FCC CFR47 PART 15
REPORT OF

MAXIMUM PERMISSIBLE EXPOSURE CALCULATIONS

FOR

802.11a/b/g/n PCIExpress Minicard

MODEL NUMBER: AR5BXB72-L

FCC ID: PPD-AR5BXB72-L

REPORT NUMBER: 06U10365-13

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Prepared for
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Revision History

Rev.	Issue Date	Revisions	Revised By
--	7/10/06	Initial Issue	MH

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ATHEROS COMMUNICATIONS, INC.
5480 Great America Parkway
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EUT DESCRIPTION: 802.11a/b/g/n PCIExpress Minicard

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. 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 Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By: Tested By:

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2. SCOPE OF REPORT

The Maximum Permissible Exposure calculations documented in this report were based on RF measurements and antenna specifications documented in the original filings of the radio modules identified below.

3. FACILITIES AND ACCREDITATION

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

4. EQUIPMENT UNDER TEST

4.1. IDENTIFICATION OF WLAN MODULE

The WLAN module is certified as FCC ID: PPD-AR5BXB72-L.

This module is intended to be installed in mobile configurations and co-located with a Bluetooth module as identified below.

4.2. IDENTIFICATION OF BLUETOOTH MODULE

The Bluetooth module is certified as FCC ID: MCLJ07H081

5. CO-LOCATED MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

CALCULATIONS

Given

$E = \sqrt{(30 * P * G)} / d$

and

$S = E ^ 2 / 3770$

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

Combining equations yields:

$S = (30 * P * G) / (3770 * (d ^ 2))$

Changing to units of Power to mW and Distance to cm, using:

P (W) = P (mW) / 1000 and
d (m) = d (cm) / 100

yields

$S = 0.0795 * (P * G) / (d^2)$

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW/cm^2

For multiple co-located transmitters operating simultaneously the total power density can be calculated by summing the Power * Gain product of each transmitter.

yields

$S = 0.0795 * ((P1 * G1) + (P2 * G2) + ... + (Pn * Gn)) / (d^2)$

where

d = distance in cm
Pk = Power in mW of the kth transmitter
Gk = Numeric antenna gain of the kth transmitter
S = Power Density in mW/cm^2

In the table below, Power and Gain are entered in units of dBm and dBi respectively, then these are converted to their linear forms prior to the summation function.

LIMITS

From §1.1310 Table 1 (B), S = 1.0 mW/cm^2

RESULTS

No non-compliance noted: (MPE distance equals 20 cm)

Mode	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)
WLAN 2.4 GHz		23.74	3.62	
Bluetooth		4.90	2.00	
Combined	20.0			0.11

Mode	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)
WLAN 5 GHz		21.23	6.20	
Bluetooth		4.90	2.00	
Combined	20.0			0.11

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

END OF REPORT