Compliance Testing, LLC
Previously Flom Test Lab
EMI, EMC, RF Testing Experts Since 1963

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Test Report

Prepared for: Proxim Wireless

Model: NGP1058

Description: 802.11ac PCIe Module

Serial Number: N/A

FCC ID: HZB-NGP1058W
IC: 1856A-NGP1058W

To

FCC Part 90 Y

And

RSS-111, Issue 5 September 2014

Date of Issue: March 10, 2017

On the behalf of the applicant:	**Proxim Wireless** **47633 Westinghouse Dr.** **Fremont, CA 95131**
Attention of:	**Cor Van de Water, Sr. Regulatory and Compliance Manager** **Ph: (408)383-7626** **E-Mail: cwater@proxim.com**

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Project No: p16b0011

Poona Saber
Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	December 29, 2016	Poona Saber	Original Document
2.0	February 16,2016	Poona Saber	Updated mask L requirements, replace KDB 789033 with 971168. Removed notch filer from page 14, replace frequency counter with spectrum analyzer, fixed mask measurement plots
3.0	March 9, 2017	Poona Saber	Updated power and power spectral density tables based on new data taken, Updated measurement procedure for PSD, Annex B and Annex C updated based on new data and limits
4.0	March 10, 2017	Poona Saber	Note added on page 14

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ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to http://www.compliancetesting.com/labscope.html for current scope of accreditation.

Testing Certificate Number: **2152.01**

FCC Site Reg. #349717

IC Site Reg. #2044A-2

Non-accredited tests contained in this report:

N/A

The Applicant has been cautioned as to the following:

15.21: **Information to the User**

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a): **Special Accessories**

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

Test and Measurement Data

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II, Part 2, Subpart J, Sections 2.947, 2.1033(c), 2.1041, 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, and the following individual Parts: FCC Part 90.

Standard Test Conditions and Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing.

In accordance with ANSI/TIA 603C, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the particular equipment requirements specified testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Environmental Conditions		
Temp (ºC)	**Humidity (%)**	**Pressure (mbar)**
23.8 – 24.5	21 - 28	961 - 968

Measurement results, unless otherwise noted, are worst-case measurements.

EUT Description
Model: NGP1058
Description: 802.11ac PCIe Module
Firmware: N/A
Software: N/A
Serial Number: N/A
Additional Information: The EUT is a 2x2 MIMO, 802.11 ac Module running with an extension cable outside of the host and it's powered by POE. It uses panel antenna of 23 dBi for point to point applications and 10 dBi omni and 17 dBi sector antenna for point to multi point applications.

EUT Operation during Tests
The EUT was controlled using the manufacturers HTML terminal

Accessories:

Qty	Description	Manufacturer	Model	S/N
1	POE Power Supply	SL Power	N/A	N/A

Cables:

Qty	Description	Length (M)	Shielding Y/N	Shielded Hood Y/N	Termination
2	Ethernet cable	<3m	N	N	N/A

Modifications: None

Test Result Summary

Specification	Test Name	Pass, Fail, N/A	Comments
90.205 90.1215	Carrier Output Power (Conducted)	Pass	
90.205, 90.1215	Peak Power Spectral Density	Pass	
90.1215	Peak Excursion	Pass	
2.1051 90.210	Unwanted Emissions (Transmitter Conducted)	Pass	
2.1053 90.210	Field Strength of Spurious Radiation	Pass	
90.210, 2.1049	Emission Masks (Occupied Bandwidth)	Pass	
90.209	Bandwidth	Pass	
2.1055 90.213	Frequency Stability (Temperature Variation)	Pass	
2.1055 90.213	Frequency Stability (Voltage Variation)	Pass	

Carrier Output Power (Conducted)
Engineer: Poona Saber
Test Date: 12/8/2016

Test Requirements

According to § 90.1215 (a)

(1) The maximum conducted output power should not exceed:

Channel Bandwidth (MHz)	Low Power Maximum Conducted Output Power (dBm)
20	20

(2) Low power devices are also limited to a peak power spectral density of 8 dBm per one MHz. Low power devices using channel bandwidths other than those listed above are permitted; however, they are limited to a peak power spectral density of 8 dBm/MHz. If transmitting antennas of directional gain greater than 9 dBi are used, both the maximum conducted output power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi.

Measurement Procedure

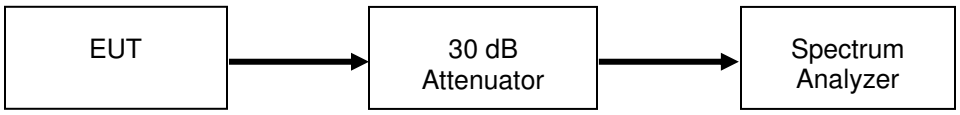
The Equipment Under Test (EUT) was connected to a spectrum analyzer through a 30 dB Power attenuator. All cable and attenuator losses were input into the spectrum analyzer as a reference level offset to ensure accurate readings were obtained.

The RF power was calculated using the spectrum analyzers' band power function per KDB 971168 D02. Measurements were made at the low, mid, and high channels of the band.

The Spectrum Analyzer was set to the following:

a. RBW = 1-5% of the OBW, not to exceed 1 MHz
b. VBW ≥ 3 x RBW MHz
c. Sweep time = auto
d. Detector = RMS
e. 100 traces in power averaging mode

Test Setup



Low Power Transmitter Peak Output Power

Bandwidth (MHz)	Test Frequency (MHz)	TP	JA Measured Level (dBm)	JB Measured Level (dBm)	JA Measured Level (mW)	JB Measured Level (mW)	Combined Output Power (dBm)	Limit (dBm)	Margin (dB)
20 ptm	4950	20	-1.9	-5.9	0.7	0.3	-0.4	12	-12.4
20 ptm	4965	20	-1.4	-5.5	0.7	0.3	0.0	12	-12.0
20 ptm	4980	20	-1.0	-5.0	0.8	0.3	0.5	12	-11.5
20 ptp	4950	27	-6.2	-9.7	0.2	0.1	-4.6	6	-10.6
20 ptp	4965	27	-5.6	-8.8	0.3	0.1	-3.9	6	-9.9
20 ptp	4980	27	-5.8	-8.2	0.3	0.2	-3.8	6	-9.8

Peak Power Spectral Density
Engineer: Poona Saber
Test Date: 12/8/2016

Test Requirements

According to § 90.1215 (a)

(1) The maximum Power Spectral Density should not exceed:

Channel Bandwidth (MHz)	Low Power Maximum Conducted Output Power (dBm)
20	8

(2) Low power devices are also limited to a peak power spectral density of 8 dBm per one MHz. Low power devices using channel bandwidths other than those listed above are permitted; however, they are limited to a peak power spectral density of 8 dBm/MHz. If transmitting antennas of directional gain greater than 9 dBi are used, both the maximum conducted output power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi.

Measurement Procedure

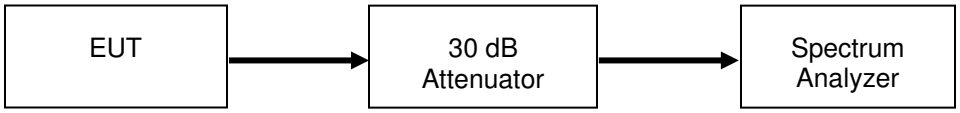
The Equipment Under Test (EUT) was connected to a spectrum analyzer through a 30 dB Power attenuator. All cable and attenuator losses were input into the spectrum analyzer as a reference level offset to ensure accurate readings were obtained.

The Power Spectral Density was measured per KDB 971168 D02. Measurements were made at the low, mid, and high channels of the band. The maximum PSD was determine by finding the peak value across the carrier bandwidth.

The Spectrum Analyzer was set to the following:

a. RBW = 1 MHz
b. VBW ≥ 3 MHz
c. Span 1.5 * BW
d. Sweep time = auto
e. Detector = Peak
f. Trace mode: Max Hold
g. Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the specifies reference bandwidth (PSD)

Test Setup



Power Spectral Density

Bandwidth (MHz)	Test Frequency (MHz)	Data Rate	TP	JA Measured Level (dBm)	JB Measured Level (dBm)	JA Measured Level (mW)	J B Measured Level (mW)	Combined Spectral Density (dBm)	Limit (dBm)	Margin (dB)
20 ptm	4950	vt0	20	-2.2	-6.4	0.6	0.2	-0.8	0	-0.8
20 ptm	4965	vt0	20	-1.6	-5.4	0.7	0.3	-0.1	0	-0.1
20 ptm	4980	vt0	20	-2.0	-6.0	0.6	0.3	-0.5	0	-0.5
20 ptp	4950	vt0	27	-8.2	-12.5	0.2	0.1	-6.8	-6	-0.8
20 ptp	4965	vt0	27	-7.5	-11.8	0.2	0.1	-6.1	-6	-0.1
20 ptp	4980	vt0	27	-7.7	-11.2	0.2	0.1	-6.1	-6	-0.1

Peak Excursion
Engineer: Poona Saber
Test Date: 11/22/2016

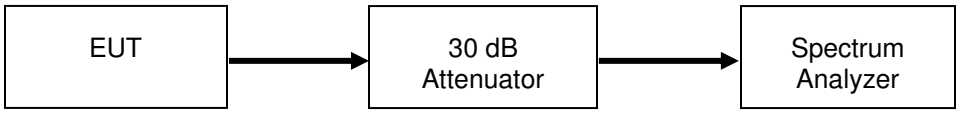
Test Requirements

According to 90.1215 (e) the ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Test Procedure

1. Set the spectrum analyzer or EMI receiver span to view the entire emission bandwidth.
2. Find the maximum of the peak-max-hold spectrum.
3. Set RBW = 1 MHz.
4. VBW ≥ 3 MHz.
5. Detector = peak.
6. Trace mode = max-hold.
7. Allow the sweeps to continue until the trace stabilizes.
8. Use the peak search function to find the peak of the spectrum.
9. Compute the ratio of the modulation envelope (measured using a peak hold function) to the maximum conducted output power

Test Setup



See Annex A for Test Results

Conducted Spurious Emissions
Engineer: Poona Saber
Test Date: 11/11/2016

Standard Applicable

According to § 90.210 Emission masks L:

For low power transmitters (20 dBm or less) operating in the 4940-4990 MHz frequency band, the power spectral density of the emissions must be attenuated below the output power of the transmitter as follows:

(1) On any frequency removed from the assigned frequency between 0-45% of the authorized bandwidth (BW): 0 dB.

(2) On any frequency removed from the assigned frequency between 45-50% of the authorized bandwidth: 219 log (% of (BW)/45) dB.

(3) On any frequency removed from the assigned frequency between 50-55% of the authorized bandwidth: 10 + 242 log (% of (BW)/50) dB.

(4) On any frequency removed from the assigned frequency between 55-100% of the authorized bandwidth: 20 + 31 log (% of (BW)/55) dB attenuation.

(5) On any frequency removed from the assigned frequency between 100-150% of the authorized bandwidth: 28 + 68 log (% of (BW)/100) dB attenuation.

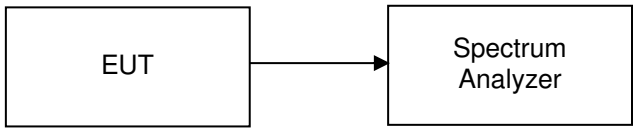
(6) On any frequency removed from the assigned frequency above 150% of the authorized bandwidth: 40 dB.

Test Procedure

The EUT was connected directly to a spectrum analyzer to verify that the UUT met the requirements for spurious emissions. The resolution bandwidth set for 100 kHz < 1GHz and 1MHz >1 GHz the reference level was adjusted to ensure the system had sufficient dynamic range to measure spurious emissions. The frequency range from 30 MHz to the 10^{th} harmonic of the fundamental transmitter was observed and plotted.

Note: for beyond 150% of the occupied bandwidth extra investigation has been done with higher number of points to meet the 2 x span/RBW and no extra emissions were observed.

Test Setup



See Annex B for Test Results

Field Strength of Spurious Radiation
Engineer: Poona Saber
Test Date: 12/23/2016

Test Procedure

The EUT was setup in accordance with ANSI C63.10. 2013 and tested per KDB 971168. The antenna was replaced with non-radiating matched load. The EUT is placed on non-conductive platform at a height of 0.8 meters above the ground plane of the semi-anechoic chambers. The EUT was rotated 360 degrees and the receive antenna raised and lowered to find the maximum emissions from 30MHz to the 10th harmonic of the fundamental. The EUT was set to the maximum power level allowed and the low, mid, and high channels were investigated for emissions.

Only noise floor was seen past 18 GHz

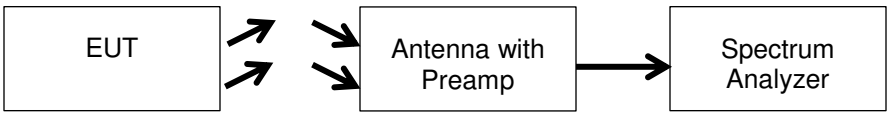
The Spectrum Analyzer was set to the following for emissions > 1000MHz:

a. (RBW = 1 MHz
b. VBW ≥ 3 MHz
c. Detector = Peak
d. Sweep time = auto
e. Trace mode = max hold
f. RBW = 1 MHz
g. VBW ≤ RBW/100 (i.e., 10 kHz) but not less than 10Hz

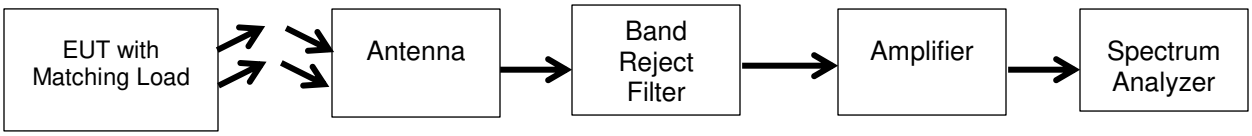
For emissions below 1000MHz the Spectrum Analyzer settings were as follows:

a. RBW = 100 kHz
b. VBW ≥ 300 kHz
c. Detector = Peak
d. Sweep time = auto
e. Trace mode = max hold

Test Setup below 1000MHz



Test Setup above 1000MHz



See Annex C for Test Results

Emission Masks and Occupied Bandwidth
Engineer: Poona Saber
Test Date: 12/8/2016

Measurement Procedure

According to 90.209 and 90.210 Bandwidth limitations this test was performed to measure transmitter occupied bandwidth and the EUT was connected directly to a spectrum analyzer to verify that the EUT meets the required emissions mask. L.

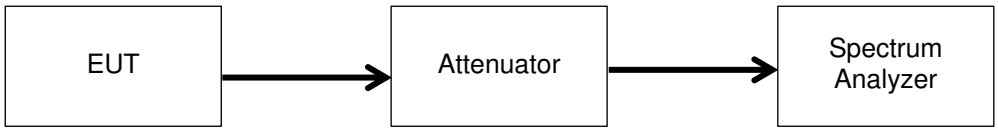
For the Emissions Band width measurements the spectrum analyzer was set to the following parameters:

1) Set RBW = 1-5% of occupied bandwidth
2) Set the VBW > RBW.
3) Trace mode = max hold.
4) Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

For the Emissions Mask measurements the spectrum analyzer was set to the following parameters:

1) Set RBW = at least 1% of the emission bandwidth.
2) Set the VBW= 30kHz
3) Trace mode = max hold.
4) Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

Test Setup



See Annex D for Test Results

Frequency Stability (Temperature and Voltage Variation)

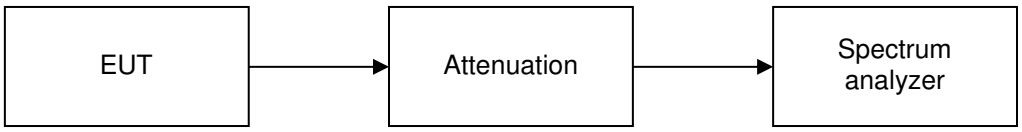
Engineer: Poona Saber

Test Date: 12/22/2016

Measurement Procedure

The EUT was placed in an environmental test chamber and the RF output was connected directly to a spectrum analyzer. The temperature was varied from -30°C to 50°C in 10°C increments. After a sufficient time for temperature stabilization the RF output frequency was measured. At 20°C the power supply voltage to the EUT was varied from 85% to 115% of the nominal value and the RF output was measured.

Measurement Setup



See Annex E for Test Results

Test Equipment Utilized

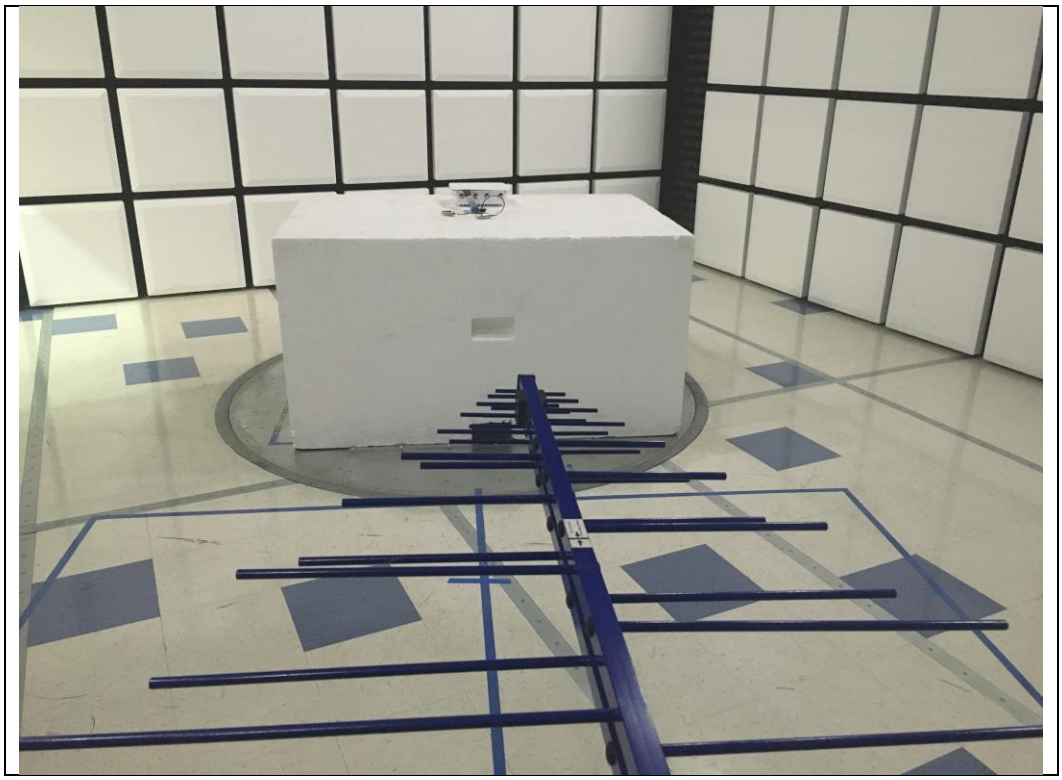
Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Temperature Chamber	Tenney	Tenney Jr	i00027	Verified on: 6/20/16	
Horn Antenna	EMCO	3115	i00103	1/20/15	1/20/17
Horn Antenna, Amplified	ARA	MWH-1826/B	i00273	4/22/15	4/22/18
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	5/26/16	5/26/17
Spectrum Analyzer	Agilent	E4407B	i00331	9/18/15	9/18/16
Data Logger	Fluke	Hydra Data Bucket	i00343	4/5/16	4/5/17
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	10/19/15	10/19/17
EMI Analyzer	Agilent	E7405A	i00379	2/11/16	2/11/17
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	7/27/14	7/27/16
PSA Spectrum Analyzer	Agilent	E4445A	i00471	8/26/15	8/26/16
Preamplifier for 1-18GHz horn antenna	Miteq	AFS44 00101 400 23-10P-44	i00509	N/A	N/A

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT

Test Setup Photos
FCC ID: HZB-NGP1058W
IC ID: 1856A-NGP1058W

RF Radiated 30 MHz- 1GHz



Test Setup Photos
FCC ID: HZB-NGP1058W
IC ID: 1856A-NGP1058W

RF Radiated 1-12 GHz