

TEST REPORT

FCC ID: TVV-PIAPGW4

Product: Pronto Intelligent Access Point

Model No.: PIAP-11AC-M-GW4

**Additional Model No.: PC31, PC31-7455, PC31-QV, PC31-QT, PC31-QA,
PIAP-11AC-M2S-SW, PIAP-11AC-M2S-QT, PC31-IN**

Trade Mark: Pronto

Report No.: TCT171204E011

Issued Date: Jan. 10, 2017

Issued for:

Pronto Networks, Inc

1966 Tice Valley Boulevard #411 Walnut Creek, CA 94595 United States

Issued By:

Shenzhen Tongce Testing Lab.

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Appendix A: Photographs of Test Setup

1. Test Certification

Product:	Pronto Intelligent Access Point
Model No.:	PIAP-11AC-M-GW4
Additional Model No.:	PC31, PC31-7455, PC31-QV, PC31-QT, PC31-QA, PIAP-11AC-M2S-SW, PIAP-11AC-M2S-QT, PC31-IN
Trade Mark:	Pronto
Applicant:	Pronto Networks, Inc
Address:	1966 Tice Valley Boulevard #411 Walnut Creek, CA 94595 United States
Manufacturer:	Shenzhen Yunlink Technology Co., Ltd
Address:	B2 Building, An'le Industrial Zone, Hangcheng Road, Gushu, Xixiang Town, Baoan, Shenzhen, Guangdong Province, China
Date of Test:	Jan. 03, 2018 - Jan. 08, 2018
Applicable Standards:	FCC Rules and Regulations Part 15 Subpart C Section 15.247 ANSI C63.10: 2013

The above equipment has been tested by Shenzhen Tongce Testing Lab and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:

Brews Xu

Date:

Jan. 03, 2018

Brews Xu

Reviewed By:

Joe Zhou

Date:

Jan. 08, 2018

Joe Zhou

Approved By:

Tomsin

Date:

Jan. 10, 2018

Tomsin



2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna requirement	§15.203/§15.247 (c)	PASS
AC Power Line Conducted Emission	§15.207	PASS
Conducted Peak Output Power	§15.247 (b)(3) §2.1046	PASS
6dB Emission Bandwidth	§15.247 (a)(2) §2.1049	PASS
Power Spectral Density	§15.247 (e)	PASS
Band Edge	§15.247(d) §2.1051, §2.1057	PASS
Spurious Emission	§15.205/§15.209 §2.1053, §2.1057	PASS

Note:

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

3. EUT Description

Product:	Pronto Intelligent Access Point
Model No.:	PIAP-11AC-M-GW4
Additional Model No.:	PC31, PC31-7455, PC31-QV, PC31-QT, PC31-QA, PIAP-11AC-M2S-SW, PIAP-11AC-M2S-QT, PC31-IN
Trade Mark:	Pronto
Operation Frequency:	2412MHz~2462MHz (802.11b/802.11g/802.11n(HT20)) 2422MHz~2452MHz (802.11n(HT40))
MIMO type	2.4G BAND :2TX
Channel Separation:	5MHz
Number of Channel:	11 for 802.11b/802.11g/802.11n(HT20) 7 for 802.11n(HT40)
Modulation Technology: (IEEE 802.11b)	Direct Sequence Spread Spectrum (DSSS)
Modulation Technology: (IEEE 802.11g/802.11n)	Orthogonal Frequency Division Multiplexing(OFDM)
Data speed (IEEE 802.11b)	1Mbps, 2Mbps, 5.5Mbps, 11Mbps
Data speed (IEEE 802.11g)	6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps
Data speed (IEEE 802.11n)	Up to 150Mbps
Antenna Type:	reverse-SMA Antenna
Antenna Gain:	2dBi
Power supply:	AC ADAPTOR MODEL: HB18C-1201503SPA INPUT: AC100-240V 50/60Hz 0.5A OUTPUT: DC12V 1500mA
Remark:	All above models are identical in the same PCB layout, interior structure and electrical circuits. The differences are color and model name for commercial purpose.

Operation Frequency each of channel For 802.11b/g/n(HT20)

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		

Operation Frequency each of channel For 802.11n (HT40)

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
--	--	4	2427MHz	7	2442MHz	--	--
--	--	5	2432MHz	8	2447MHz	--	--
3	2422MHz	6	2437MHz	9	2452MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

802.11b/802.11g/802.11n (HT20)

Channel	Frequency
The lowest channel	2412MHz
The middle channel	2437MHz
The Highest channel	2462MHz

802.11n (HT40)

Channel	Frequency
The lowest channel	2422MHz
The middle channel	2437MHz
The Highest channel	2452MHz

4. Genera Information

4.1. Test environment and mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations(The value of duty cycle is 98.46%)
<p>The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. For the full battery state and The output power to the maximum state.</p>	

<p>We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:</p>	
Per-scan all kind of data rate in lowest channel, and found the follow list which It was worst case.	
Mode	Data rate
802.11b	1Mbps
802.11g	6Mbps
802.11n(H20)	6.5Mbps
802.11n(H40)	13.5Mbps
Final Test Mode:	
Operation mode:	Keep the EUT in continuous transmitting with modulation
<p>1. For WIFI function, the engineering test program was provided and enabled to make EUT continuous transmit/receive.</p> <p>2. According to ANSI C63.10 standards, the test results are both the “worst case” and</p>	

“worst setup” 1Mbps for 802.11b, 6Mbps for 802.11g, 6.5Mbps for 802.11n(H20), 13.5Mbps for 802.11(H40). Duty cycle setting during the transmission is 98.5% with maximum power setting for all modulations.

4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. For conducted measurements (Output Power, 6dB Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

5. Facilities and Accreditations

5.1. Facilities

The test facility is recognized, certified, or accredited by the following organizations:

- FCC - Registration No.: 645098

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

5.2. Location

Shenzhen Tongce Testing Lab

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

TEL: +86-755-27673339

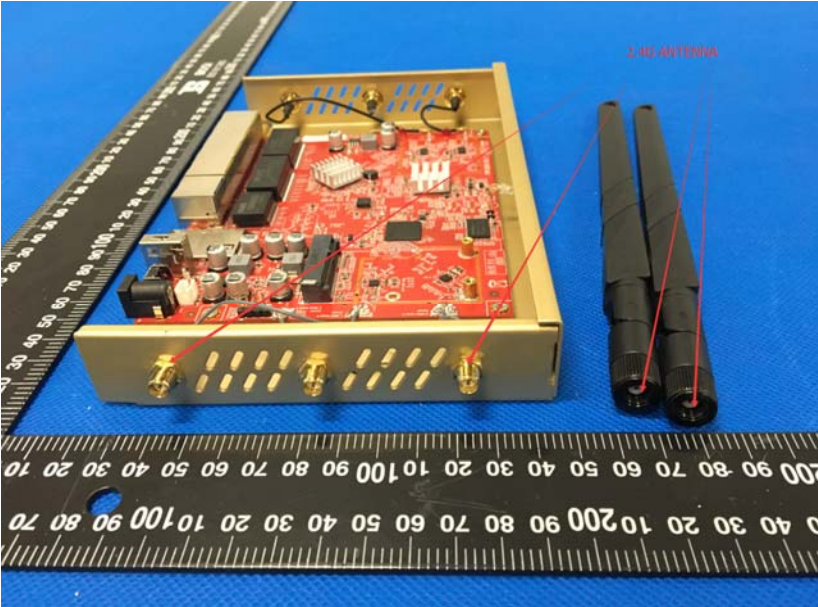
5.3. Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	$\pm 2.56\text{dB}$
2	RF power, conducted	$\pm 0.12\text{dB}$
3	Spurious emissions, conducted	$\pm 0.11\text{dB}$
4	All emissions, radiated(<1G)	$\pm 3.92\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^\circ\text{C}$
7	Humidity	$\pm 1.0\%$

6. Test Results and Measurement Data

6.1. Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
<p>15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <p>15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.</p>	
E.U.T Antenna:	
<p>The WIFI antenna is reverse-SMA Antenna which permanently attached, and the best case gain of the antenna is Antenna port 1:2dBi and Antenna port 2:2dBi.</p>	
	

6.2. Conducted Emission

6.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.207														
Test Method:	ANSI C63.10:2013														
Frequency Range:	150 kHz to 30 MHz														
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto														
Limits:	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>	Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)														
	Quasi-peak	Average													
0.15-0.5	66 to 56*	56 to 46*													
0.5-5	56	46													
5-30	60	50													
Test Setup:	<p><i>Remark</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>														
Test Mode:	Charging + transmitting with modulation														
Test Procedure:	<ol style="list-style-type: none"> 1. The E.U.T is connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement. 														
Test Result:	PASS														

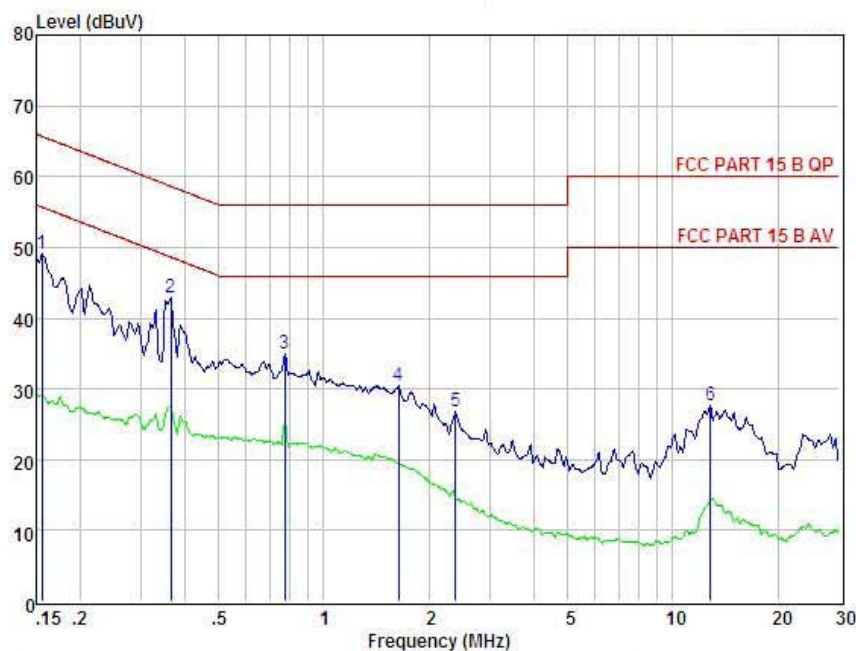
6.2.2. Test Instruments

Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	R&S	ESPI	101401	Jun. 12, 2018
LISN	Schwarzbeck	NSLK 8126	8126453	Sep. 27, 2018
Coax cable (9KHz-30MHz)	TCT	CE-05	N/A	Sep. 27, 2018
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.2.3. Test data

Please refer to following diagram for individual Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



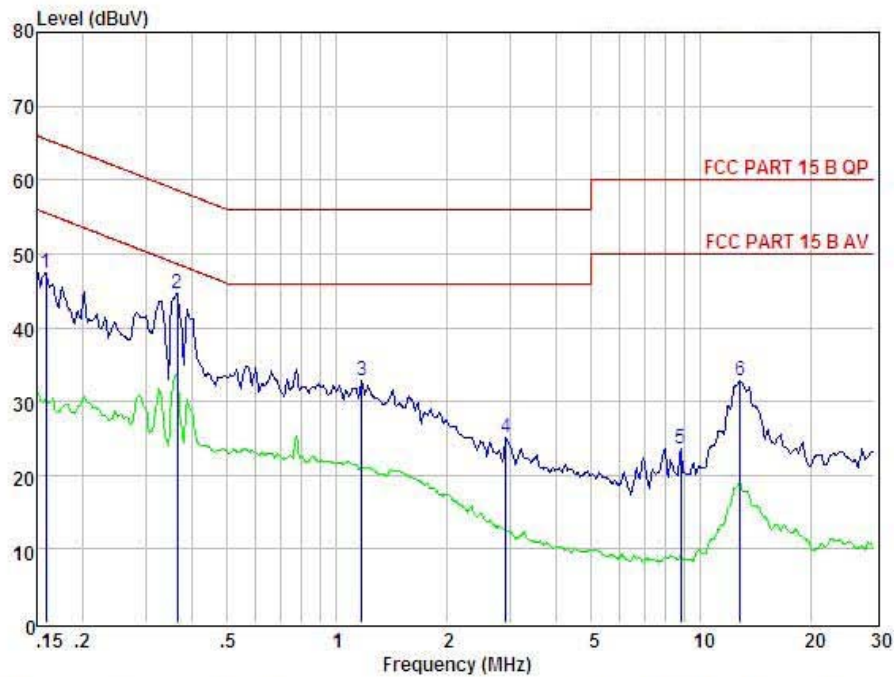
Condition		: FCC PART 15 B QP		POL: LINE		Temp: 23.1°C		Hum: 48 %	
Item	Freq MHz	Read Level dBuV	LISN Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	0.156	39.43	0.03	-9.52	0.10	49.08	65.69	-16.61	Peak
2	0.365	33.28	0.03	-9.57	0.10	42.98	58.61	-15.63	Peak
3	0.775	25.30	0.00	-9.60	0.10	35.00	56.00	-21.00	Peak
4	1.636	20.63	0.05	-9.69	0.10	30.47	56.00	-25.53	Peak
5	2.384	16.81	0.06	-9.75	0.11	26.73	56.00	-29.27	Peak
6	12.852	17.37	0.23	-9.89	0.22	27.71	60.00	-32.29	Peak

Remark: Level = Read Level + LISN Factor - Preamp Factor + Cable Loss

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss
4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)



Item	Freq MHz	Read Level dBuV	LISN Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	0.159	37.80	0.03	-9.52	0.10	47.45	65.52	-18.07	Peak
2	0.365	35.01	0.03	-9.57	0.10	44.71	58.61	-13.90	Peak
3	1.172	23.08	0.04	-9.65	0.10	32.87	56.00	-23.13	Peak
4	2.915	15.18	0.07	-9.79	0.12	25.16	56.00	-30.84	Peak
5	8.822	13.36	0.16	-9.95	0.18	23.65	60.00	-36.35	Peak
6	12.852	22.42	0.23	-9.89	0.22	32.76	60.00	-27.24	Peak

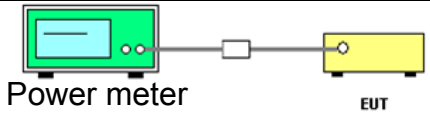
Remark: Level = Read Level + LISN Factor - Preamp Factor + Cable Loss

Notes:

5. An initial pre-scan was performed on the line and neutral lines with peak detector.
6. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
7. Final Level = Receiver Read level + LISN Factor + Cable Loss
8. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

6.2.4. Maximum Conducted (Peak) Output Power

6.2.5. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	KDB 558074
Limit:	30dBm
Test Setup:	 <p>The diagram illustrates the test setup. On the left is a green power meter. A cable connects it to a small white attenuator. Another cable connects the attenuator to a yellow EUT (Equipment Under Test).</p>
Test Mode:	Transmitting mode with modulation
Test Procedure:	<ol style="list-style-type: none"> 1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v04. 2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Measure the conducted output power and record the results in the test report.
Test Result:	PASS

6.2.6. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Power Meter	R&S	NRVD	SEL0069	Sep. 27, 2018
Power Sensor	R&S	URV5-Z2	SEL0071	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018


Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.2.7. Test Data

Test Channel	Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)			LIMIT dBm
		Antenna port 1	Antenna port 2	MIMO	
TX 802.11b Mode					
CH01	2412	13.26	13.35	/	30
CH06	2437	13.11	13.09	/	30
CH11	2462	12.89	13.27	/	30
TX 802.11g Mode					
CH01	2412	12.84	12.72	/	30
CH06	2437	12.67	12.64	/	30
CH11	2462	12.52	12.48	/	30
TX 802.11n20 Mode					
CH01	2412	12.43	12.59	15.52	30
CH06	2437	12.28	12.31	15.30	30
CH11	2462	12.15	12.05	15.11	30
TX 802.11n40 Mode					
CH03	2422	11.67	11.54	14.61	30
CH06	2437	11.51	11.38	14.45	30
CH09	2452	11.44	11.23	14.34	30
Note: This product supports antenna 1 and antenna 2 launch, but only support 802.11 n for MIMO mode, not support 802.11 b and 802.11 g for MIMO mode.					

6.3. Emission Bandwidth

6.3.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	KDB 558074
Limit:	>500kHz
Test Setup:	 <p style="text-align: center;">Spectrum Analyzer EUT</p>
Test Mode:	Transmitting mode with modulation
Test Procedure:	<ol style="list-style-type: none"> 1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v04. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz. 4. Measure and record the results in the test report.
Test Result:	PASS

6.3.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.3.3. Test data

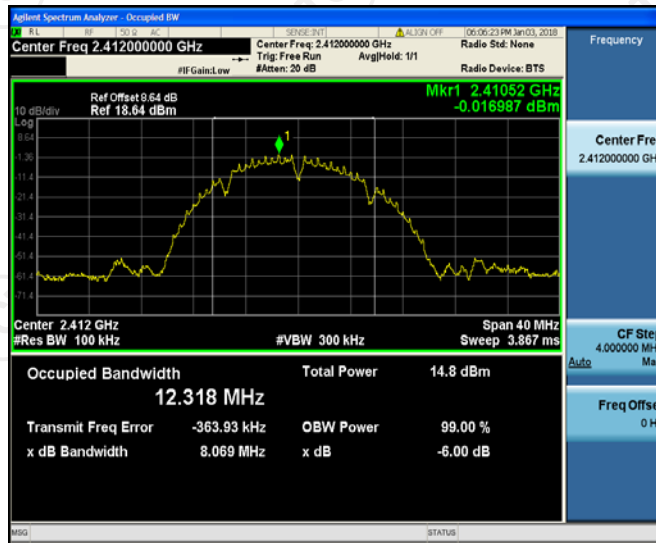
For antenna port 1

Test channel	6dB Emission Bandwidth (MHz)			
	802.11b	802.11g	802.11n(H20)	802.11n(H40)
Lowest	8.069	14.23	12.62	35.89
Middle	7.114	12.87	13.88	21.31
Highest	7.140	15.21	15.08	35.12
Limit:	≥500 (kHz)			
Test Result:	PASS			

Test plots as follows:

802.11b Modulation

Lowest channel



Middle channel



Highest channel



802.11g Modulation

Lowest channel



Middle channel



Highest channel



802.11n (HT20) Modulation

Lowest channel



Middle channel



Highest channel



802.11n (HT40) Modulation

Lowest channel



Middle channel



Highest channel



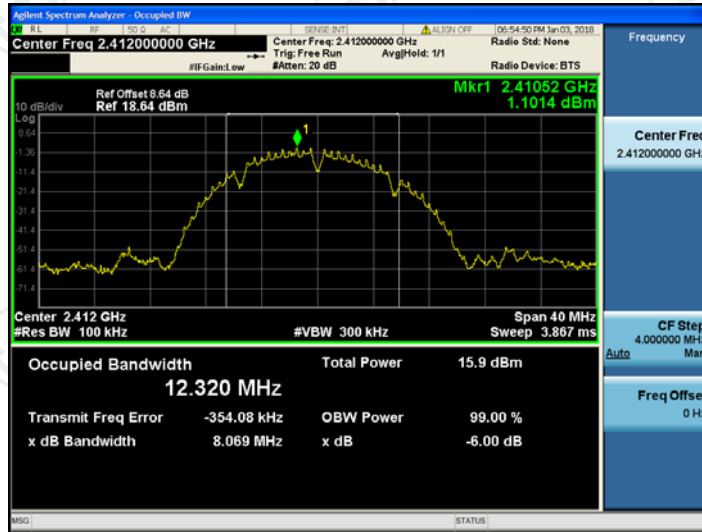
For antenna port 2

Test channel	6dB Emission Bandwidth (MHz)			
	802.11b	802.11g	802.11n(H20)	802.11n(H40)
Lowest	8.069	14.25	12.56	35.80
Middle	7.114	13.21	13.88	22.58
Highest	7.141	15.35	15.13	35.16
Limit:	≥500 (kHz)			
Test Result:	PASS			

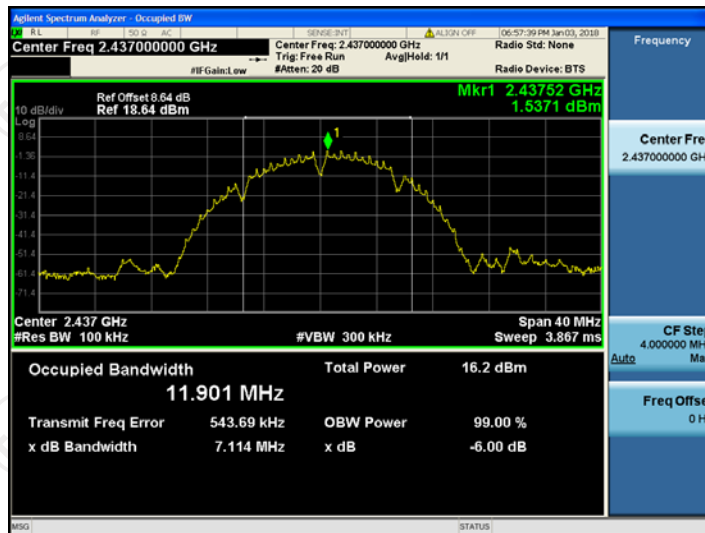
Test plots as follows:

802.11b Modulation

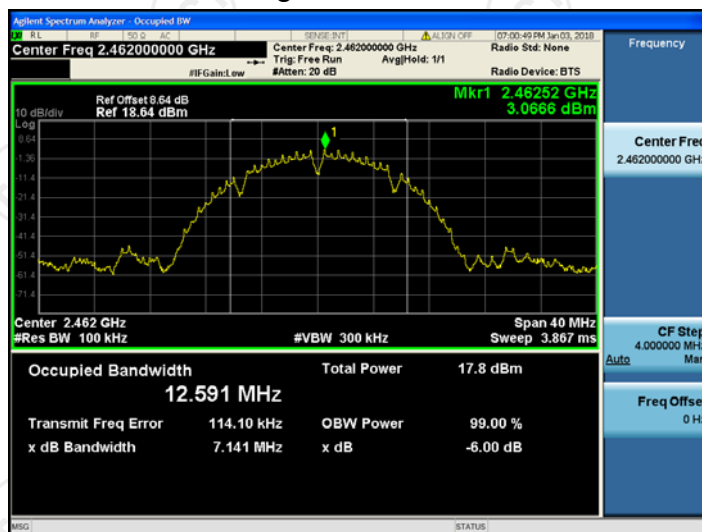
Lowest channel



Middle channel

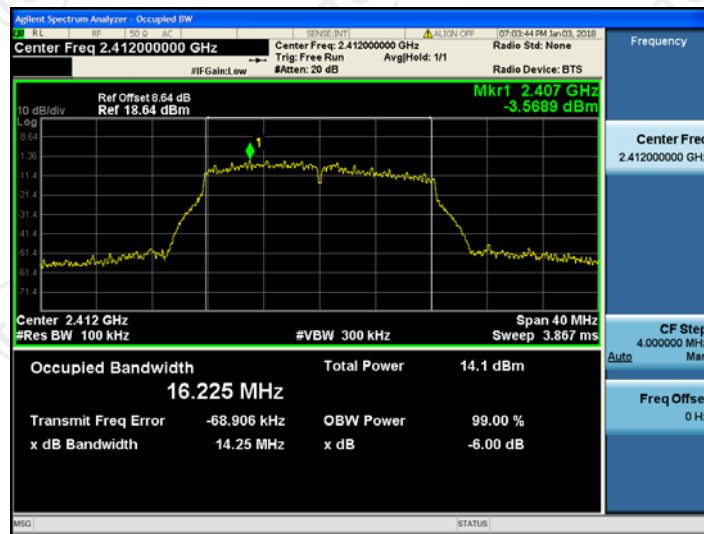


Highest channel

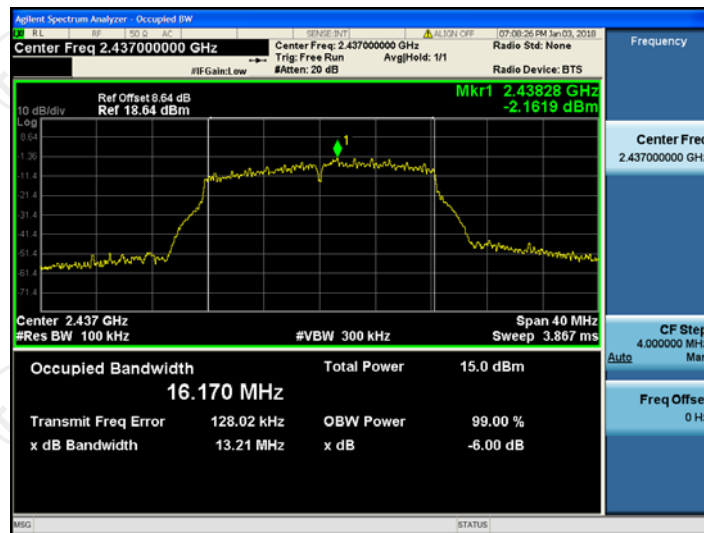


802.11g Modulation

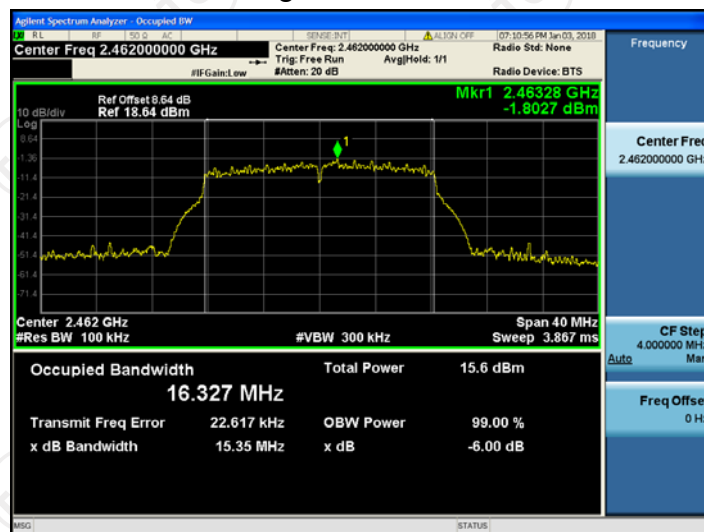
Lowest channel



Middle channel



Highest channel



802.11n (HT20) Modulation

Lowest channel



Middle channel

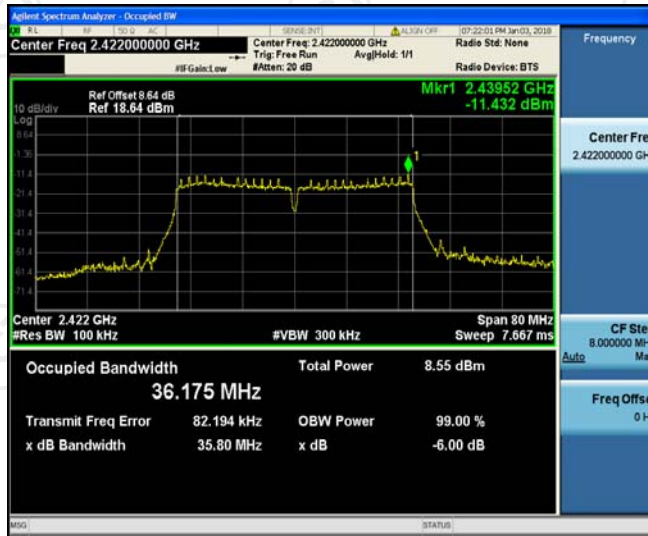


Highest channel



802.11n (HT40) Modulation

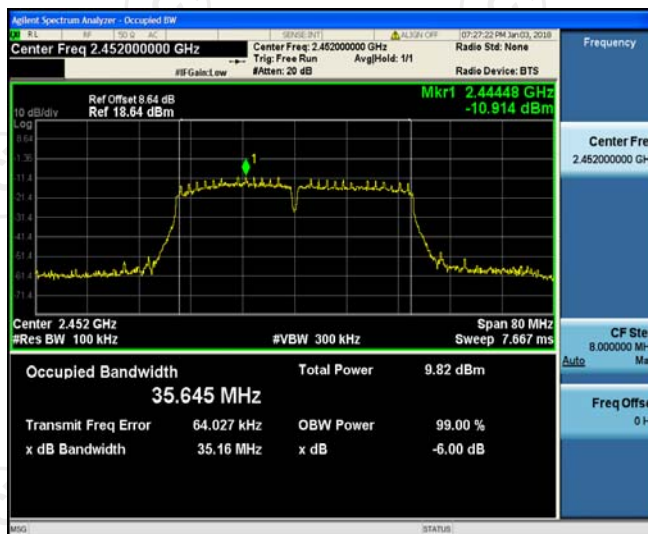
Lowest channel



Middle channel



Highest channel



6.4.3. Test data

For antenna port 1

Test channel	AVG Power Spectral Density (dBm/3kHz)			
	802.11b	802.11g	802.11n(H20)	802.11n(H40)
Lowest	-0.787	-9.476	-10.765	-15.096
Middle	0.572	-8.167	-10.419	-12.061
Highest	1.538	-7.825	-9.632	-13.228
Limit:	8 (dBm/3kHz)			
Test Result:	PASS			

Test plots as follows:

802.11b Modulation

Lowest channel



Middle channel



Highest channel



802.11g Modulation

Lowest channel



Middle channel



Highest channel

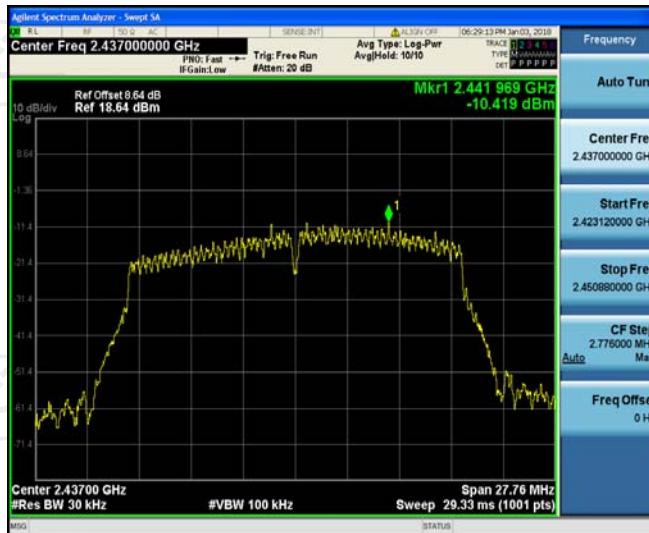


802.11n (HT20) Modulation

Lowest channel



Middle channel

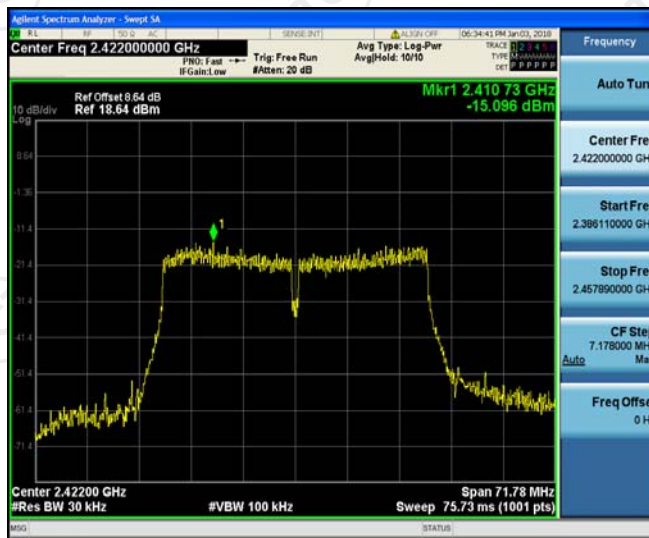


Highest channel



802.11n (HT40) Modulation

Lowest channel



Middle channel



Highest channel



For antenna port 2

Test channel	AVG Power Spectral Density (dBm/3kHz)			
	802.11b	802.11g	802.11n(H20)	802.11n(H40)
Lowest	1.030	-8.180	-11.885	-17.735
Middle	1.463	-6.908	-11.302	-14.538
Highest	-1.712	-6.909	-10.902	-15.580
Limit:	8 (dBm/3kHz)			
Test Result:	PASS			

Test plots as follows:

802.11b Modulation

Lowest channel



Middle channel



Highest channel



802.11g Modulation

Lowest channel



Middle channel



Highest channel

