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Report No.: 1507RSU00807
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MEASUREMENT REPORT

FCC PART 15.407 WLAN 802.11a/n/ac

FCC ID: H8N-WHD0110
APPLICANT: ASKEY COMPUTER CORP
Application Type: Certification
Product: Smart Gateway
Model No.: WHD0110(RoHS), WHD0111(RoHS)
Brand Name: ASKEY
FCC Classification: Unlicensed National Information Infrastructure (UNII)
FCC Rule Part(s): Part 15.407
Test Procedure(s): ANSI C63.10-2013, KDB 789033 D02v01,
KDB 662911 D01v02r01, KDB 644545 D03v01
Test Date: July 13 ~ August 17, 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 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
1507RSU00807	Rev. 01	Initial report	10-12-2015

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§2.1033 General Information

Applicant:	ASKEY COMPUTER CORP
Applicant Address:	10F, No.119, JIANKANG RD., ZHONGHE DIST., NEW TAIPEI CITY 23585, TAIWAN, R.O.C.
Manufacturer:	ASKEY COMPUTER CORP
Manufacturer Address:	10F, No.119, JIANKANG RD., ZHONGHE DIST., NEW TAIPEI CITY 23585, TAIWAN, R.O.C.
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
FCC Registration No.:	809388
FCC Rule Part(s):	Part 15.407
Model No.:	WHD0110(RoHS), WHD0111(RoHS)
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	Smart Gateway
Model No.	WHD0110(RoHS), WHD0111(RoHS)
Wi-Fi Specification	802.11a/b/g/n/ac
Frequency Range	<u>2.4GHz:</u> For 802.11b/g/n-HT20: 2412 ~ 2462 MHz For 802.11n-HT40: 2422 ~ 2452 MHz <u>5GHz:</u> 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
5GHz Maximum Output Power	802.11a: 22.33dBm 802.11n-HT20: 21.51dBm 802.11n-HT40: 23.06dBm 802.11ac-VHT20: 22.85dBm 802.11ac-VHT40: 23.34dBm 802.11ac-VHT80: 22.36dBm
Type of Modulation	802.11a/n/ac: OFDM

Note 1: There is a built-in hard disk with the model “WHD0110(RoHS)”, and the model “WHD0111(RoHS)” have not this configuration, and there is different heat sinks of these models. The model difference has been assessed in the EMC Test Report.

Note 2: This Bluetooth module has been certificated, and the collocation mode has been assessed in MRT test report.

2.2. Working Frequencies

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
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	--	--

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
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

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	--	--

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

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 (MHz)	Tx Paths	Per Chain Max Antenna Gain (dBi)		CDD Directional Gain (dBi)
			Ant 0	Ant 1	
PCB Antenna	2412 ~2462	2	4.13	3.82	6.99
	5150 ~ 5250	2	3.90	3.53	6.73
	5250 ~ 5350	2	3.86	3.42	6.66
	5470 ~ 5725	2	4.10	3.65	6.89
	5725 ~ 5850	2	4.00	4.35	7.19

1. The EUT supports Cyclic Delay Diversity (CDD) technology for 802.11a/b/g mode, and that CDD technology is correlated signals.

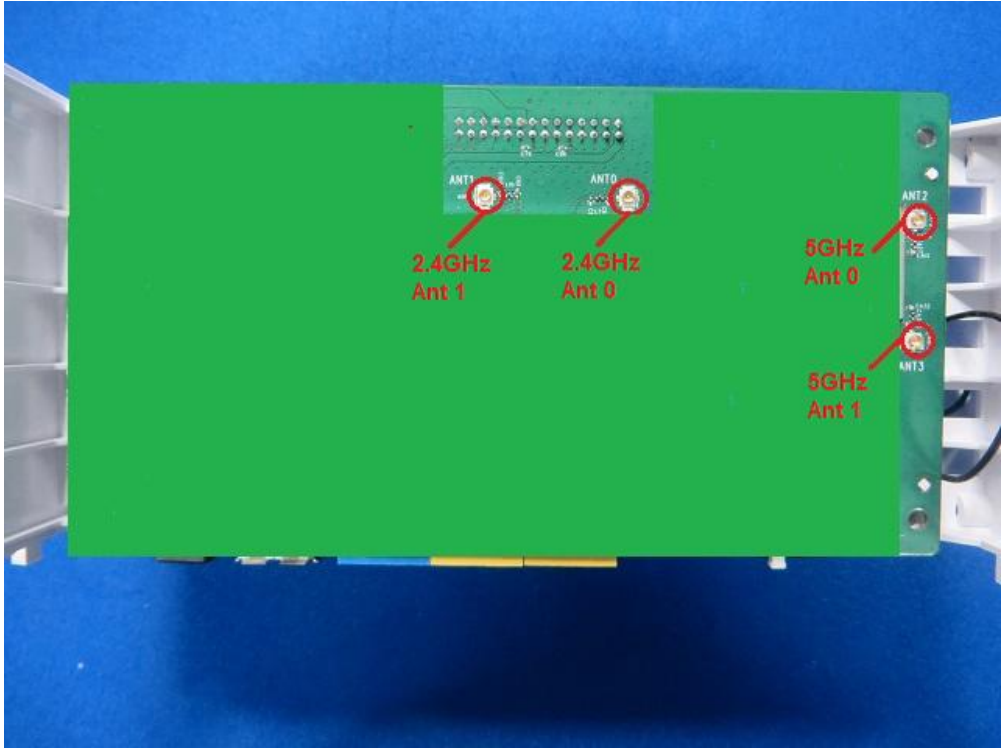
(1) Correlated signals include, but are not limited to, signals transmitted in any of the following modes:

- 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 = $10 \cdot \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}]$ 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.]

For example: 5150 ~ 5250MHz Directional Gain = $10 \cdot \log[(10^{3.90/20} + 10^{3.53/20})^2 / 2] = 6.73$ dBi

2.4. Description of Antenna RF Port

Antenna RF Port				
--	2.4GHz RF Port		5GHz RF Port	
Software Control Port	Ant 0	Ant 1	Ant 0	Ant 1



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 “MT76xxE_AP”.

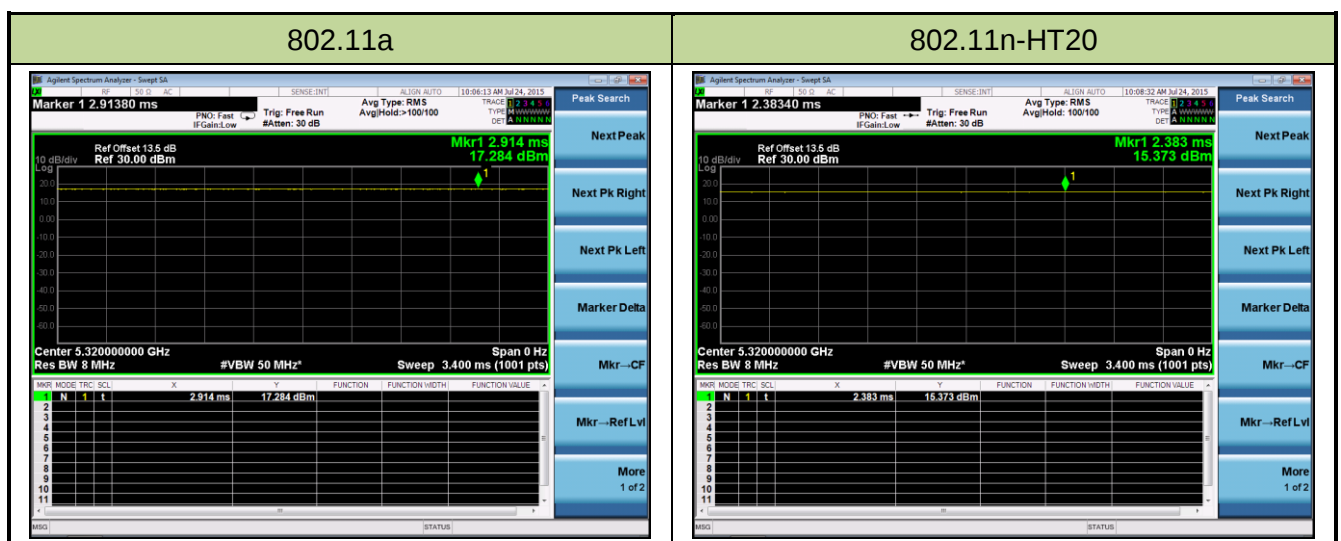
2.7. Device Capabilities

This device contains the following capabilities:

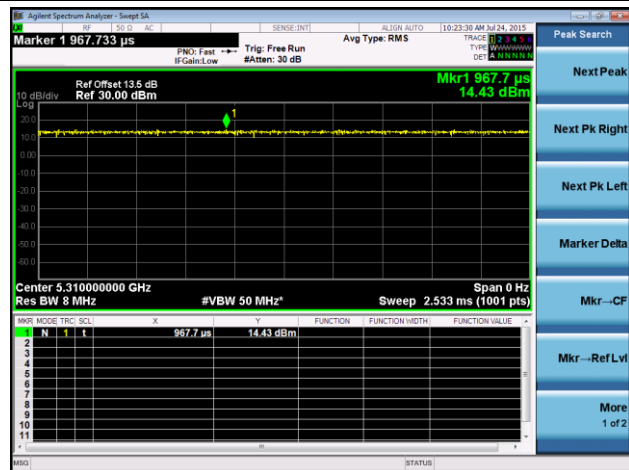
2.4GHz WLAN (DTS) and 5GHz WLAN (UNII).

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 = average 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:

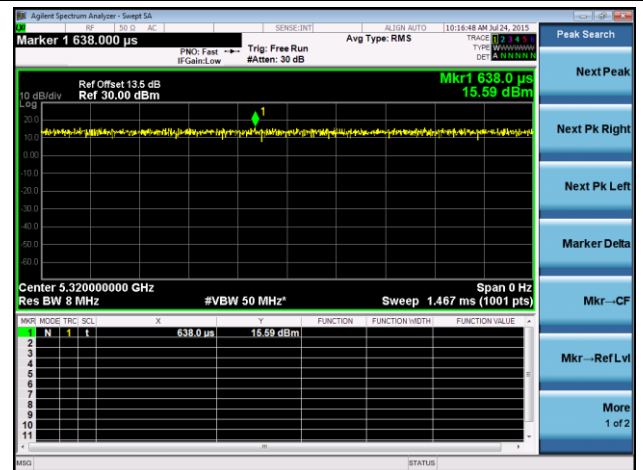
Test Mode	Duty Cycle
802.11a	100.0 %
802.11n-HT20	100.0 %
802.11n-HT40	100.0 %
802.11ac-VHT20	100.0 %
802.11ac-VHT40	100.0 %
802.11ac-VHT80	100.0 %



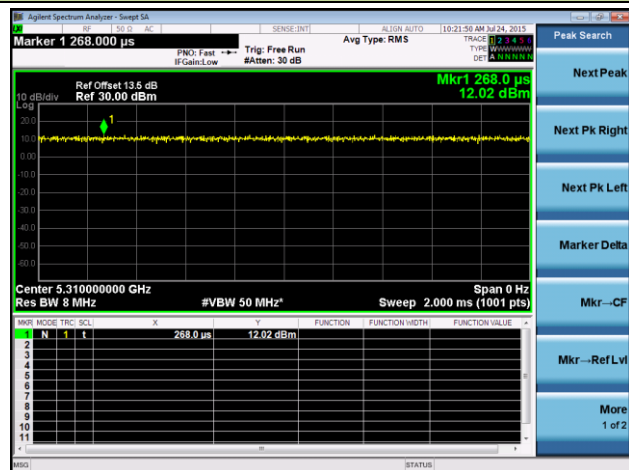
802.11n-HT40



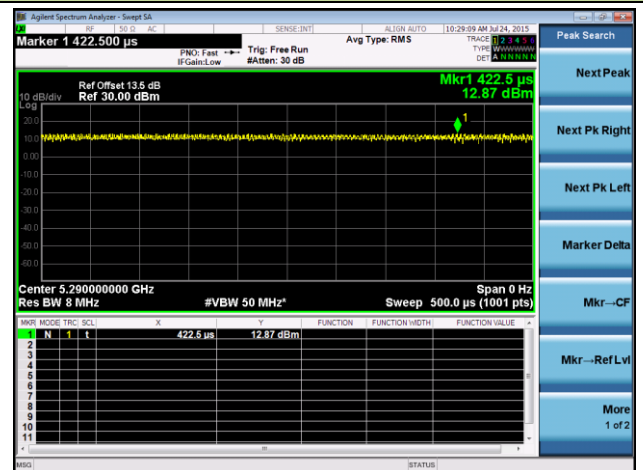
802.11ac-VHT20



802.11ac-VHT40



802.11ac-VHT80



2.8. Test Configuration

The **Smart Gateway FCC ID: H8N-WHD0110** was tested per the guidance of KDB 789033 D02v01. 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 D02v01 were used in the measurement of the **Smart Gateway FCC ID: H8N-WHD0110**.

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 C63.10-2013.

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 antenna of **Smart Gateway** is **permanently attached**.
- There are no provisions for connection to an external antenna.

Conclusion:

The **Smart Gateway FCC ID: H8N-WHD0110** 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	2015/11/07
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2015/11/07
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2015/11/07
Temperature/Humidity Meter	Ouleinuo	N/A	MRTSUE06114	1 year	2015/11/20

Radiated Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	E4447A	MRTSUE06028	1 year	2015/10/09
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2015/11/07
Preamplifier	Agilent	83017A	MRTSUE06020	1 year	2015/12/13
Preamplifier	Schwarzbeck	BBV9721	MRTSUE06121	1 year	2016/04/15
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2015/11/08
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2015/11/08
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2015/11/08
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2016/01/05
Temperature/Humidity Meter	Ouleinuo	N/A	MRTSUE06115	1 year	2015/11/20

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2016/04/23
USB Wideband Power Sensor	Boonton	55006	MRTSUE06109	1 year	2015/10/15
Temperature/Humidity Meter	Ouleinuo	N/A	MRTSUE06112	1 year	2015/11/20

Software	Version	Function
e3	V 8.3.5	EMI Test Software

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: 3.46dB
Radiated Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 40GHz: 4.76dB

7. TEST RESULT

7.1. Summary

Company Name: ASKEY COMPUTER CORP

FCC ID: H8N-WHD0110

Data Rate(s) Tested: 6Mbps ~ 54Mbps (a);
13.0/14.4Mbps ~ 130/144.4Mbps (n-HT20);
27.0/30.0Mbps ~ 270/300Mbps (n-HT40)
13.0/14.4Mbps ~ 156/173.4Mbps (ac-VHT20MHz BW);
27.0/30.0Mbps ~ 360/400Mbps (ac-VHT40MHz BW);
58.6/65.0Mbps ~ 780/866.6Mbps (ac-VHT80MHz BW)

FCC 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	≤ 30 dBm U-NII-1 ≤ 24 dBm U-NII-2A ≤ 24 dBm U-NII-2C ≤ 30 dBm U-NII-3		Pass	Section 7.5
15.407(h)(1)	Transmit Power Control	≤ 24 dBm		Pass	Section 7.6
15.407(a)(1)(ii), (2), (3), (5)	Peak Power Spectral Density	≤ 17 dBm/MHz U-NII-1 ≤ 11 dBm/MHz U-NII-2A ≤ 11 dBm/MHz U-NII-2C ≤ 30 dBm/500kHz U-NII-3		Pass	Section 7.7
15.407(g)	Frequency Stability	N/A		Pass	Section 7.8
15.407(b)(1), (2), (3), (4)	Undesirable Emissions	≤ -27dBm/MHz EIRP ≤ -17dBm/MHz EIRP	Radiated	Pass	Section 7.9 & 7.10
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 7.11

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

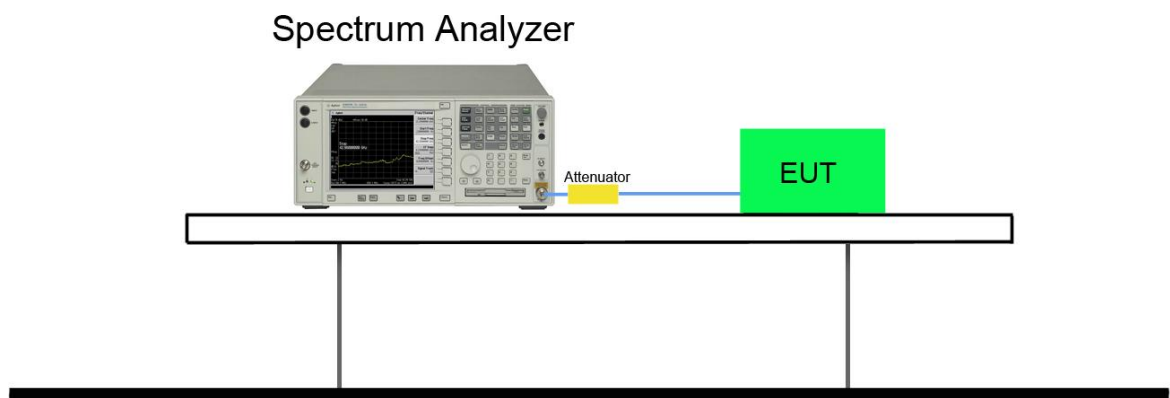
7.2.2. Test Procedure used

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	20.36	16.79	Pass
802.11a	6	44	5220	20.40	16.70	Pass
802.11a	6	48	5240	23.45	16.79	Pass
802.11a	6	52	5260	20.02	16.70	Pass
802.11a	6	60	5300	20.19	16.71	Pass
802.11a	6	64	5320	22.89	16.85	Pass
802.11a	6	100	5500	20.34	16.71	Pass
802.11a	6	120	5600	19.76	16.68	Pass
802.11a	6	140	5700	21.08	16.77	Pass
802.11a	6	149	5745	23.84	16.79	Pass
802.11a	6	157	5785	23.09	16.76	Pass
802.11a	6	165	5825	24.47	16.78	Pass
802.11n-HT20	13	36	5180	21.96	17.72	Pass
802.11n-HT20	13	44	5220	21.97	17.73	Pass
802.11n-HT20	13	48	5240	22.03	17.74	Pass
802.11n-HT20	13	52	5260	20.48	17.69	Pass
802.11n-HT20	13	60	5300	20.51	17.70	Pass
802.11n-HT20	13	64	5320	20.48	17.71	Pass
802.11n-HT20	13	100	5500	20.48	17.70	Pass
802.11n-HT20	13	120	5600	20.33	17.68	Pass
802.11n-HT20	13	140	5700	20.38	17.67	Pass
802.11n-HT20	13	149	5745	22.85	17.72	Pass
802.11n-HT20	13	157	5785	23.20	17.74	Pass
802.11n-HT20	13	165	5825	21.84	17.72	Pass

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
Ant 0 / Ant 0 + 1						
802.11n-HT40	27	38	5190	40.86	36.20	Pass
802.11n-HT40	27	46	5230	40.93	36.24	Pass
802.11n-HT40	27	54	5270	43.36	36.21	Pass
802.11n-HT40	27	62	5310	40.53	36.14	Pass
802.11n-HT40	27	102	5510	40.78	36.14	Pass
802.11n-HT40	27	118	5590	44.24	36.25	Pass
802.11n-HT40	27	134	5670	40.83	36.20	Pass
802.11n-HT40	27	151	5755	40.85	36.21	Pass
802.11n-HT40	27	159	5795	40.71	36.20	Pass
802.11ac-VHT20	13	36	5180	20.12	17.64	Pass
802.11ac-VHT20	13	44	5220	23.13	17.72	Pass
802.11ac-VHT20	13	48	5240	20.87	17.71	Pass
802.11ac-VHT20	13	52	5260	20.33	17.66	Pass
802.11ac-VHT20	13	60	5300	20.52	17.67	Pass
802.11ac-VHT20	13	64	5320	22.59	17.71	Pass
802.11ac-VHT20	13	100	5500	20.77	17.70	Pass
802.11ac-VHT20	13	120	5600	22.34	17.72	Pass
802.11ac-VHT20	13	140	5700	20.31	17.67	Pass
802.11ac-VHT20	13	144	5720	20.73	17.69	Pass
802.11ac-VHT20	13	149	5745	21.44	17.70	Pass
802.11ac-VHT20	13	157	5785	23.29	17.71	Pass
802.11ac-VHT20	13	165	5825	23.27	17.72	Pass

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
Ant 0 / Ant 0 + 1						
802.11ac-VHT40	27	38	5190	41.33	36.15	Pass
802.11ac-VHT40	27	46	5230	43.14	36.21	Pass
802.11ac-VHT40	27	54	5270	41.55	36.12	Pass
802.11ac-VHT40	27	62	5310	40.96	36.13	Pass
802.11ac-VHT40	27	102	5510	40.95	36.08	Pass
802.11ac-VHT40	27	118	5590	41.23	36.12	Pass
802.11ac-VHT40	27	134	5670	41.22	36.11	Pass
802.11ac-VHT40	27	142	5710	41.12	36.12	Pass
802.11ac-VHT40	27	151	5755	41.36	36.08	Pass
802.11ac-VHT40	27	159	5795	41.27	36.16	Pass
802.11ac-VHT80	58.6	42	5210	81.17	75.17	Pass
802.11ac-VHT80	58.6	58	5290	80.98	75.12	Pass
802.11ac-VHT80	58.6	106	5530	90.88	75.26	Pass
802.11ac-VHT80	58.6	122	5610	91.80	75.16	Pass
802.11ac-VHT80	58.6	138	5690	87.32	75.20	Pass
802.11ac-VHT80	58.6	155	5775	87.61	75.13	Pass

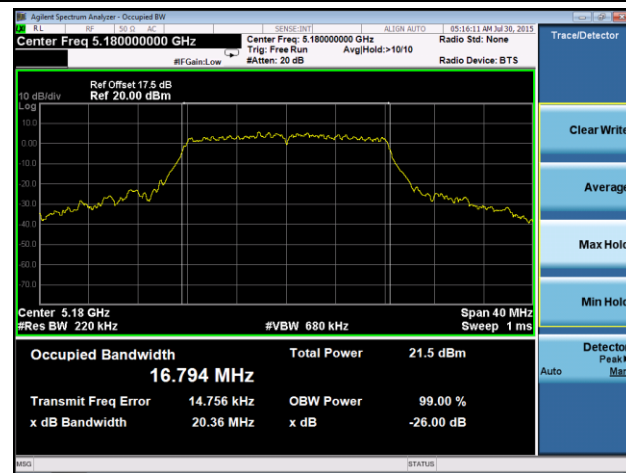
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
Ant 1 / Ant 0 + 1						
802.11a	6	36	5180	22.12	16.75	Pass
802.11a	6	44	5220	19.92	16.68	Pass
802.11a	6	48	5240	20.46	16.84	Pass
802.11a	6	52	5260	20.34	16.81	Pass
802.11a	6	60	5300	22.68	16.74	Pass
802.11a	6	64	5320	20.25	16.83	Pass
802.11a	6	100	5500	20.86	16.83	Pass
802.11a	6	120	5600	21.07	16.71	Pass
802.11a	6	140	5700	22.24	16.81	Pass
802.11a	6	149	5745	23.37	16.77	Pass
802.11a	6	157	5785	25.75	16.93	Pass
802.11a	6	165	5825	24.87	16.77	Pass
802.11n-HT20	13	36	5180	20.15	17.62	Pass
802.11n-HT20	13	44	5220	20.20	17.64	Pass
802.11n-HT20	13	48	5240	20.10	17.62	Pass
802.11n-HT20	13	52	5260	20.14	17.61	Pass
802.11n-HT20	13	60	5300	20.22	17.61	Pass
802.11n-HT20	13	64	5320	20.11	17.63	Pass
802.11n-HT20	13	100	5500	20.26	17.63	Pass
802.11n-HT20	13	120	5600	20.04	17.63	Pass
802.11n-HT20	13	140	5700	20.06	17.61	Pass
802.11n-HT20	13	149	5745	22.34	17.65	Pass
802.11n-HT20	13	157	5785	23.49	17.69	Pass
802.11n-HT20	13	165	5825	22.35	17.66	Pass

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
Ant 1 / Ant 0 + 1						
802.11n-HT40	27	38	5190	40.42	36.16	Pass
802.11n-HT40	27	46	5230	42.03	36.18	Pass
802.11n-HT40	27	54	5270	40.18	36.08	Pass
802.11n-HT40	27	62	5310	40.00	35.98	Pass
802.11n-HT40	27	102	5510	40.07	35.96	Pass
802.11n-HT40	27	118	5590	41.80	36.17	Pass
802.11n-HT40	27	134	5670	40.36	36.11	Pass
802.11n-HT40	27	151	5755	40.19	36.11	Pass
802.11n-HT40	27	159	5795	41.20	36.11	Pass
802.11ac-VHT20	13	36	5180	20.17	17.64	Pass
802.11ac-VHT20	13	44	5220	20.20	17.61	Pass
802.11ac-VHT20	13	48	5240	22.40	17.70	Pass
802.11ac-VHT20	13	52	5260	20.28	17.65	Pass
802.11ac-VHT20	13	60	5300	24.22	17.74	Pass
802.11ac-VHT20	13	64	5320	20.58	17.68	Pass
802.11ac-VHT20	13	100	5500	20.54	17.72	Pass
802.11ac-VHT20	13	120	5600	20.18	17.64	Pass
802.11ac-VHT20	13	140	5700	22.43	17.71	Pass
802.11ac-VHT20	13	144	5720	20.41	17.67	Pass
802.11ac-VHT20	13	149	5745	20.38	17.66	Pass
802.11ac-VHT20	13	157	5785	22.33	17.71	Pass
802.11ac-VHT20	13	165	5825	20.76	17.70	Pass

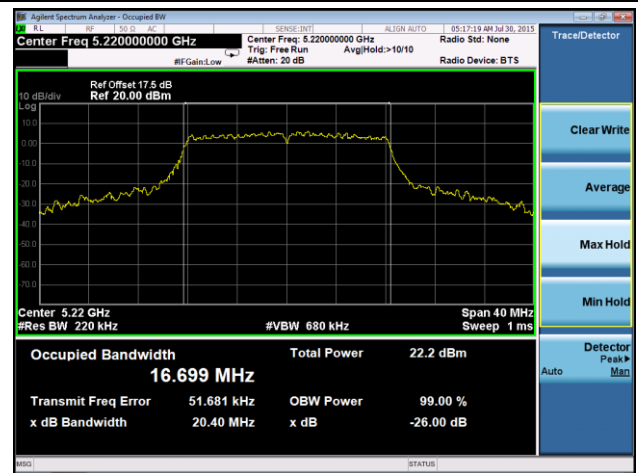
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
Ant 1 / Ant 0 + 1						
802.11ac-VHT40	27	38	5190	40.86	36.14	Pass
802.11ac-VHT40	27	46	5230	42.24	36.14	Pass
802.11ac-VHT40	27	54	5270	41.24	36.13	Pass
802.11ac-VHT40	27	62	5310	42.57	36.20	Pass
802.11ac-VHT40	27	102	5510	41.20	36.12	Pass
802.11ac-VHT40	27	118	5590	40.54	36.08	Pass
802.11ac-VHT40	27	134	5670	40.73	36.10	Pass
802.11ac-VHT40	27	142	5710	41.17	36.15	Pass
802.11ac-VHT40	27	151	5755	42.73	36.15	Pass
802.11ac-VHT40	27	159	5795	41.34	36.17	Pass
802.11ac-VHT80	58.6	42	5210	90.74	75.21	Pass
802.11ac-VHT80	58.6	58	5290	87.01	75.22	Pass
802.11ac-VHT80	58.6	106	5530	81.04	75.06	Pass
802.11ac-VHT80	58.6	122	5610	80.89	75.06	Pass
802.11ac-VHT80	58.6	138	5690	81.15	75.09	Pass
802.11ac-VHT80	58.6	155	5775	81.23	75.05	Pass

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

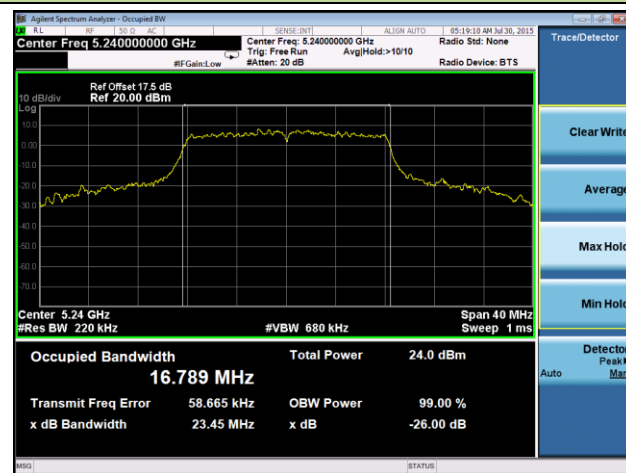
Channel 36 (5180MHz)



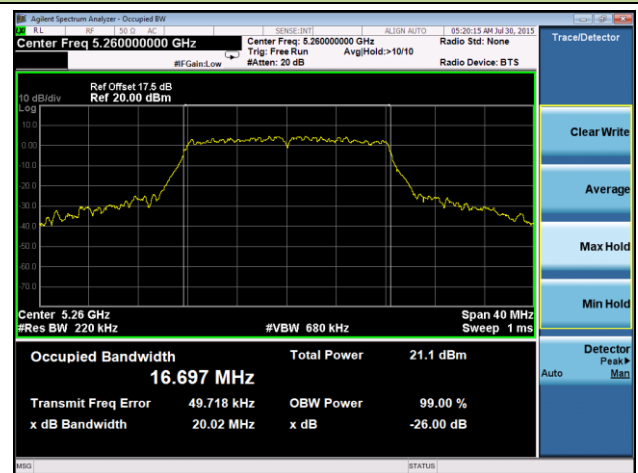
Channel 44 (5220MHz)



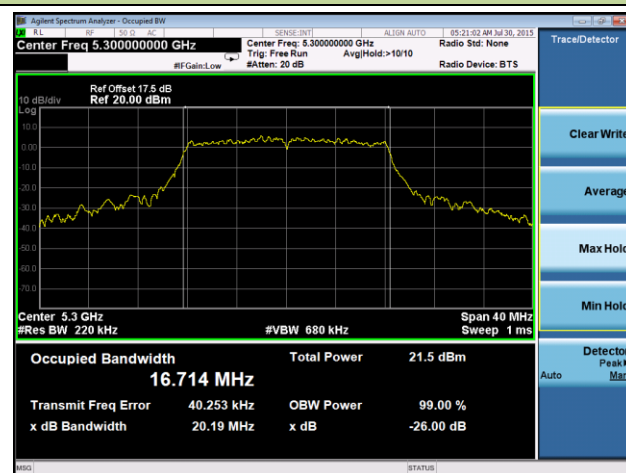
Channel 48 (5240MHz)



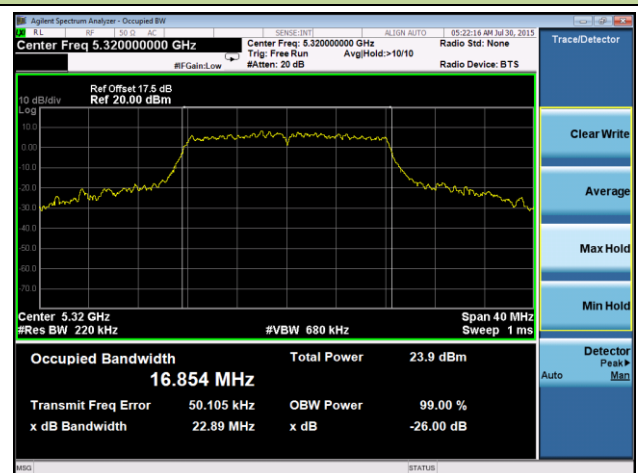
Channel 52 (5260MHz)



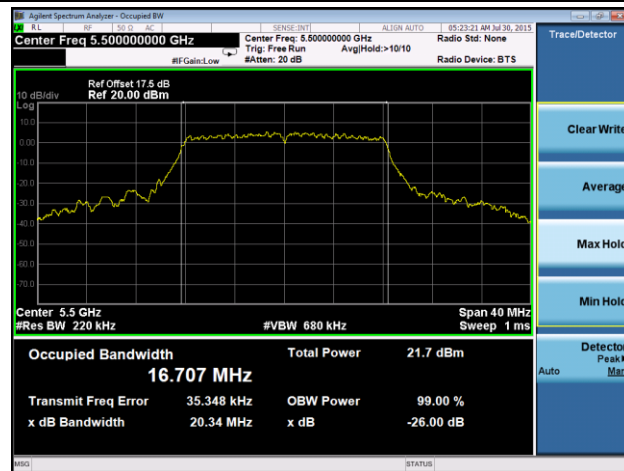
Channel 60 (5300MHz)



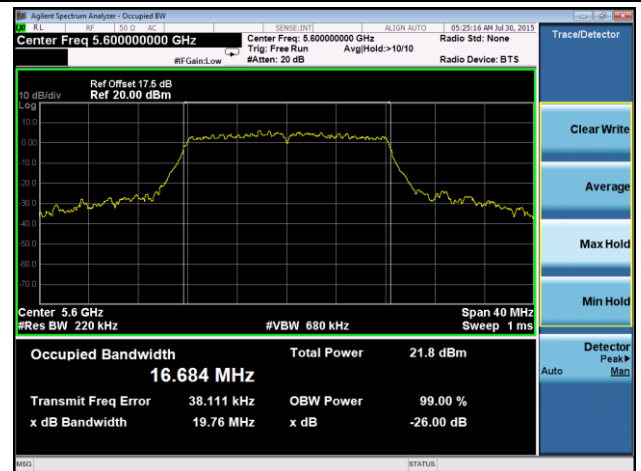
Channel 64 (5320MHz)



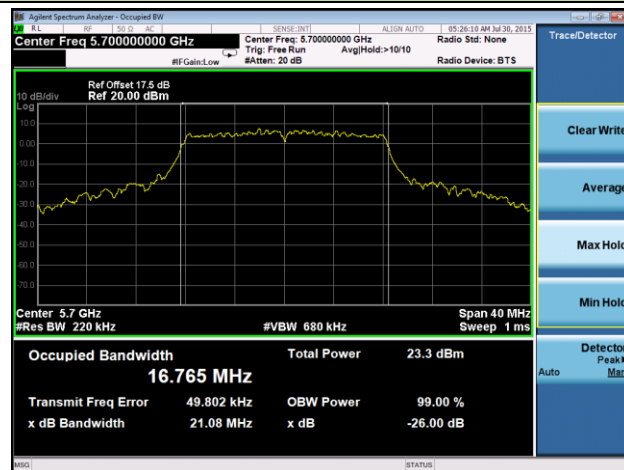
Channel 100 (5500MHz)



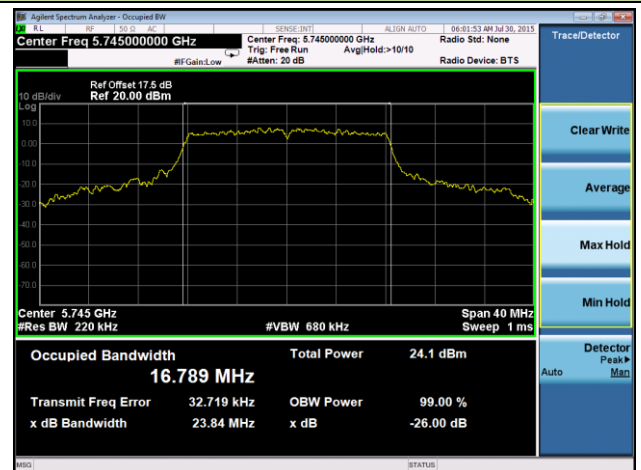
Channel 120 (5600MHz)



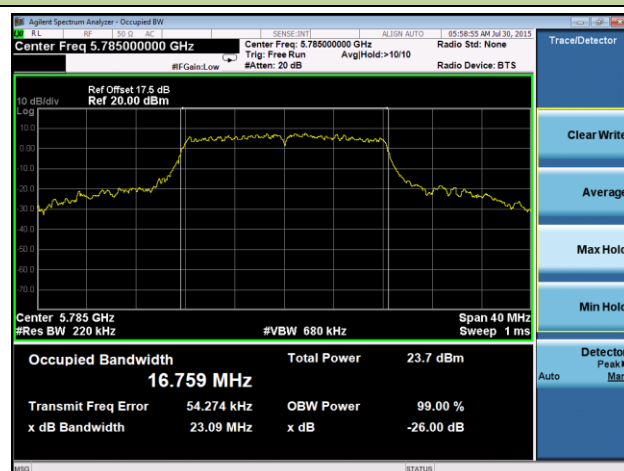
Channel 140 (5700MHz)



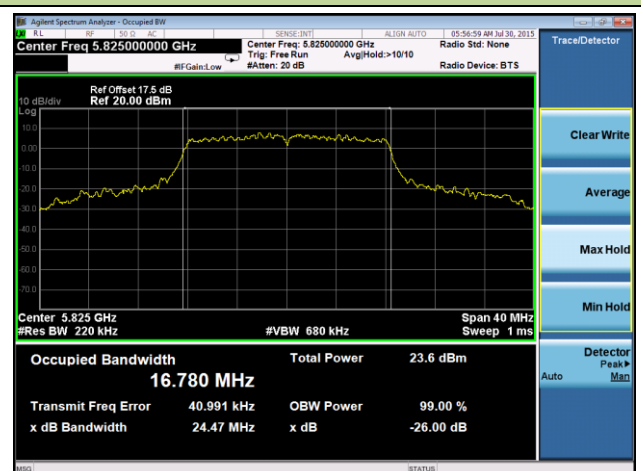
Channel 149 (5745MHz)



Channel 157 (5785MHz)

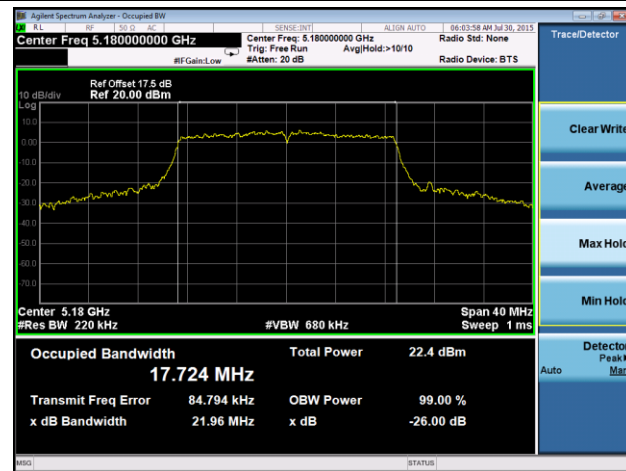


Channel 165 (5825MHz)

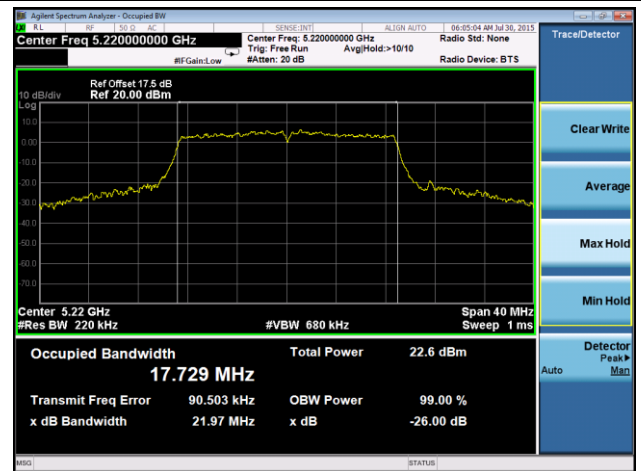


802.11n-HT20 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1

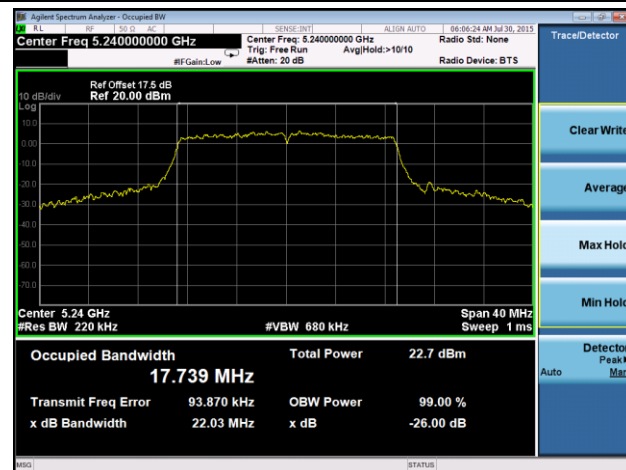
Channel 36 (5180MHz)



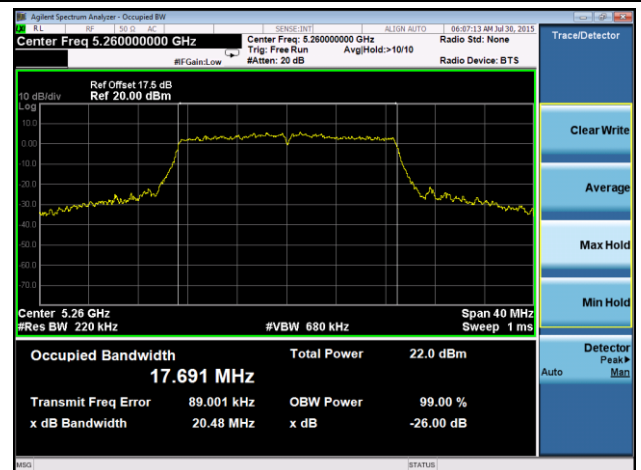
Channel 44 (5220MHz)



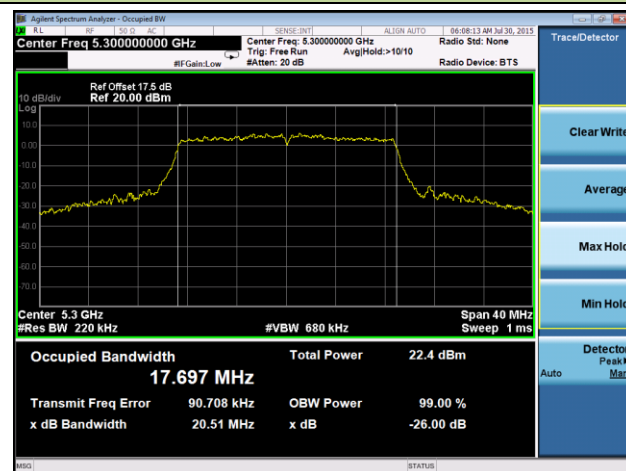
Channel 48 (5240MHz)



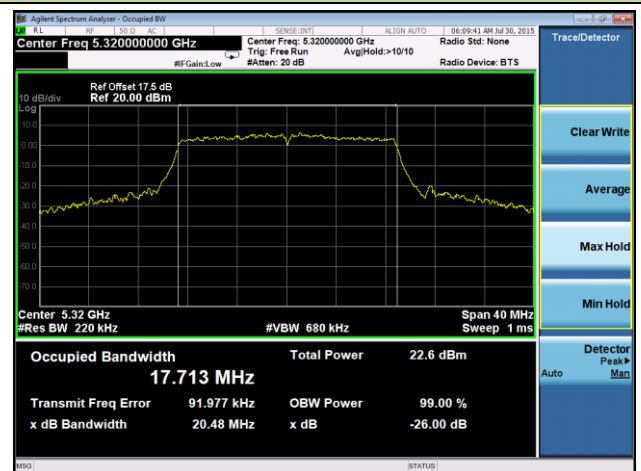
Channel 52 (5260MHz)



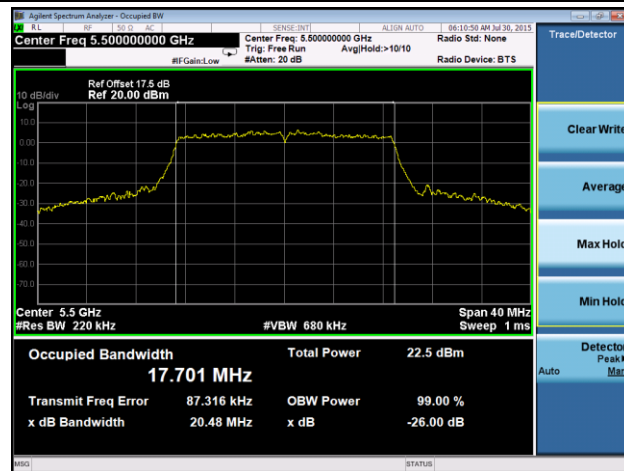
Channel 60 (5300MHz)



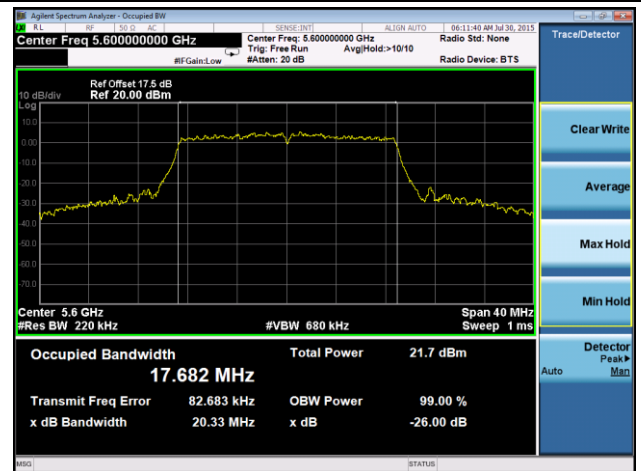
Channel 64 (5320MHz)



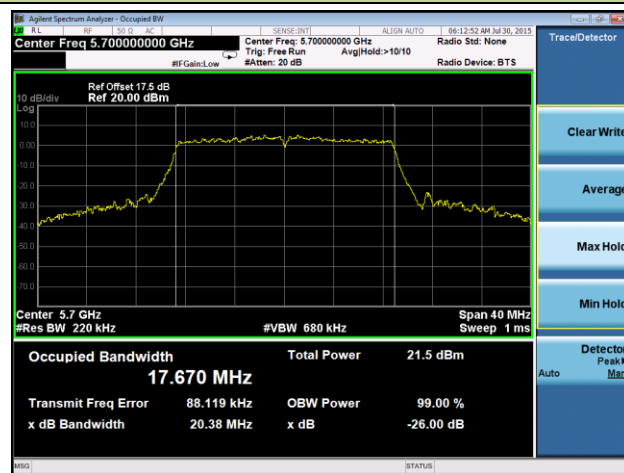
Channel 100 (5500MHz)



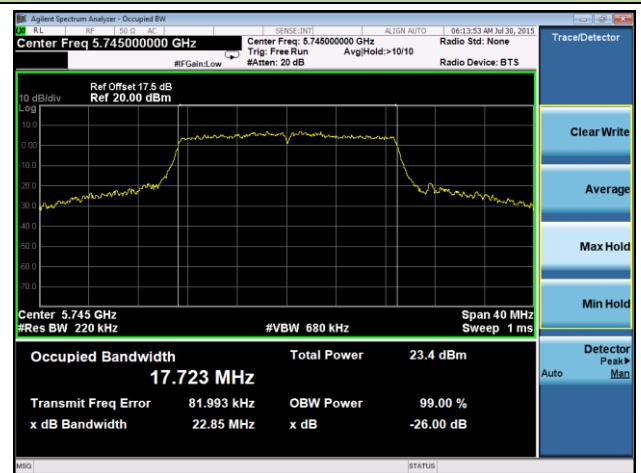
Channel 120 (5600MHz)



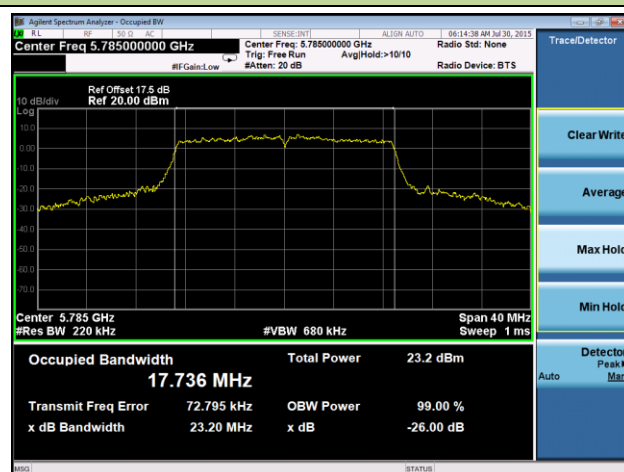
Channel 140 (5700MHz)



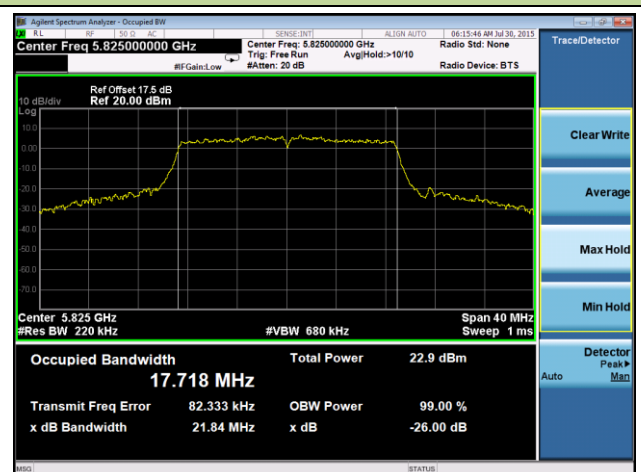
Channel 149 (5745MHz)



Channel 157 (5785MHz)

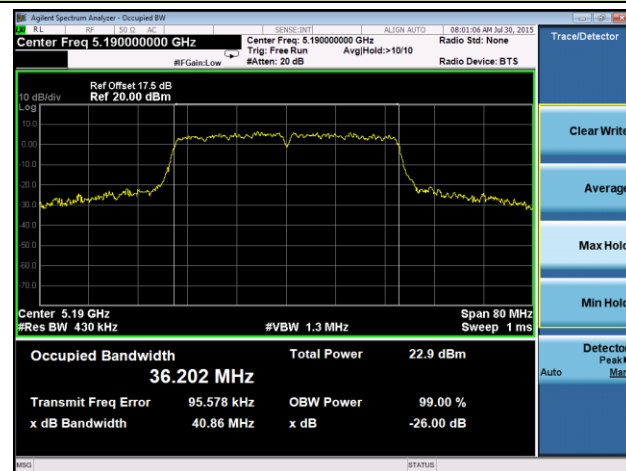


Channel 165 (5825MHz)

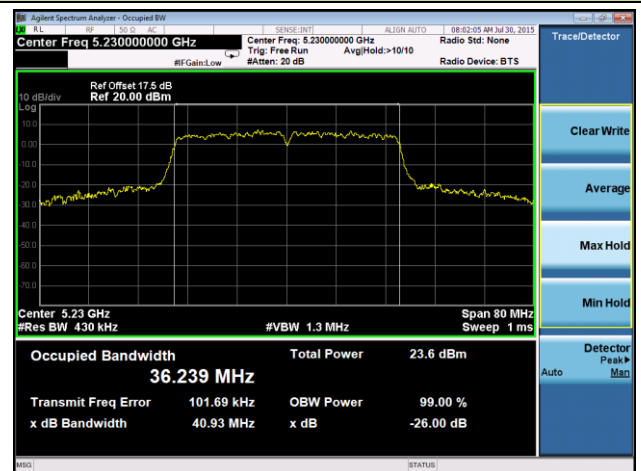


802.11n-HT40 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1

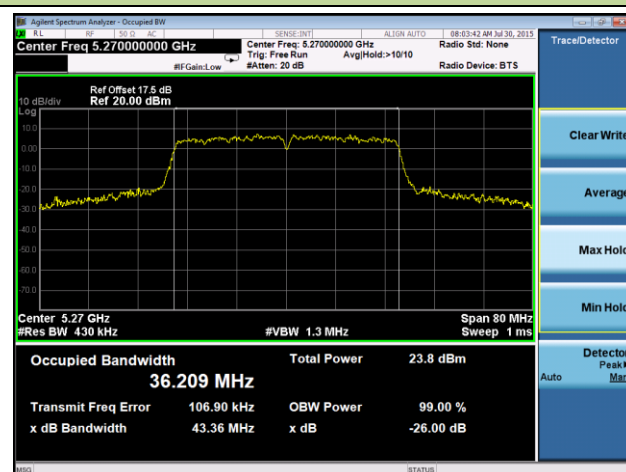
Channel 38 (5190MHz)



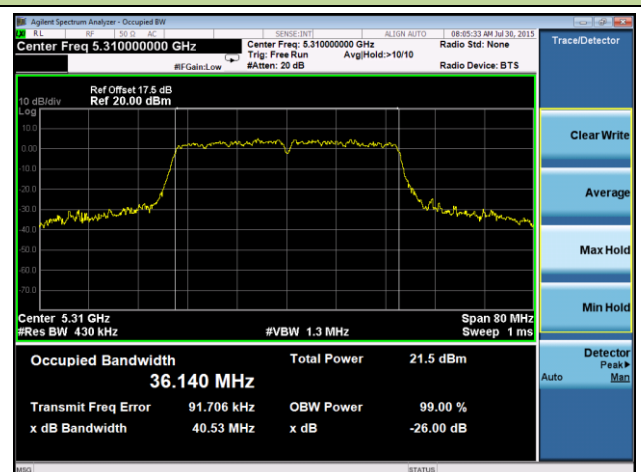
Channel 46 (5230MHz)



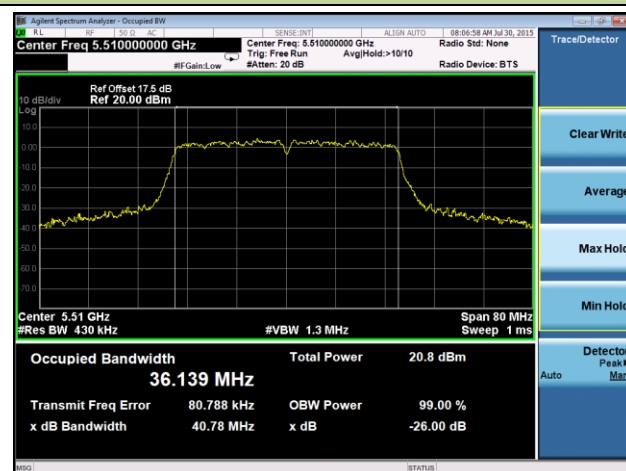
Channel 54 (5270MHz)



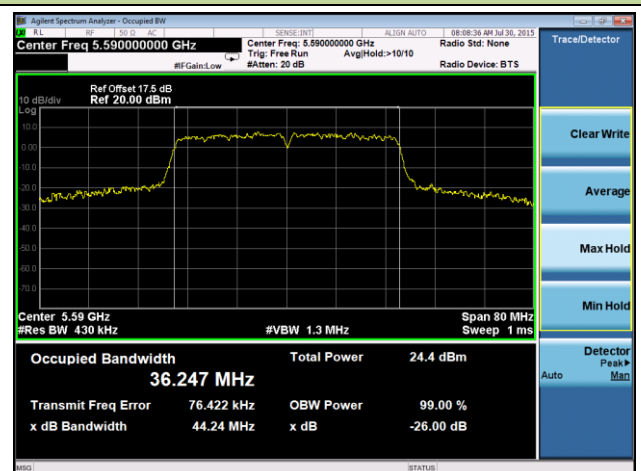
Channel 62 (5310MHz)



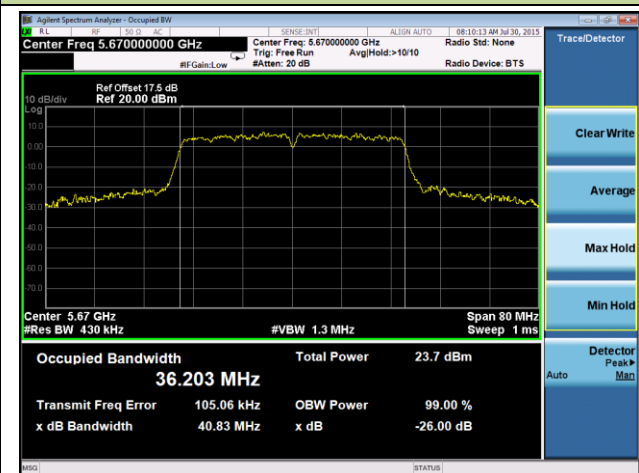
Channel 102 (5510MHz)



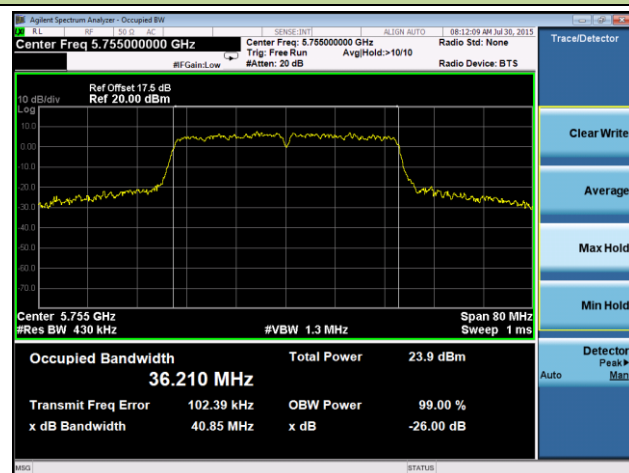
Channel 118 (5590MHz)



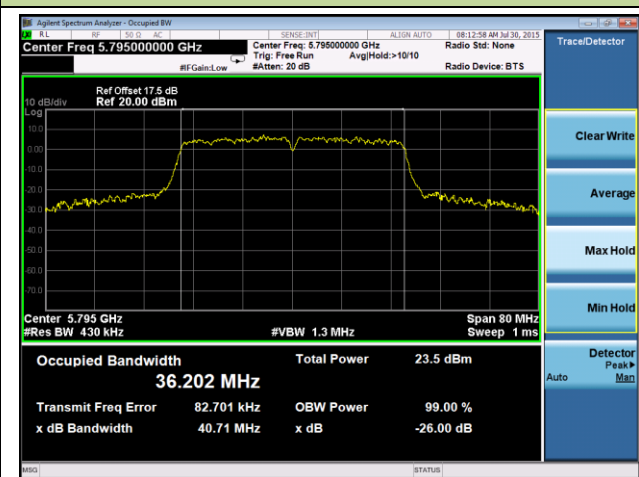
Channel 134 (5670MHz)



Channel 151 (5755MHz)

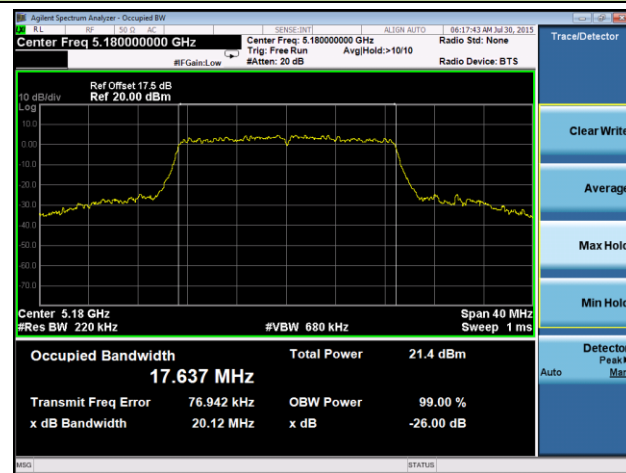


Channel 159 (5795MHz)

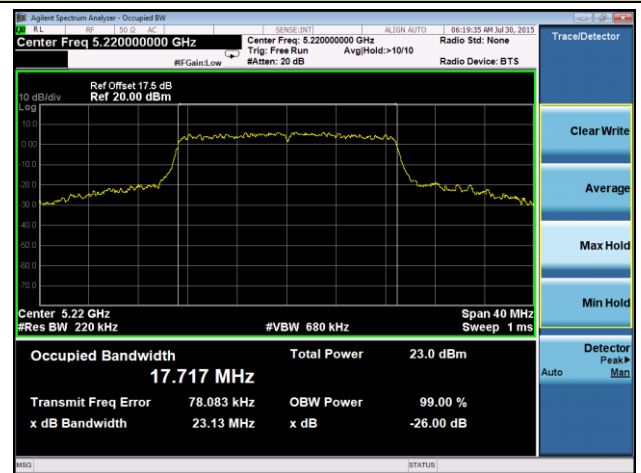


802.11ac-VHT20 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1

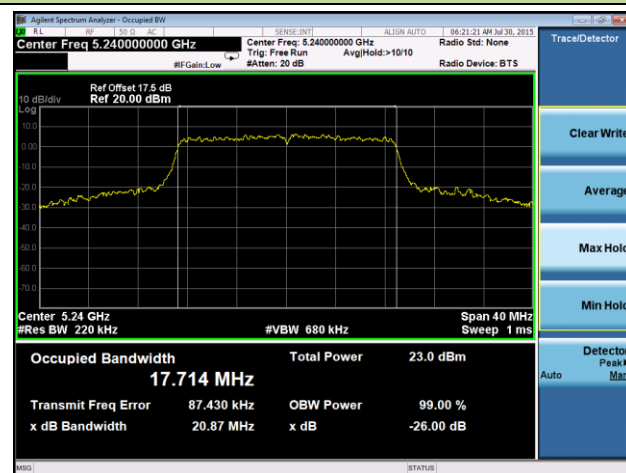
Channel 36 (5180MHz)



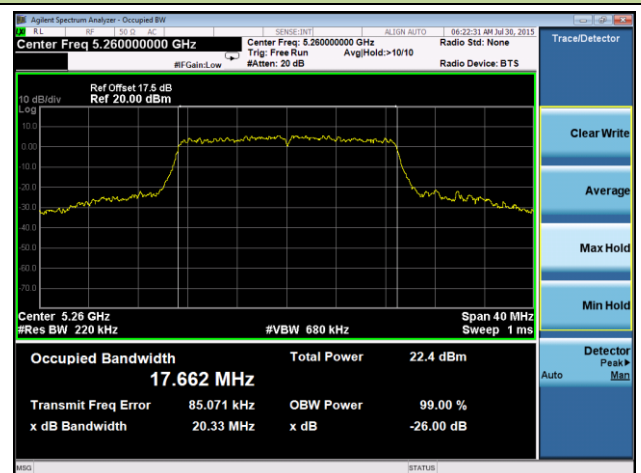
Channel 44 (5220MHz)



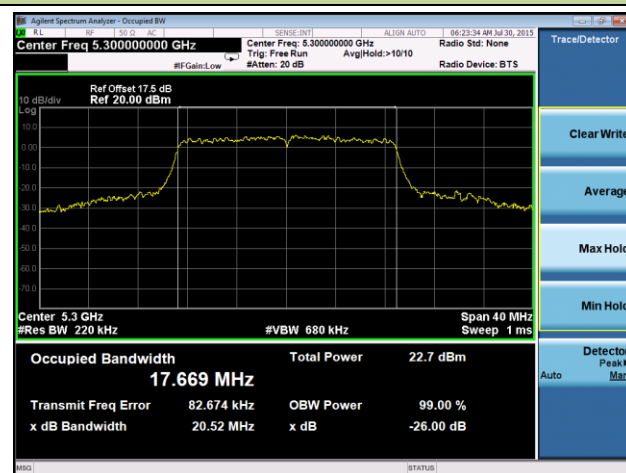
Channel 48 (5240MHz)



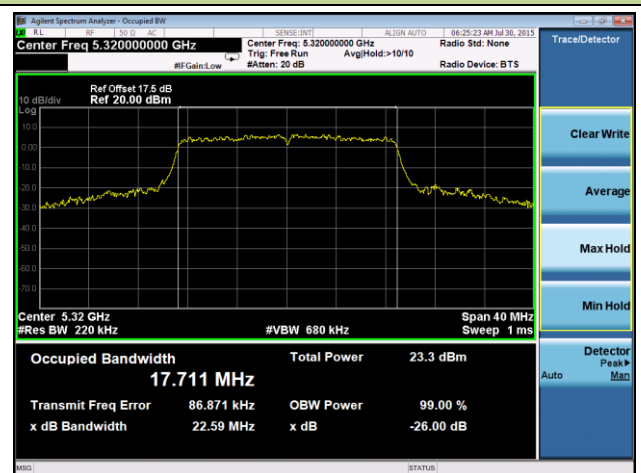
Channel 52 (5260MHz)



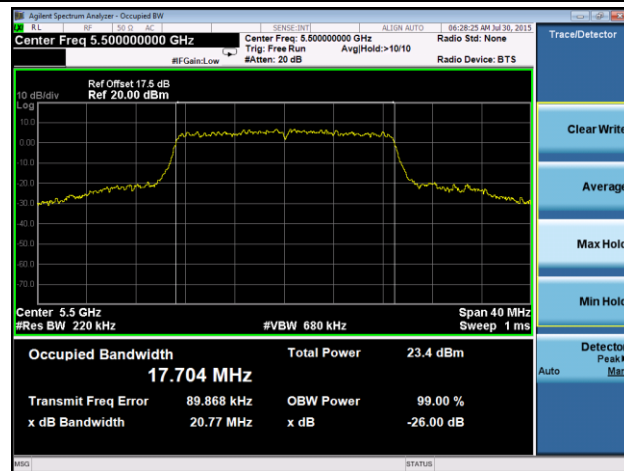
Channel 60 (5300MHz)



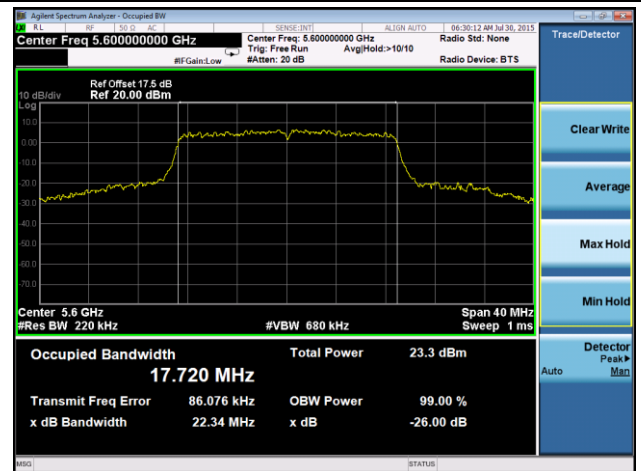
Channel 64 (5320MHz)



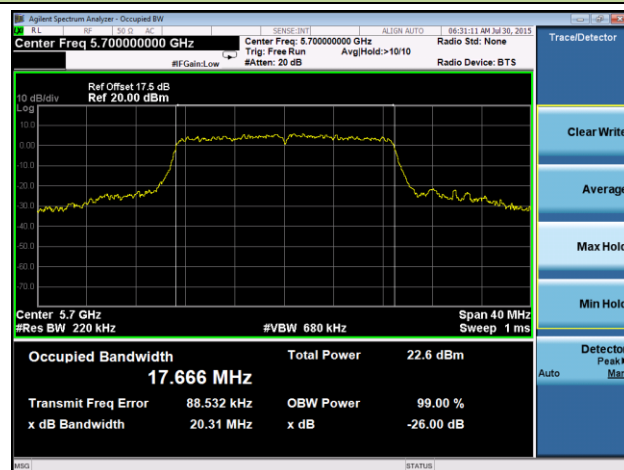
Channel 100 (5500MHz)



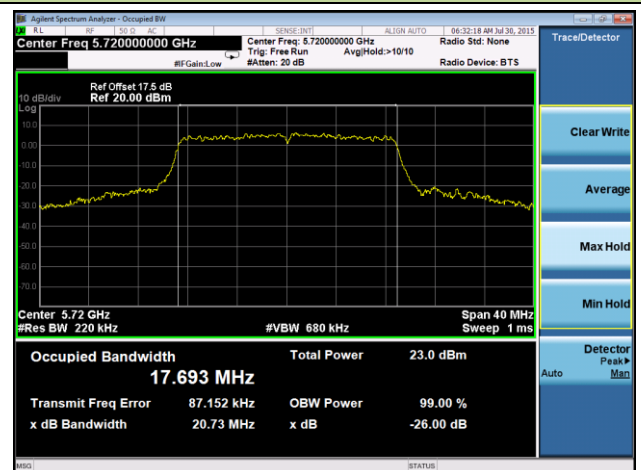
Channel 120 (5600MHz)



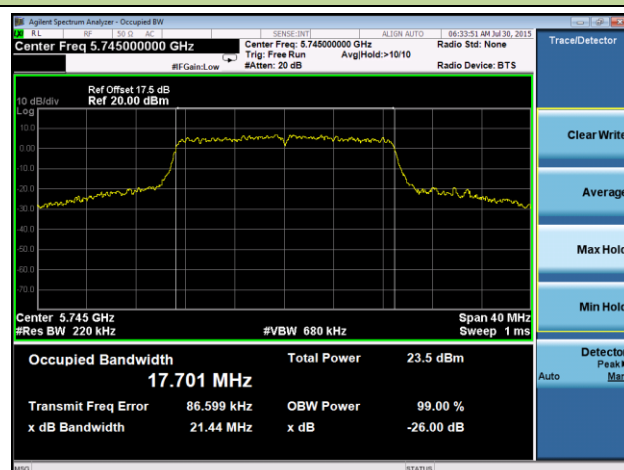
Channel 140 (5700MHz)



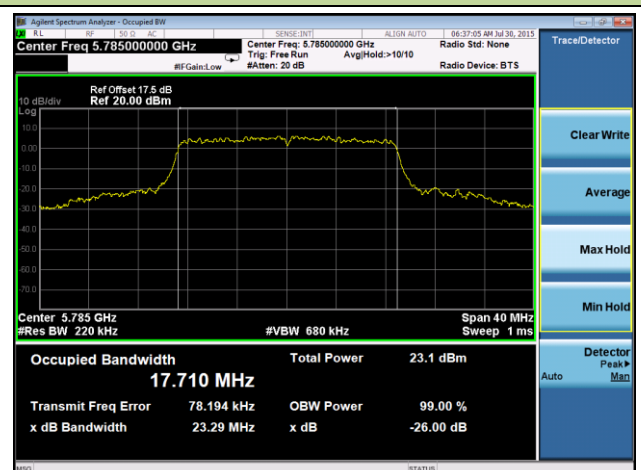
Channel 144 (5720MHz)



Channel 149 (5745MHz)



Channel 157 (5785MHz)



Channel 165 (5825MHz)

