



**FCC CFR47 PART 15 SUBPART B
ICES-003 ISSUE 4
VERIFICATION TEST REPORT**

FOR

AR5BXB112 3x3 802.11n PCIe MODULE

MODEL NUMBER: AR5BXB112

REPORT NUMBER: 09U12738-5

ISSUE DATE: DECEMBER 09, 2010

Prepared for

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NVLAP LAB CODE 200065-0

Revision History

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ATHEROS COMMUNICATION, INC.
1700 TECHNOLOGY DRIVE,
SAN JOSE, CA 95110

EUT DESCRIPTION: AR5BXB112 3x3 802.11n PCIe MODULE

MODEL: AR5BXB112

SERIAL NUMBER: CUS152-053-F0760

DATE TESTED: DECEMBER 09, 2010

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART B	Pass
ICES-003 ISSUE 4	Pass

Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For CCS By:

Tested By:



THU CHAN
EMC MANAGER
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EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2009, CAN/CSA-CEI/IEC CISPR 22:02 as referenced by ICES-003 Issue 4.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11abgn 3x3 product with the option of Beam Forming.

The radio module is manufactured by Atheros.

GENERAL INFORMATION

Power Requirements	100-240 VAC / 50-60 Hz
List of frequencies generated or used by the EUT	40 MHz

5.2. TEST CONFIGURATIONS

The following configurations were investigated during preliminary testing:

EUT Configuration	Description
Typical Configuration	EUT connected to laptop via extended card with minimum configuration such as printer, USB mouse

5.3. MODE(S) OF OPERATION

Mode	Description
Normal	All I/O ports activate with H' patterns scrolling on the screen display with TX on.

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Atheros AR93 Anwi Diagnostic Kernel Driver.

The test utility software used during testing was Atheros artgui ver_2.5.

5.5. MODIFICATIONS

No modifications were made during testing.

5.6. DETAILS OF TESTED SYSTEM

SUPPORT EQUIPMENT & PERIPHERALS

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	IBM Lenovo	T400	R8-NCKY4	DoC
AC Adapter	IBM Lenovo	DCWP CM-2	11S92P1156Z1ZDXN99HDSS	DoC
Printer	Microline 186	D22300A	AC5C018494A0	DoC
Mouse	Microsoft	X802382	867932	DoC

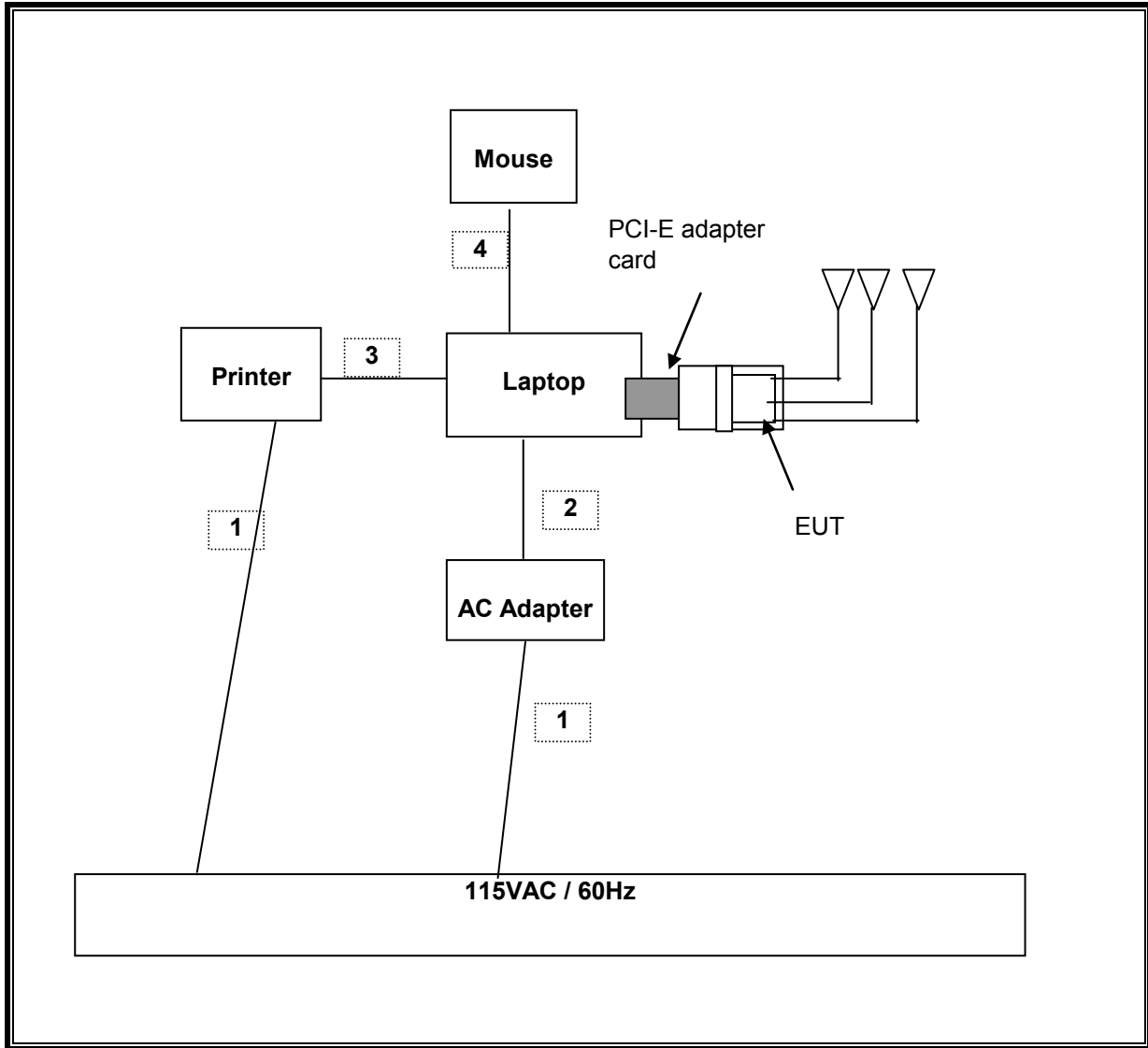
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	2	US 115V	Un-shielded	2m	one ferrite at Laptop end.
2	DC	1	DC	Un-shielded	1m	NA
3	USB	1	Printer	Un-shielded	2m	NA
4	USB	1	Mouse	Un-shielded	2m	one ferrite on USB end

TEST SETUP

The EUT is installed in a typical configuration. Test software exercised the EUT.

TEST SETUP DIAGRAM



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Asset Number	Cal Due
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	10/29/11
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00778	07/06/11
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	07/14/11
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	02/06/11
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	05/06/11

7. APPLICABLE LIMITS AND TEST RESULTS

7.1. RADIATED EMISSIONS

TEST PROCEDURE

ANSI C63.4

The highest clock frequency generated or used in the EUT is 40 MHz, therefore the frequency range was investigated from 30 MHz to 1000 MHz.

LIMIT

§15.109 (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Limits for radiated disturbance of Class B ITE at measuring distance of 3 m	
Frequency range (MHz)	Quasi-peak limits (dB μ V/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960 MHz	54

Note: The lower limit shall apply at the transition frequency.

RESULTS

RADIATED EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)

30-1000MHz Frequency Measurement													
Compliance Certification Services, Fremont 5m Chamber													
Test Engr:		Chin Pang											
Date:		12/09/10											
Project #:		10U13467											
Company:		Atheros											
Test Target:		FCC15. 209											
Mode Oper:		Normal											
f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit								
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters										
Read	Analyzer Reading	Filter	Filter Insert Loss										
AF	Antenna Factor	Corr.	Calculated Field Strength										
CL	Cable Loss	Limit	Field Strength Limit										
f	Dist	Read	AF	CL	Amp	D Corr	Pad	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
MHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
horiz 2.4													
150.485	3.0	49.0	12.5	1.1	29.3	0.0	0.0	33.3	40.0	-6.7	H	P	
192.007	3.0	48.7	11.4	1.2	29.0	0.0	0.0	32.3	40.0	-7.7	H	P	
233.048	3.0	53.2	11.9	1.4	28.8	0.0	0.0	37.6	46.0	-8.4	H	P	
299.771	3.0	56.4	13.3	1.6	28.8	0.0	0.0	42.5	46.0	-3.5	H	P	
365.174	3.0	56.0	14.4	1.8	29.1	0.0	0.0	43.1	46.0	-2.9	H	P	
56.401	3.0	53.5	7.9	0.6	29.6	0.0	0.0	32.4	40.0	-7.6	V	P	
152.285	3.0	41.6	12.2	1.1	29.3	0.0	0.0	25.6	40.0	-14.4	V	P	
233.048	3.0	55.6	11.9	1.4	28.8	0.0	0.0	40.0	46.0	-6.0	V	P	
299.771	3.0	49.1	13.3	1.6	28.8	0.0	0.0	35.2	46.0	-10.8	V	P	
366.374	3.0	54.3	14.4	1.8	29.1	0.0	0.0	41.4	46.0	-4.6	V	P	
192.007	3.0	43.3	11.4	1.2	29.0	0.0	0.0	26.9	40.0	-13.1	V	P	

7.2. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.4

LIMIT

§15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

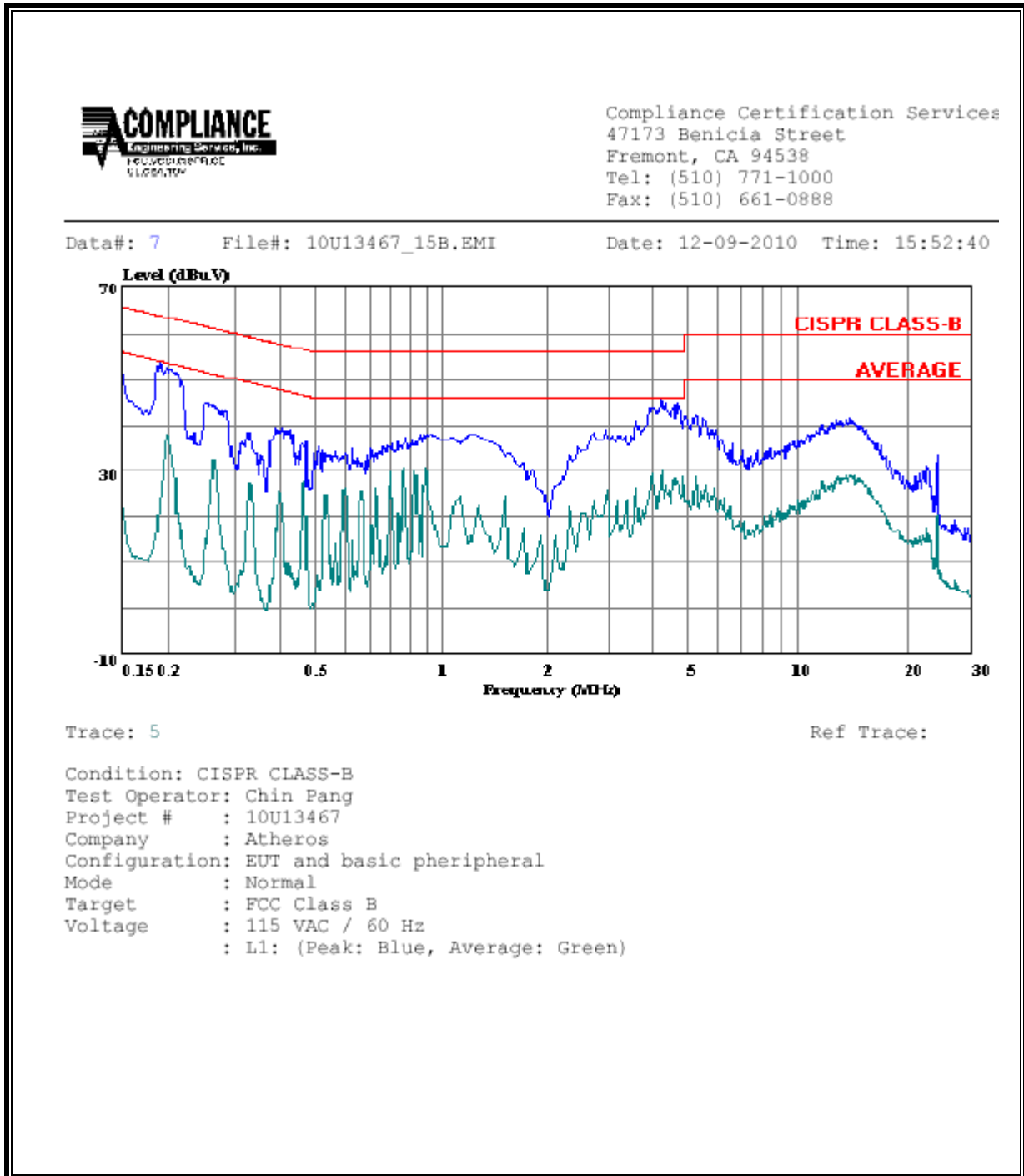
Notes:
 1. The lower limit shall apply at the transition frequencies
 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

RESULTS

6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq. (MHz)	Reading			Class (dB)	Limit QP	EN B AV	Margin		Remark L1 / L2
	PK (dBµV)	QP (dBµV)	AV (dBµV)				QP (dB)	AV (dB)	
0.19	52.23	--	37.77	0.00	64.04	54.04	-11.81	-16.27	L1
0.46	39.02	--	27.24	0.00	56.67	46.67	-17.65	-19.43	L1
4.34	45.61	--	30.53	0.00	56.00	46.00	-10.39	-15.47	L1
0.20	52.01	--	38.24	0.00	63.69	53.69	-11.68	-15.45	L2
1.03	38.46	--	31.13	0.00	56.00	46.00	-17.54	-14.87	L2
4.38	45.01	--	27.57	0.00	56.00	46.00	-10.99	-18.43	L2
6 Worst Data									

LINE 1 RESULTS



LINE 2 RESULTS

