Excellence in Compliance Testing

Certification Test Report

FCC ID: HSW-DNT500P
IC: 4492A-DNT500P

FCC Rule Part: 15.247
IC Radio Standards Specification: RSS-210

ACS Report Number: 08-0316-15C DTS

Manufacturer: Cirronet Inc.
Model: DNT500P

Test Begin Date: August 11, 2008
Test End Date: August 11, 2008

Report Issue Date: September 15, 2008

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report is not be used to claim certification, approval, or endorsement by NVLAP, NIST or any government agency.

Prepared by:
Jeff Woods
Wireless Certifications Engineer
ACS, Inc.

Reviewed by: _____

J. Kirby Munroe
Manager Wireless Certifications
ACS, Inc.

This report contains 10 pages

Table of Contents

1.0 General 3
1.1 Purpose 3
1.2 Product Description 3
1.2.1 General 3
1.2.2 Intended Use 3
1.3 Test Methodology and Considerations 3
2.0 Test Facilities 4
2.1 Location 4
2.2 Laboratory Accreditations/Recognitions/Certifications 4
2.3 Radiated Emissions Test Site Description 5
2.3.1 Semi-Anechoic Chamber Test Site 5
2.3.2 Open Area Tests Site (OATS) 6
2.4 Conducted Emissions Test Site Description 7
3.0 Applicable Standards and References 7
4.0 List of Test Equipment 8
5.0 Support Equipment 8
6.0 EUT Setup Block Diagram 8
7.0 Summary of Tests 9
7.1 Antenna Requirement – FCC: Section 15.203 9
7.2.3 Radiated Spurious Emissions – FCC Section 15.205 IC: RSS-210 2.6 9
7.2.3.1 Test Methodology 9
7.2.3.2 Duty Cycle Correction 9
7.2.3.3 Test Results 9
7.2.3.4 Sample Calculation 10
8.0 CONCLUSION 10

Additional Exhibits Included In Filing

Test Setup Photographs
RF Exposure – MPE Calculations

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 and Industry Canada's Radio Standards Specification RSS-210 for a Class II Permissive Change.

This class II permissive change report is to address the addition of a new ¼ wave Monopole antenna with 2.1 dBi Gain.

1.2 Product Description

1.2.1 General

900 MHz transceiver module utilizing either frequency hopping spread spectrum or digital transmission technology.

Manufacturer Information:
Cirronet, Inc.
3079 Premiere Parkway, Suite 140
Duluth, GA 30097

Serial Number: ACS#2

Antenna(s): Antenna Factor Model ANT-916-JJB-ST

Test Sample Condition:
The test samples were provided in good working order with no visible defects.

1.2.2 Intended Use

900 MHz transceiver module utilizing either frequency hopping spread spectrum or digital transmission technology.

1.3 Test Methodology and Considerations

This device is considered a composite device by definition. The device operates as a DSS device at data rates of 34.8 Kbps to 200 Kbps. The device operates as a DTS at a data rate of 500 Kbps. Both operate under CFR 47 Part 15.247 and IC RSS-210. This report addresses the DSS portion of the device when operating at a data rate of 500kbps.

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: 894540
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: 200612-0

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:

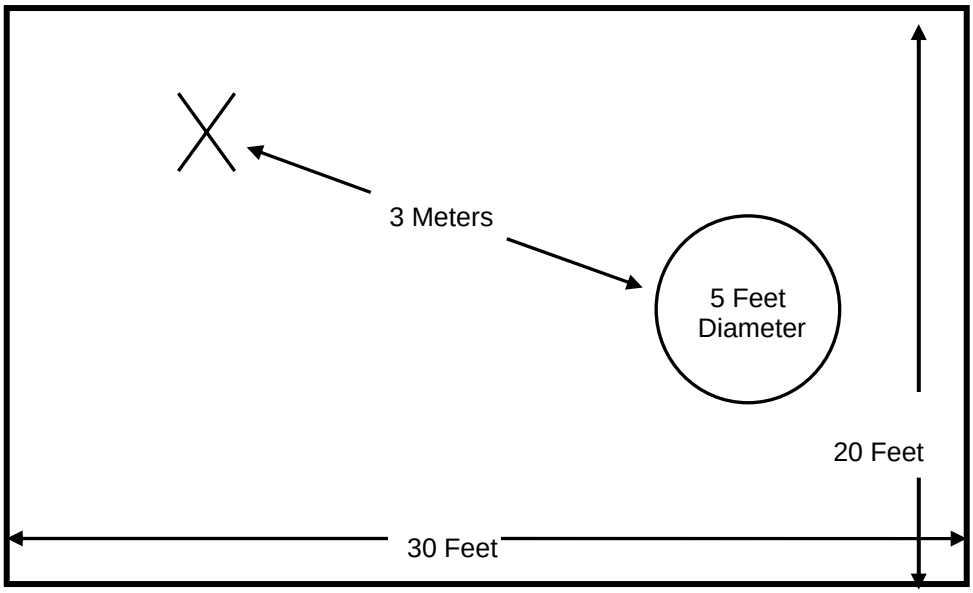

Figure 2.3-1: Semi-Anechoic Chamber Test Site

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:

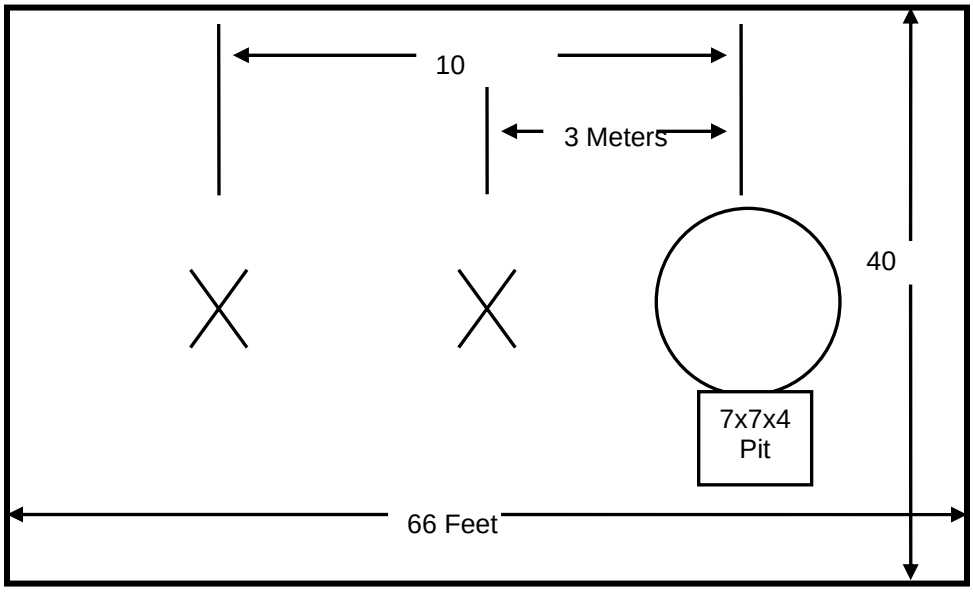

Figure 2.3-2: Open Area Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal group reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site 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 4.1.3-1:

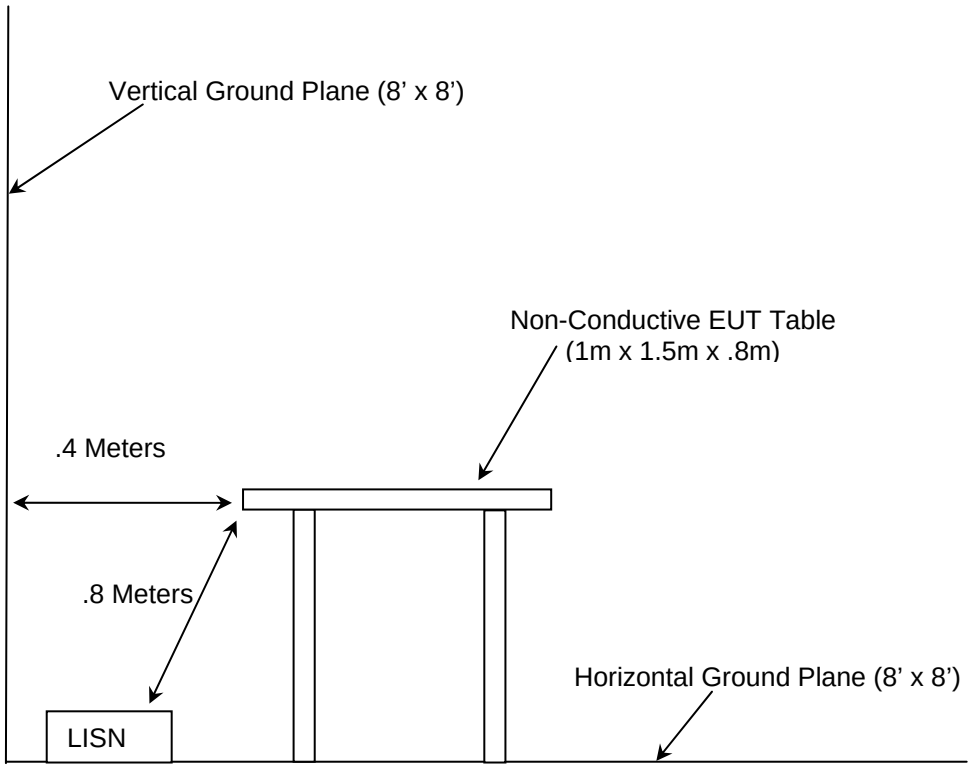

Figure 2.4-1: AC Mains Conducted EMI Site

3.0 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2008
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2008
- FCC OET Bulletin 65 Appendix C - Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, 2001
- FCC KDB Publication No. 558074 - Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247), March 2005
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 7 June 2007
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue2, June 2007.

4.0 LIST OF TEST EQUIPMENT

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

Table 4-1: Test Equipment

Equipment Calibration Information					
ACS#	**Mfg.**	**Eq. type**	**Model**	**S/N**	**Cal. Due**
331	Microwave Circuits	Filter	H1G513G1	31417	07/28/09
22	Agilent	Amplifier	8449B	3008A00526	10/25/08
30	Spectrum Technologies	Antenna	DRH-0118	970102	05/07/09
3	Rohde & Schwarz	Spectrum Analyzers	ESMI – Display	839379/011	10/26/08
4	Rohde & Schwarz	Spectrum Analyzers	ESMI - Receiver	833827/003	10/26/08
25	Chase	Antenna	CBL6111	1043	08/22/09
73	Agilent	Pre-Amplifier	8447D	2727A05624	12/19/08
167	ACS	Cable Set	Chamber EMI Cable Set	167	01/04/09
343	Florida RF Cables	Cables	SMRE-200W-12.0-SMRE	343	11/21/08
430	Florida RF Cables	Cables	SMS-290AW-480-SMS	430	06/09/09
283	Rohde & Schwarz	Spectrum Analyzer	FSP40	1000033	11/09/08

5.0 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item#	Mfg.	Eq. type	Model	S/N
1	Cirronet	EUT	DNT500P	ACS#2
2	Cirronet	Support PCB	NA	NA
3	CUI, Inc.	Power Supply	EPAS-101W-05	NA

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

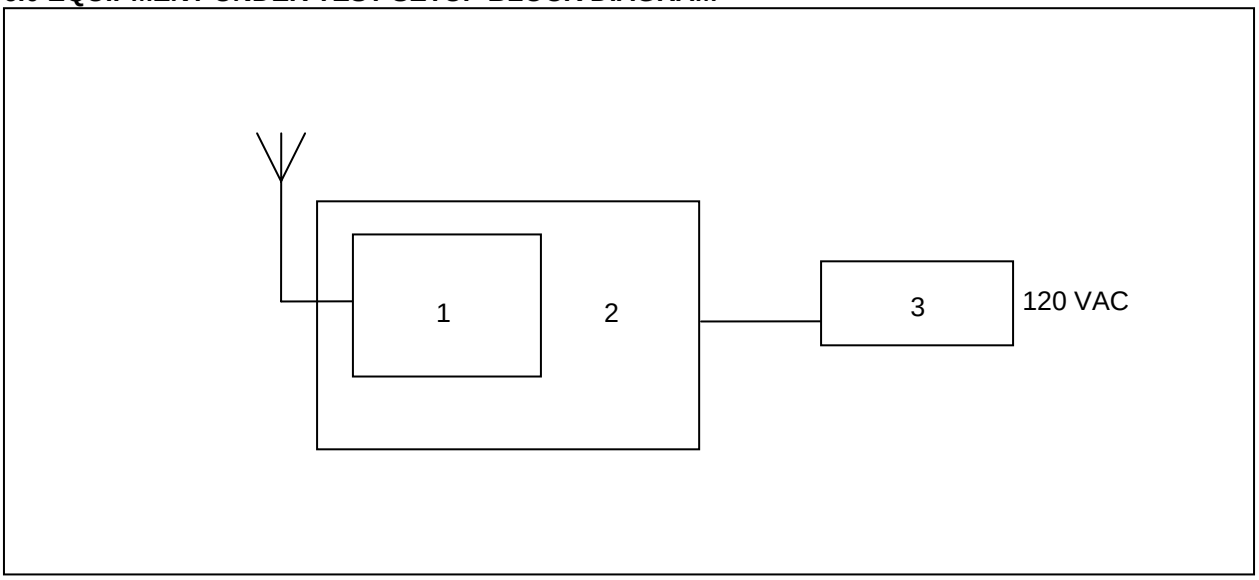

Figure 6-1: EUT Test Setup

*See Test Setup photographs for additional detail.

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 Antenna Requirement – FCC: Section 15.203

The new antenna is a ¼ wave monopole that is soldered to the PCB Board thus satisfying 15.203.

7.2.3 Radiated Spurious Emissions – FCC Section 15.205 IC: RSS-210 2.6

7.2.3.1 Test Methodology

Radiated emissions tests were made over the frequency range of 30MHz to 10GHz, 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 120 kHz and a video bandwidth (VBW) of 300 kHz. For frequencies above 1000MHz, peak measurements were made using an RBW of 1 MHz and a VBW of 3 MHz and the average measurements made using an average detector. The average measurements were further corrected for the duty cycle of the EUT.

7.2.3.2 Duty Cycle Correction

For average radiated measurements in restricted bands, the measured level was reduced by a factor 27.75dB to account for the duty cycle of the EUT. The EUT transmits for approximately 4.096mS within a 100ms period. The duty cycle correction factor is determined using the formula: 20log (4.096/100) = -27.75dB. The justification for the duty cycle used is as follows:

Maximum Packet length that can be sent = 256 bytes
1 Byte = 16 microseconds
Maximum Packet length = 256 bytes * 16 us = 4.096 milliseconds.
This means the radio can only transmit 4.096 ms during any 100 ms period.

7.2.3.3 Test Results

Using the procedures set forth in the FCC KDB Publication No. 558074 "Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)", radiated spurious emissions found in the band of 30MHz to 10GHz are reported in Tables 7.2.3.3-1 to 7.2.3.3-3. Each emission found to be in a restricted band, was compared to the radiated emission limits of 15.209.

Table 7.2.3.3-1: Radiated Spurious Emissions – Low Channel

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
2709.75	55.88	53.45	H	-0.73	55.15	24.97	74.0	54.0	18.85	29.03
2709.75	58.29	55.68	V	-0.93	57.36	27.00	74.0	54.0	16.64	27.00
3613	50.78	44.11	H	2.17	52.95	18.53	74.0	54.0	21.05	35.47
3613	50.73	44.65	V	2.19	52.92	19.09	74.0	54.0	21.08	34.91
4516.25	48.70	41.30	H	3.86	52.56	17.41	74.0	54.0	21.44	36.59
4516.25	50.57	44.32	V	3.96	54.53	20.53	74.0	54.0	19.47	33.47

Note: The magnitude of all emissions not reported were beneath the noise floor of the spectrum analyzer.

Table 7.2.3.3-2: Radiated Spurious Emissions – Mid Channel

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
2750.25	55.39	52.90	H	-0.60	54.79	24.55	74.0	54.0	19.21	29.45
2750.25	57.13	54.63	V	-0.80	56.33	26.08	74.0	54.0	17.67	27.92
3667	50.73	44.26	H	2.34	53.07	18.84	74.0	54.0	20.93	35.16
3667	52.17	46.63	V	2.37	54.54	21.25	74.0	54.0	19.46	32.75
4583.75	47.10	39.08	H	4.02	51.12	15.35	74.0	54.0	22.88	38.65
4583.75	50.70	44.74	V	4.12	54.82	21.11	74.0	54.0	19.18	32.89

Note: The magnitude of all emissions not reported were beneath the noise floor of the spectrum analyzer.

Table 7.2.3.3-3: Radiated Spurious Emissions – High Channel

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
2778.75	58.05	56.10	H	-0.50	57.55	27.85	74.0	54.0	16.45	26.15
2778.75	58.30	56.93	V	-0.70	57.60	28.48	74.0	54.0	16.40	25.52
3705	58.49	55.21	H	2.45	60.94	29.91	74.0	54.0	13.06	24.09
3705	56.40	52.45	V	2.50	58.90	27.19	74.0	54.0	15.10	26.81
4631.25	50.73	44.29	H	4.14	54.87	20.68	74.0	54.0	19.13	33.32
4631.25	52.09	45.74	V	4.24	56.33	22.23	74.0	54.0	17.67	31.77

Note: The magnitude of all emissions not reported were beneath the noise floor of the spectrum analyzer.

7.2.3.4 Sample Calculation:

$R_C = R_U + CF_T$

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

Example Calculation: Peak

Corrected Level: 55.88+ -0.73= 55.15dBuV/m
Margin: 74dBuV/m – 55.15dBuV/m = 18.85dB

Example Calculation: Average

Corrected Level: 53.45+ -0.73-27.75= 24.97dBuV
Margin: 54dBuV – 24.97dBuV = 29.03dB

8.0 CONCLUSION

In the opinion of ACS, Inc. the DNT500P, manufactured by Cirronet Inc.meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT