FCC Part 15 Subpart C
Transmitter Class II Permissive Change

Direct Sequence Spread Spectrum Transmitter

Test Report

FCC ID: RTTAB-WLNB

FCC Rule Part: 15.247

ACS Report Number: 05-0374-15C

Manufacturer: DPAC Technologies
Model: ABDB-AN-DPxxx
Trade Name: Airborne WLN-B Module

Test Begin Date: November 17, 2005
Test End Date: December 21, 2005

Report Issue Date: January 11, 2006

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612

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This report contains 12 pages

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1.0 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15, Subpart C of the FCC's Code of Federal Regulations for the addition of the following antennas to the original certification of the DPAC Technologies Airborne WLN-B Module model ABDB-AN-DPxxx.

Cirronet 12 dBi Patch Antenna Assembly - Four 3 dBi patch antennas on a PC board phased together, 12dBi gain total.
PN: A-7030-0485

Centurion MicroBlue 1.5dBi PCB Patch Antenna – Linear polarization with 1.5dBi gain
PN: CAF94131

1.2 Product Description

1.2.1 General

The Airborne Wireless LAN Node (WLN) Module consists of a fully integrated 802.11 radio and application processor available in two models (see Table 1).

Table 1. Airborne WLN Module Configurations

Configuration	Description	DPAC Model Number
Airborne 802.11b Wireless LAN Node Module – UART Version	Module with UART firmware and UART interface	WLNB-AN-DP101
Airborne 802.11b Wireless LAN Node Module – SPI Version	Module with SPI (Serial Peripheral Interface) firmware and SPI interface	WLNB-AN-DP102

1.2.2 Modifications for Compliance

No modifications were made to the EUT for the purpose of compliance.

2.0 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment. In addition, ACS is compliant to ISO 17025 as certified by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program. The following certification numbers have been issued in recognition of these accreditations and certifications:

FCC Registration Number: 89450
Industry Canada Lab Code: IC 4175
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

NVLAP Lab Code: 200612

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

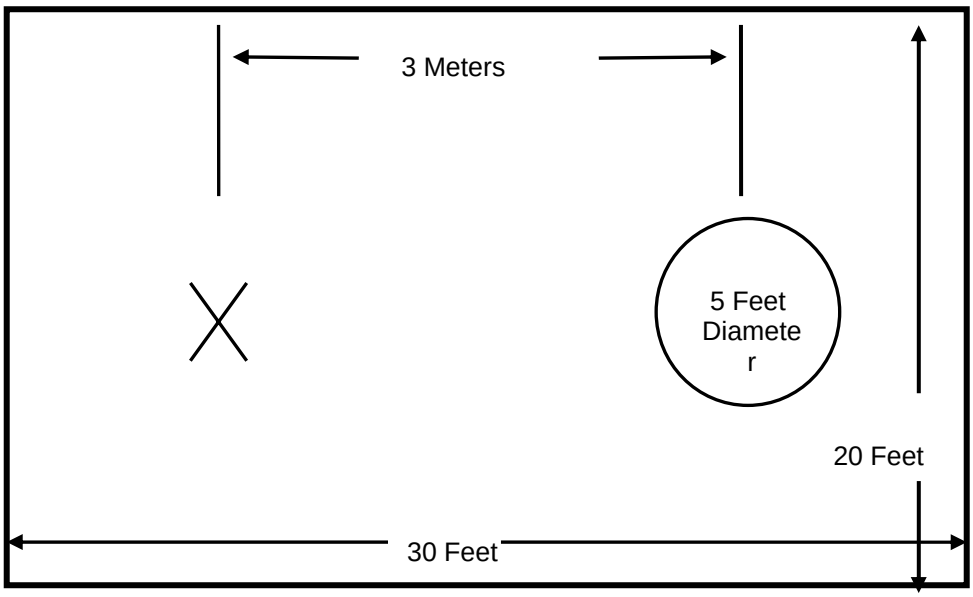

Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

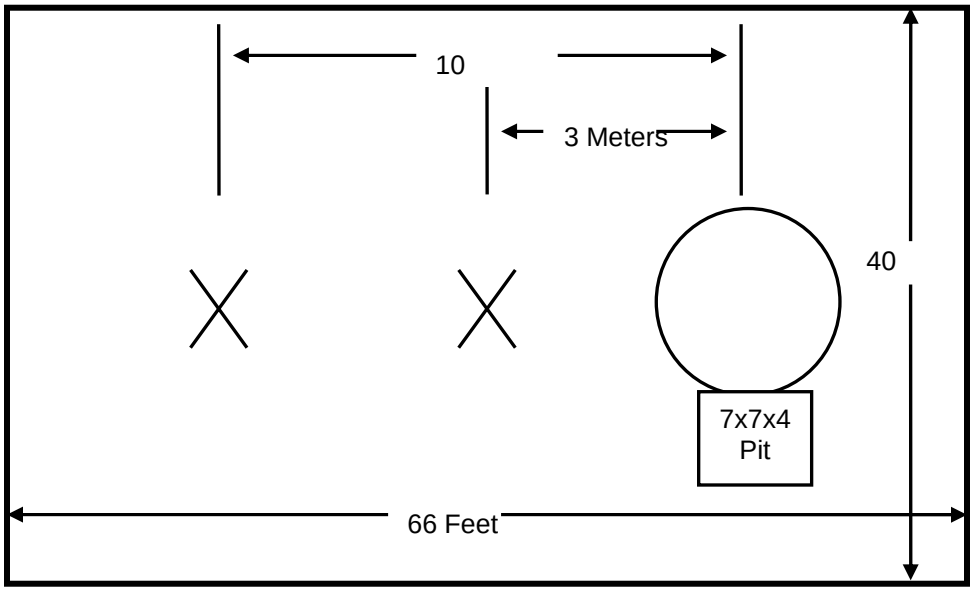

Figure 2.3-2: Open Area Test Site

2.4 Conducted Emissions Test Site Description
The AC mains conducted EMI site is a shielded room with the following dimensions:

- Height: 3.0 Meters
- Width: 3.6 Meters
- Length: 4.9 Meters

The room is manufactured by Rayproof Corporation and installed by Panashield, Inc. Earth ground is provided to the room via an 8' copper ground rod. Each panel of the room is connected electrically at intervals of 4".

Power to the room is filtered to prevent ambient noise from coupling to the EUT and measurement equipment. Filters are models 1B42-60P manufactured by Rayproof Corporation.

The room is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4.

A diagram of the room is shown below in figure 2.4-1:

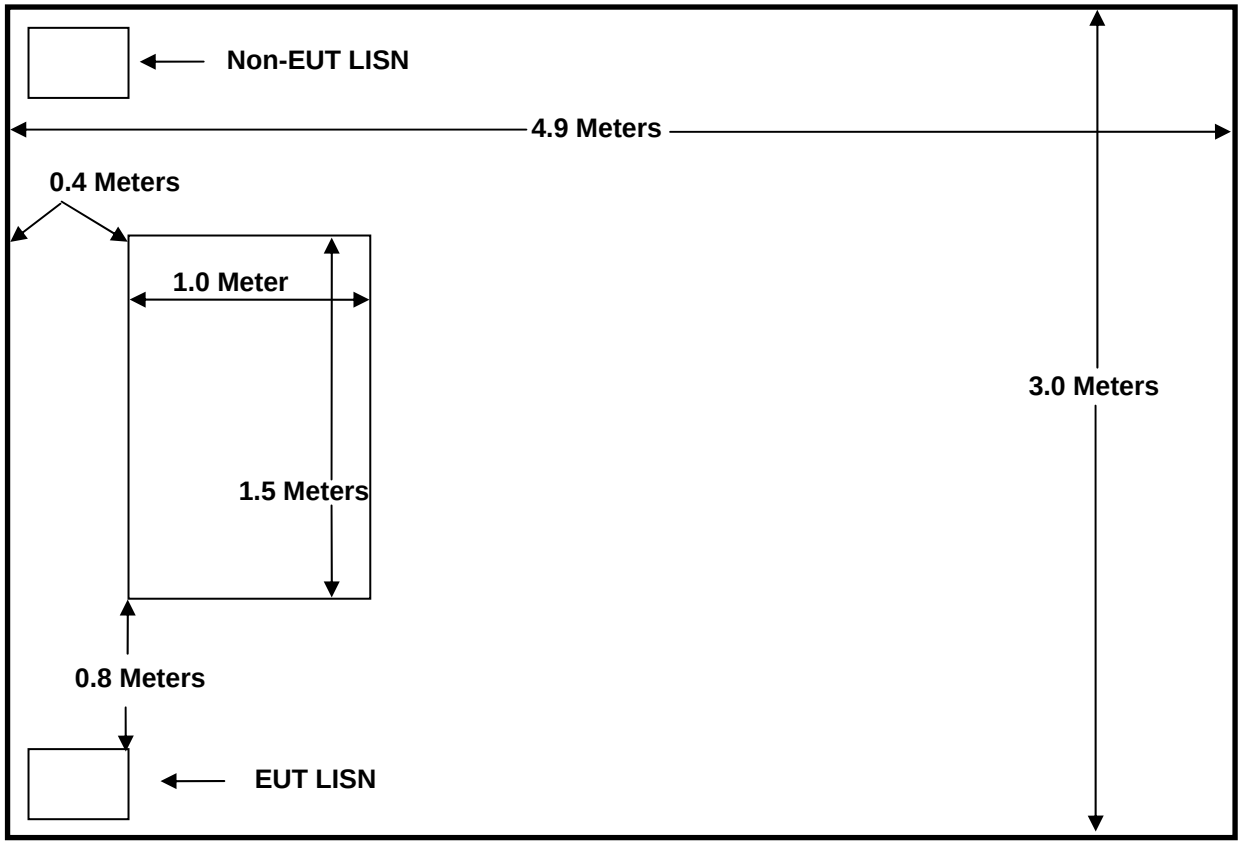

Figure 2.4-1: AC Mains Conducted EMI Site

3.0 APPLICABLE STANDARD REFERENCES
The following standards were used:

1 - ANSI C63.4: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the 9 KHz to 40GHz
2 - US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators
3 - FCC OET Bulletin 65 Appendix C - Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields

4.0 LIST OF TEST EQUIPMENT

All test equipment used for regulatory testing is calibrated yearly or according to manufacturer's specifications.

Table 4.0-1: Test Equipment

Equipment Calibration Information					
ACS#	**Mfg.**	**Eq. type**	**Model**	**S/N**	**Cal. Due**
☐ 25	Chase	Bi-Log Antenna	CBL6111	1043	5/23/06
☐ 041	ElectroMetrics	Bi-Con Antenna	BIA-25	2925	5/25/06
☐ 090	ElectroMetrics	LPA Antenna	LPA-25	1476	5/27/06
☐ 78	EMCO	Loop Antenna	6502	9104-2608	1/12/2006
☐ 152	EMCO	LISN	3825/2	9111-1905	1/18/06
☐ 153	EMCO	LISN	3825/2	9411-2268	12/5/06
☐ 193	ACS	OATS Cable Set	RG8	193	1/07/06
☐ 225	Andrew	OATS RF cable	Heliax	225	1/06/06
☐ 165	ACS	Conducted EMI Cable Set	RG8	165	1/06/06
☐ 22	Agilent	Pre-Amplifier	8449B	3008A00526	5/06/06
☐ 73	Agilent	Pre-Amplifier	8447D	272A05624	5/18/06
☐ 30	Spectrum Technologies	Horn Antenna	DRH-0118	970102	5/09/06
☐ 209	Microwave Circuits	High Pass Filter	H3G020G2	4382-01 DC0421	9/20/06
☐ 1	Rohde & Schwarz	Receiver Display	804.8932.52	833771/007	3/07/06
☐ 2	Rohde & Schwarz	ESMI Receiver	1032.5640.53	839587/003	3/07/06
☐ 3	Rohde & Schwarz	Receiver Display	804.8932.52	839379/011	11/02/06
☐ 4	Rohde & Schwarz	ESMI Receiver	1032.5640.53	833827/003	11/02/06
☐ ---	Agilent	Spectrum Analyzer	E7405A	US39110103	6/6/06
☐ 213	Test Equipment Corp.	Pre-Amplifier	PA-102	44927	6/29/06
☐ 211	Eagle	Band Reject Filter	C7RFM3NFNM	n/a	1/06/06
☐ 204	ACS	Cable	RG8	204	3/16/06
☐ 6	Harbour Industries	HF RF Cable	LL-335	00006	3/16/06
☐ 7	Harbour Industries	HF RF Cable	LL-335	00007	3/16/06
☐ 208	Harbour Industries	HF RF Cable	LL142	00208	6/24/06
☐ 167	ACS	Chamber EMI Cable Set	RG6	167	12/29/05
☐ 204	ACS	Chamber EMI RF cable	RG8	204	1/07/06

5.0 SUPPORT EQUIPMENT

Item	Manufacturer	Equipment Type	Model Number	Serial Number	FCC ID
1	DPAC Technologies	WLN Test Extender	19D0725-01 Rev.xi	NA	NA
2	Cinco Electronics Co, Ltd.	Power Adaptor	TR513-1A	NA	NA
3	Acer	Laptop Computer	730	9149C01NC511200039M	NA
4	Lite-on Electronics, Inc.	Power Adaptor	PA-1600-02	NA	NA

Table 5-3: Support Equipment

6.0 EQUIPMENT UNDER TEST SETUP AND BLOCK DIAGRAM

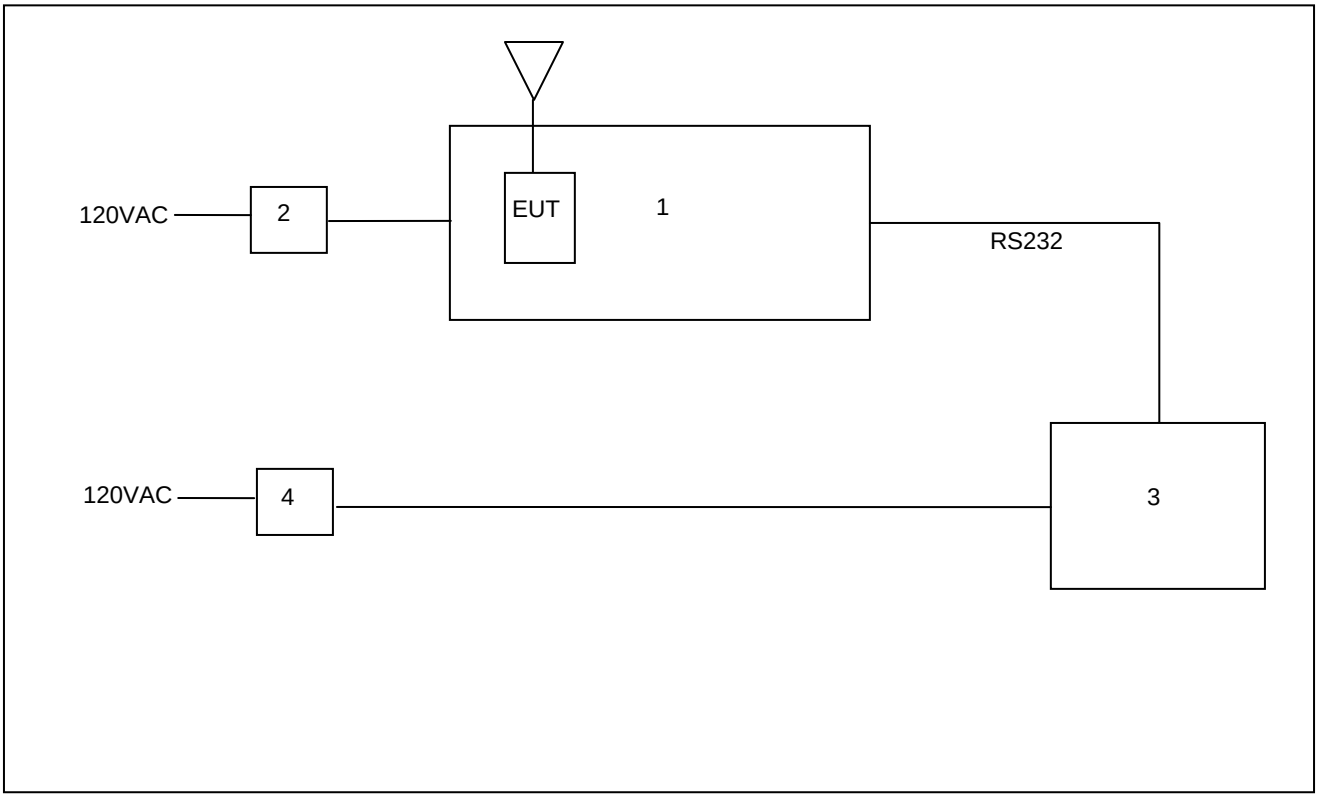

Figure 6.0-1: EUT Test Setup

7.0 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Radiated Spurious Emissions - FCC Section 15.205

7.1.1 Test Methodology

Radiated emissions tests were made over the frequency range of 30MHz to 25GHz, 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth (RBW) of 120kHz and a video bandwidth (VBW) of 300kHz. For frequencies above 1000MHz, average measurements were made using an RBW of 1MHz and a VBW of 10Hz and peak measurements were made with RBW of 1MHz and a VBW of 1MHz.

The Cirronet 12dBi patch antenna was tested vertically polarized as it will be installed in final configuration. Due to the possible orientations of the Centurion 1.5dBi Patch antenna during installation, the antenna was positioned in three orthogonal axes to determine the maximum radiated emission levels. See the test setup photograph.

Low, middle, and high channels within the transmitter frequency range were tested and the data presented below.

7.1.2 Test Results – Cirronet 12dBi Patch Antenna

Radiated spurious emissions found in the band of 30MHz to 25GHz are reported in Table 7.1.2-1. Each emission found to be in a restricted band as defined by section 15.205, was compared to the radiated emission limits for as defined in section 15.209.

Table 7.1.2-1: Radiated Spurious Emissions

Frequency	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
(MHz)	pk	avg	(H/V)	(dB)	pk	avg	pk	avg	pk	avg
Spurious Emissions										
4824	41.78	29.06	H	12.38	54.16	41.44	74	54	19.84	12.56
4824	43.08	31.75	V	12.38	55.46	44.13	74	54	18.54	9.87
4880	41.56	27.77	H	12.57	54.13	40.34	74	54	19.87	13.66
4880	42.57	35.26	V	12.57	55.14	47.83	74	54	18.86	6.17
4924	41.68	28.76	H	12.72	54.40	41.48	74	54	19.60	12.52
4924	44.45	37.80	V	12.72	57.17	50.52	74	54	16.83	3.48

Note: Emissions not reported were below the noise floor of the measurement equipment.

7.1.3 Test Results – Centurion 1.5dBi PCB Patch Antenna

Radiated spurious emissions found in the band of 30MHz to 25GHz are reported in Table 7.1.3-1. Each emission found to be in a restricted band as defined by section 15.205, was compared to the radiated emission limits for as defined in section 15.209.

Table 7.1.3-1: Radiated Spurious Emissions

Frequency	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)		Orientation (xyz)
(MHz)	pk	avg	(H/V)	(dB)	pk	avg	pk	avg	pk	avg	
Spurious Emissions											
4824	44.98	39.90	H	12.38	47.82	42.74	74	54	26.18	11.26	**x**
4824	44.37	40.10	V	12.38	47.21	42.94	74	54	26.79	11.06	**x**
4824	44.98	41.60	H	12.38	47.82	44.44	74	54	26.18	9.56	**y**
4824	42.92	38.17	V	12.38	45.76	41.01	74	54	28.24	12.99	**y**
4824	44.95	39.62	H	12.38	47.79	42.46	74	54	26.21	11.54	**z**
4824	43.23	37.18	V	12.38	46.07	40.02	74	54	27.93	13.98	**z**
4874	43.99	37.97	H	12.55	47.00	40.98	74	54	27.00	13.02	**x**
4874	43.28	38.45	V	12.55	46.29	41.46	74	54	27.71	12.54	**x**
4874	42.77	34.49	H	12.55	45.78	37.50	74	54	28.22	16.50	**y**
4874	41.80	34.08	V	12.55	44.81	37.09	74	54	29.19	16.91	**y**
4874	44.19	38.53	H	12.55	47.20	41.54	74	54	26.80	12.46	**z**
4874	42.31	34.54	V	12.55	45.32	37.55	74	54	28.68	16.45	**z**
4924	45.21	41.14	H	12.72	48.39	44.32	74	54	25.61	9.68	**x**
4924	43.35	36.55	V	12.72	46.53	39.73	74	54	27.47	14.27	**x**
4924	44.34	38.86	H	12.72	47.52	42.04	74	54	26.48	11.96	**y**
4924	43.23	38.35	V	12.72	46.41	41.53	74	54	27.59	12.47	**y**
4924	45.26	40.89	H	12.72	48.44	44.07	74	54	25.56	9.93	**z**
4924	43.33	37.36	V	12.72	46.51	40.54	74	54	27.49	13.46	**z**

Note: x = foot, y = side, z = back
Note: Emissions not reported were below the noise floor of the measurement equipment.

7.1.4 Sample Calculations

$R_C = R_U + CF_T$

Where:

CF_T = Total Correction Factor (AF+CA+AG)-DC(Average Measurements Only)
R_U = Uncorrected Reading
R_C = Corrected Level
AF = Antenna Factor
CA = Cable Attenuation
AG = Amplifier Gain
DC = Duty Cycle Correction Factor (If applicable)

Note: A Duty Cycle Correction Factor for this EUT was not needed to show compliance and therefore not included.

Example Calculation: Peak
Corrected Level: 41.78 + 12.38 = 54.16 dBuV/m
Margin: 74dBuV/m – 54.16 dBuV/m = 19.84 dB

Example Calculation: Average
Corrected Level: 29.06 + 12.38 = 41.44 dBuV/m
Margin: 54dBuV/m – 41.44 dBuV/m = 12.56 dB

8.0 CONCLUSION

In the opinion of ACS, Inc. the Airborne WLN-B Module model ABDB-AN-DPxxx manufactured by DPAC Technologies, meets the relevant requirements of the FCC Parts 2 and 15, for the antennas outlined in this report.