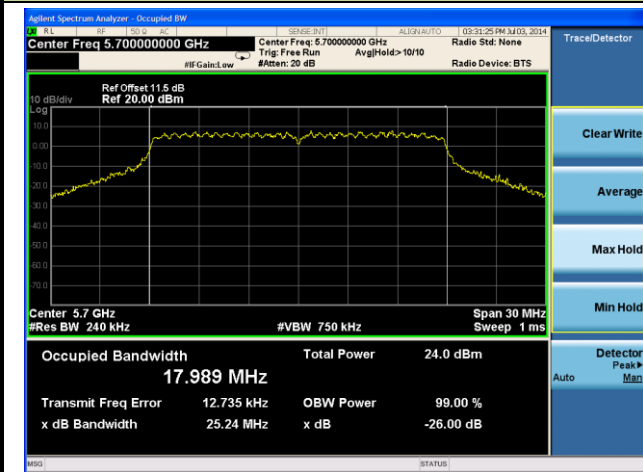
Channel 100 (5500MHz)



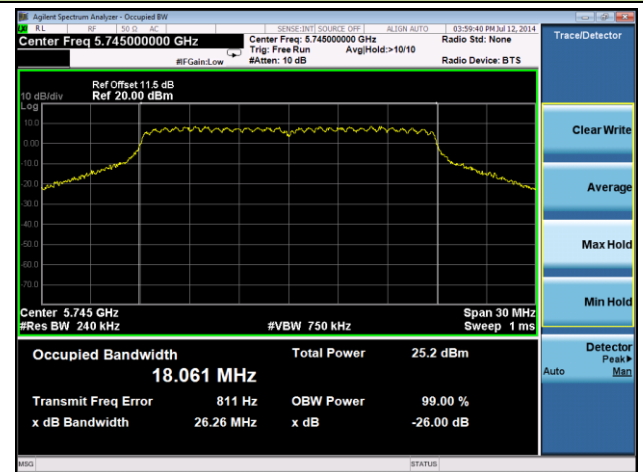
Channel 120 (5600MHz)



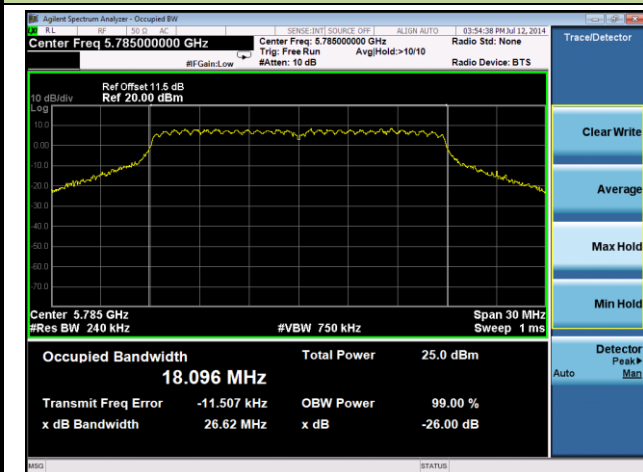
Channel 140 (5700MHz)



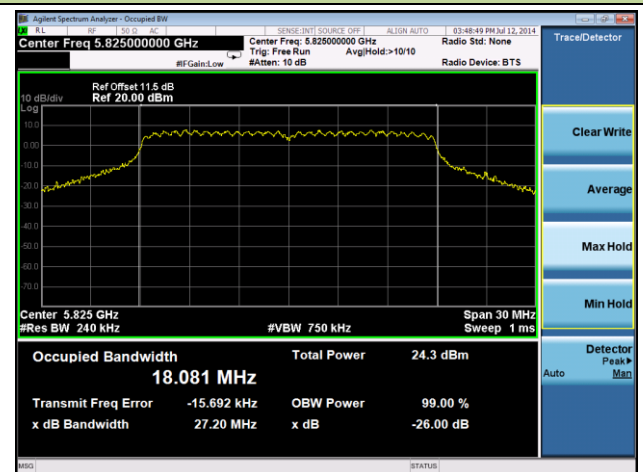
Channel 149 (5745MHz)



Channel 157 (5785MHz)

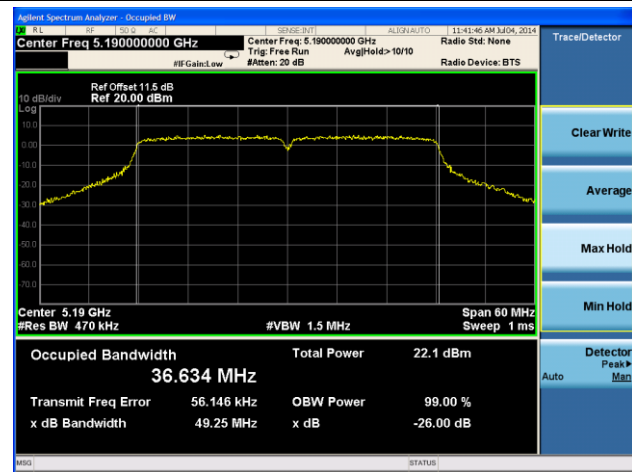


Channel 165 (5825MHz)

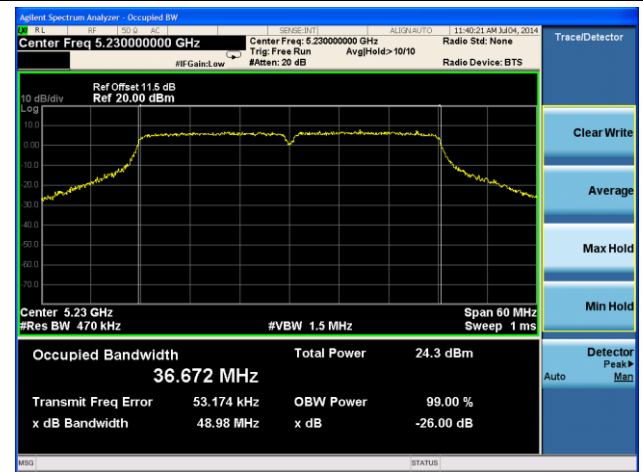


802.11n-HT40 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1

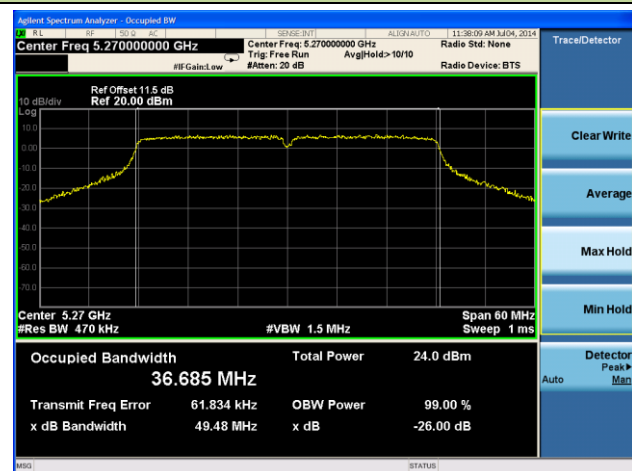
Channel 38 (5190MHz)



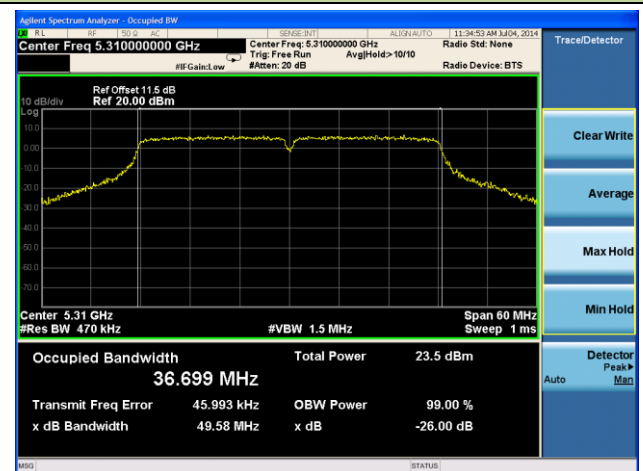
Channel 46 (5230MHz)



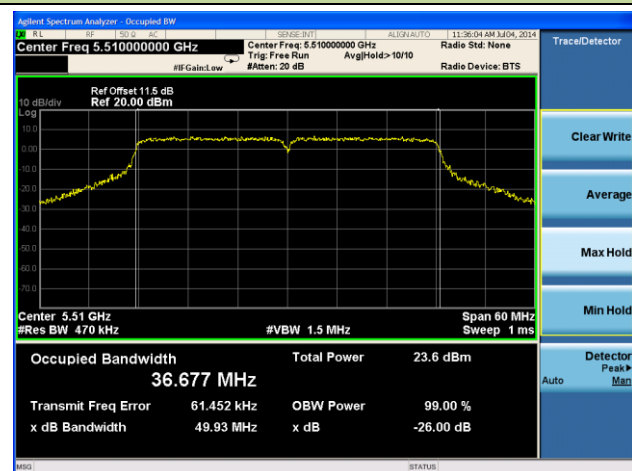
Channel 54 (5270MHz)



Channel 62 (5310MHz)



Channel 102 (5510MHz)



Channel 118 (5590MHz)

