FCC CFR47 PART 15 SUBPART C

Test Report for Class 2 Permissive Change Application

802.11 Wireless Module

Model Number: DCMA-82 High Power

FCC ID: OPA-WIBRID-108

Report Number: 09PRO002

Issue Date: 15 March 2009

Prepared for

Carlson Wireless Technologies Inc.
1385 8th Street
Arcata, CA 95521

Prepared by

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1. TEST AND TEST LOCATION INFORMATION

COMPANY NAME: Carlson Wireless Technologies Inc.
1385 8th Street
Arcata. CA 95521

EUT DESCRIPTION: Hi Power 802.11 Wiremess Module
2.4/5.9//5.15/5.8 GHz

MODEL: DCMA-82 High Power
FCC ID: OPA-WIBRID-108

DATA ALSO APPLIES TO : N/A

DATE TESTED: 12 March 2009

All tests were performed by

Compliance Certification Services
47173 Benicia Street
Fremont CA 94538

15 March 2009

T.N. Cokenias
Agent for Carlson Wireless Technologies Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

3. EQUIPMENT UNDER TEST

3.1. DESCRIPTION OF EUT

The EUT is an 802.11 abg high power module with a maximum output power of 380 mW (=25.8 dBm) in the 5.8 GHz band. The EUT was connected via a miniPCI extender cable to the host digital board.

3.2. DESCRIPTION OF ANTENNA UNDER TEST

The antenna under test is a 20 dBi flat panel with an sma connector.

3.3. SOFTWARE AND FIRMWARE

EUT "Putty" software commands were accessed via Terminal program on an Apple iBook.

3.4. WORST-CASE CONFIGURATION AND MODE

During radio emissions testing, maximum authorized output power was delivered to the antenna.

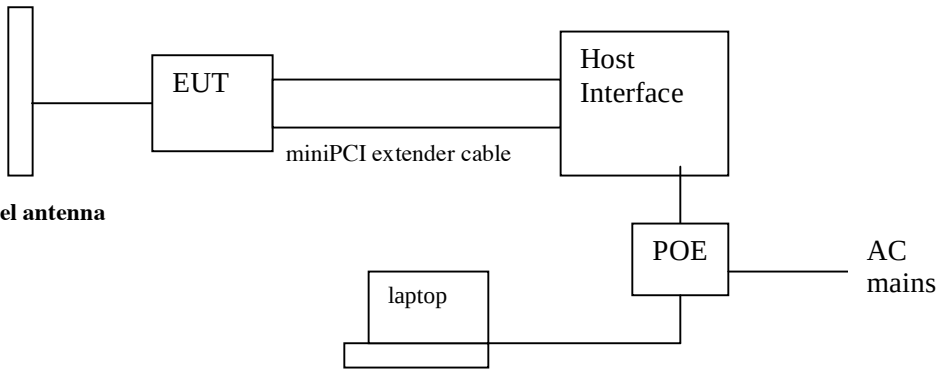
3.5. DESCRIPTION OF TEST SETUP

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
LAPTOP	Apple	iBook G4	4H545BV1SE9	n/a
AC/DC ADAPTER	Apple	ITE4T18	n/a	n/a
POE	Pacific Wireless	POE-48i	n/a	

I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	2	AC	Un-shielded	0.5 m	N/A
2	POE	1	RJ45	Un-shielded	1m	N/A
3	SERIAL	1	RS-232	Un-shielded	1m	N/A

SETUP DIAGRAM FOR TESTS



3.7 Modifications to EUT

None.

3.8 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**	**Cal Due**
Antenna, Bilog, 2 GHz	*Sunol Sciences*	*JB1*	*C01016*	*01/14/10*
Preamplifier, 26.5 GHz	*Agilent / HP*	*8449B*	*C01063*	*12/01/09*
Preamp, 1000MHz	*Sonoma*	*310N*	*N02891*	*03/31/09*
Antenna, Horn, 18 GHz	*EMCO*	*3115*	*C00783*	*04/22/09*
Spectrum Analyzer, 44 GHz	*Agilent / HP*	*E4446A*	*C01069*	*01/05/10*
Antenna, Horn, 26.5 GHz	*ARA*	*SWH-28*	*C01015*	*01/29/10*
EMI Test Receiver, 30 MHz	*R & S*	*ESHS 20*	*N02396*	*08/06/09*
LISN, 30 MHz	*FCC*	*LISN-50/250-25-2*	*N02625*	*10/29/09*

4. LIMITS AND RESULTS

4.1.1. 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 consequenoe 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 and rearranging the terms to express the distance as a function of the remaining variables yields:

$d = \sqrt{((30 * P * G) / (3770 * S))}$

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

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

yields

$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$
$d = 0.282 * \sqrt{(P * G / S)}$

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

$d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S}$ Equation (1)

where

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

Equation (1) and the measured peak power is used to calculate the MPE distance.

LIMITS

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

RESULTS

No non-compliance noted:

Power Density Limit (mW/cm^2)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
1.0	25.80	20.00	54.99

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.

4.2. RADIATED EMISSIONS

4.2.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak. Measurements are made to class A limits for the EUT's digital emissions, as the product is marketed and intended for non-residential use only. Emissions from the TX portion of the EUT that are below 1 GHz were all at least -20 dBc. There were no restricted band emissions detected in the 30-1000 MHz region.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 10 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 902-928 MHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

4.2.2. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHZ HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company:Carlson Wireless Technologies Inc.
Project #:
Date: 3/12/2009
Test Engineer: Chin Pang
Configuration: EUT/Panel Antenna
Mode: TX, 5.8GHz Band

Test Equipment:

Horn 1-18GHz: T59; S/N: 3245 @3m
Pre-amplifer 1-26GHz: T145 Agilent 3008A005(
Pre-amplifer 26-40GHz:
Horn > 18GHz:
Hi Frequency Cables
3' cable 22807700: 3' cable 22807700
12' cable 22807600: 12' cable 22807600
20' cable 22807500: 20' cable 22807500
HPF: HPF_7.6GHz
Reject Filter:

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch, 5745MHz															
11.490	3.0	49.6	37.8	38.1	9.5	-33.1	0.0	0.7	64.8	53.0	74	54	-9.2	-1.0	V
17.235	3.0	42.5	30.0	42.7	12.2	-32.0	0.0	0.6	66.0	53.5	74	54	-8.0	-0.5	V, -20dBc
11.490	3.0	47.5	36.7	38.1	9.5	-33.1	0.0	0.7	62.7	51.9	74	54	-11.3	-2.1	H
17.235	3.0	44.3	30.0	42.7	12.2	-32.0	0.0	0.6	67.8	53.5	74	54	-6.2	-0.5	H, -20dBc
Mid Ch, 5805MHz															
11.610	3.0	47.6	35.6	38.2	9.5	-32.9	0.0	0.7	63.1	51.1	74	54	-10.9	-2.9	V
17.415	3.0	43.2	29.5	43.5	12.3	-32.0	0.0	0.6	67.5	53.8	74	54	-6.5	-0.2	V, -20dBc
11.610	3.0	48.0	36.5	38.2	9.5	-32.9	0.0	0.7	63.5	52.0	74	54	-10.5	-2.0	H
17.415	3.0	42.5	29.6	43.5	12.3	-32.0	0.0	0.6	66.8	53.9	74	54	-7.2	-0.1	H, -20dBc
High Ch, 5825MHz															
11.650	3.0	47.0	35.2	38.2	9.6	-32.9	0.0	0.7	62.6	50.8	74	54	-11.4	-3.2	V
17.475	3.0	41.2	29.0	43.7	12.3	-32.0	0.0	0.6	65.8	53.6	74	54	-8.2	-0.4	V, -20dBc
11.650	3.0	46.0	34.0	38.2	9.6	-32.9	0.0	0.7	61.6	49.6	74	54	-12.4	-4.4	H
17.475	3.0	41.5	29.0	43.7	12.3	-32.0	0.0	0.6	66.1	53.6	74	54	-7.9	-0.4	H, -20dBc

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Note: Np pther emissions were detected above the system noise floor.

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

1. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr:Chin Pang
Date:3/12/2009
Project #:09U122449
Company:Carlson Wireless Technologies Inc.
EUT Description:High powered 802.11 ag Wlan Mini-PCI 3A
EUT M/N:
Test Target:FCC Class B
Mode Oper:TX

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 MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filter dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
horiz													
69.002	3.0	60.3	8.2	0.7	32.6	0.0	0.0	36.6	40.0	-3.4	H	P	
187.807	3.0	53.2	11.1	1.2	32.6	0.0	0.0	33.0	43.5	-10.5	H	P	
374.894	3.0	52.2	14.6	1.8	32.7	0.0	0.0	36.0	46.0	-10.0	H	P	
424.936	3.0	47.4	15.5	2.0	32.7	0.0	0.0	32.1	46.0	-13.9	H	P	
670.586	3.0	45.3	18.9	2.5	33.0	0.0	0.0	33.9	46.0	-12.1	H	P	
866.554	3.0	42.5	21.3	2.9	32.1	0.0	0.0	34.7	46.0	-11.3	H	P	

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Note: No other emissions were detected above the system noise floor.

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr:Chin Pang
Date:3/12/2009
Project #:09u12449
Company:Carlson Wireless Technologies Inc.
EUT Description:High Powered 802.11ag Wlan Mini-PCI 3A
EUT M/N:
Test Target:FCC Class B
Mode Oper:TX

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 MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filter dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
vert													
147.485	3.0	54.8	12.8	1.1	32.6	0.0	0.0	36.0	43.5	-7.5	V	P	
374.894	3.0	50.0	14.6	1.8	32.7	0.0	0.0	33.7	46.0	-12.3	V	P	
524.900	3.0	45.4	17.2	2.2	32.8	0.0	0.0	31.9	46.0	-14.1	V	P	
575.062	3.0	41.5	17.9	2.3	32.9	0.0	0.0	28.9	46.0	-17.1	V	P	
843.874	3.0	43.2	21.2	2.9	32.2	0.0	0.0	35.1	46.0	-10.9	V	P	

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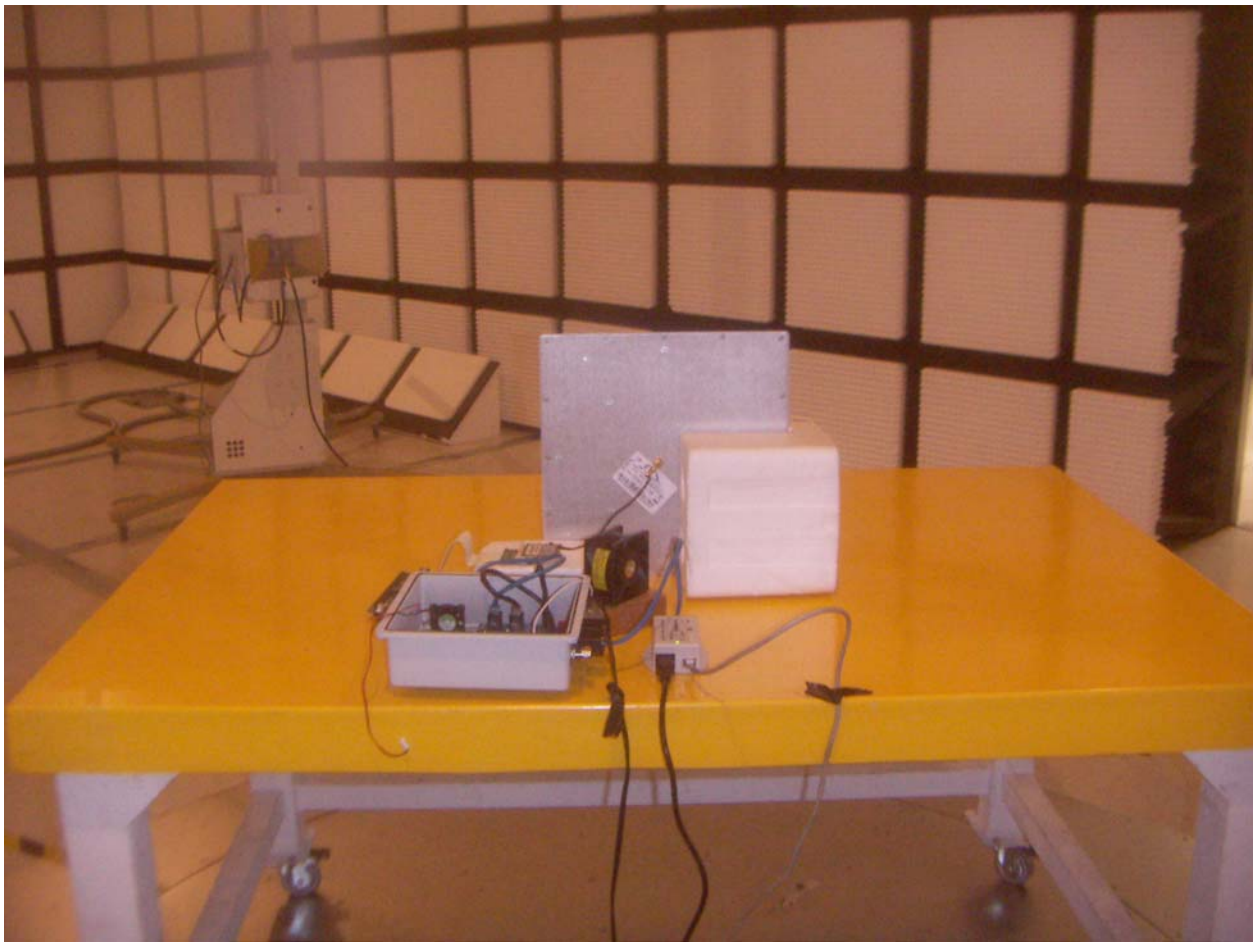
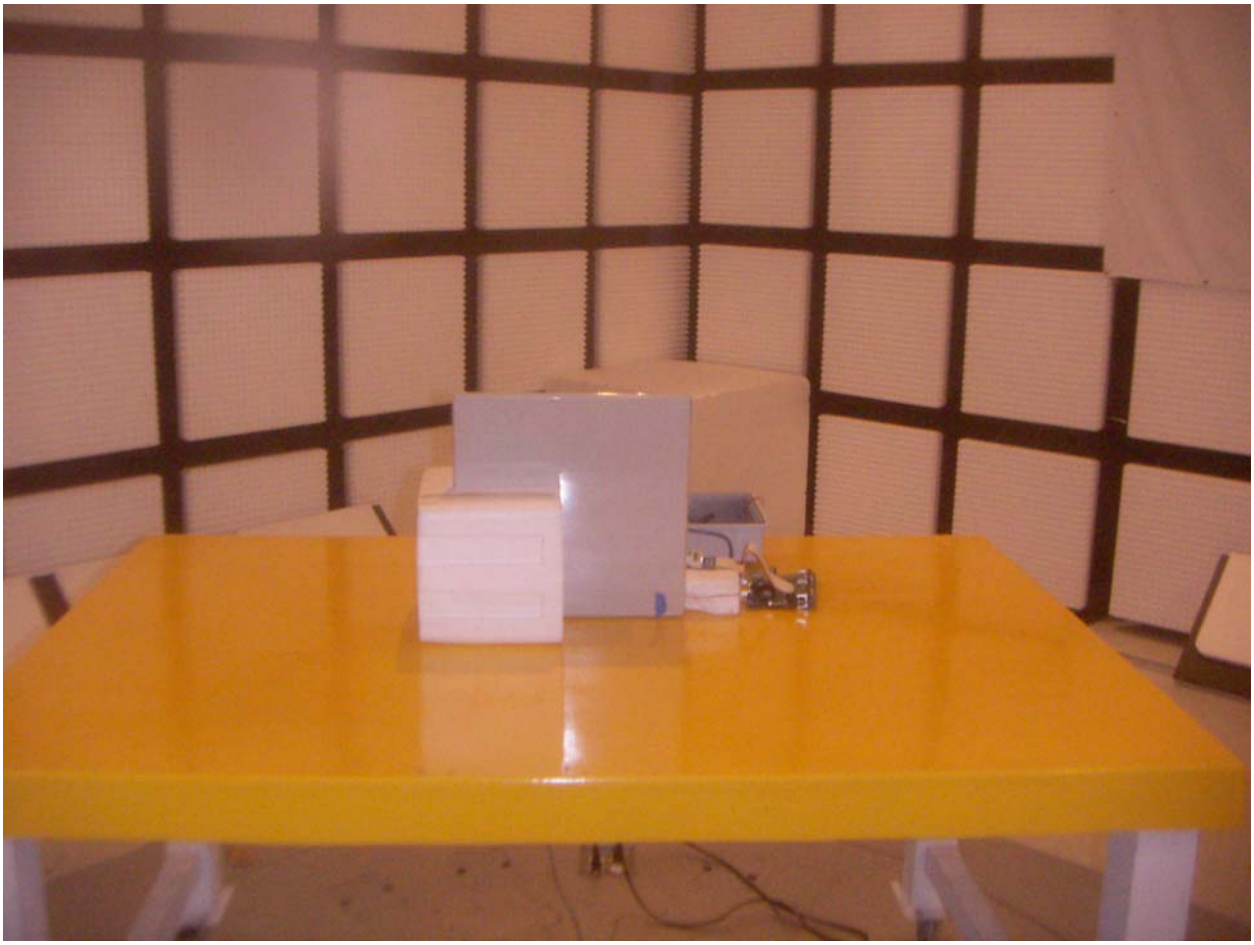
5. SETUP PHOTOS

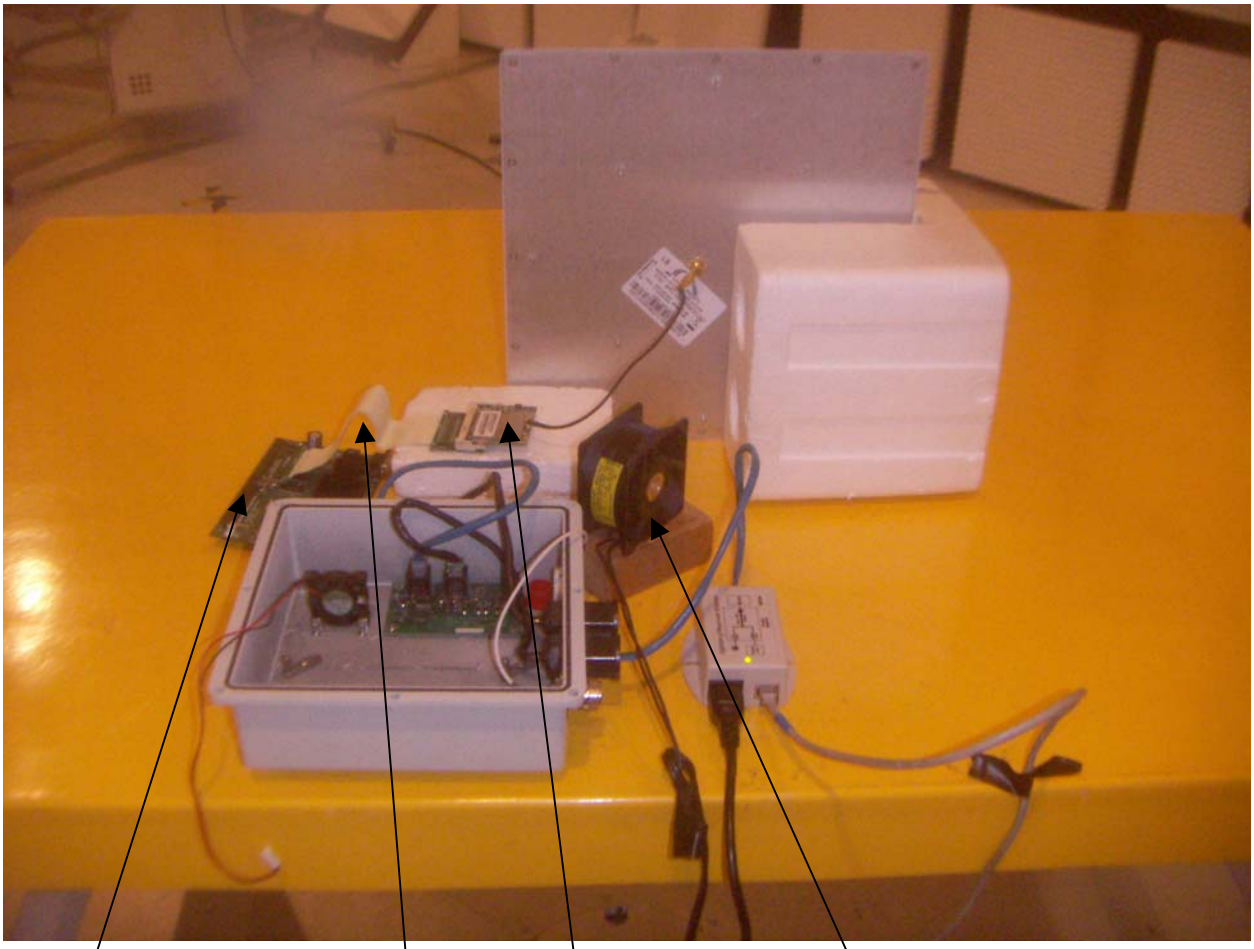
RADIATED RF MEASUREMENT SETUP, REAR



RADIATED RF MEASUREMENT SETUP, FRONT VIEW



RADIATED TEST SET-UP, EUT CLOSEUP



interface board miniPCI extender cable EUT cooling fan for module (normally inside enclosure)

END OF REPORT