Excellence in Compliance Testing

Certification Test Report

FCC ID: HSW-934
IC: 4492A-934

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

ACS Report Number: 11-0449.W04.11.A

Manufacturer: Cirronet Corporation
Model: WIT-934

Test Begin Date: December 5, 2011
Test End Date: December 5, 2011

Report Issue Date: December 13, 2011

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Reviewed by: _____

Kirby Munroe
Director, Wireless Certifications
ACS, Inc.

This report contains 11 pages

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1 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.

The changes to the device include a new antenna for portable operating configurations.

1.2 Product description

The Equipment Under Test (EUT) is the Cirronet WIT-934. The EUT is a Spread-Spectrum Frequency Hopping RF Module operating in the 902-928 MHz band.

Manufacturer Information:
Cirronet Corporation
3709 Premiere Parkway
Duluth, GA, 30097
USA

Technical details:

Rated RF Power	+24 dBm
Frequency Range	902 to 928 MHz
Number of Channels	37
Receiver Sensitivity	-103dBm for 10-5 BER
Channel Data Rate	172.8Kbps

Test Sample Serial Number(s): SN2

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

1.3 Test Methodology and Considerations

For radiated emissions, three different orientations were evaluated; X-Position, Y-Position, and Z-Position. Final emissions measurements were performed in the worst case orientation which was X-Position. Only radiated emissions were performed to demonstrate that the new antenna complies with FCC Rule Part 15.247 and IC RSS-210.

2 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

ACS is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 200612-0. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

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.

FCC Registration Number: 511277
Industry Canada Lab Code: IC 4175A-1
VCCI Member Number: 1831

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

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:

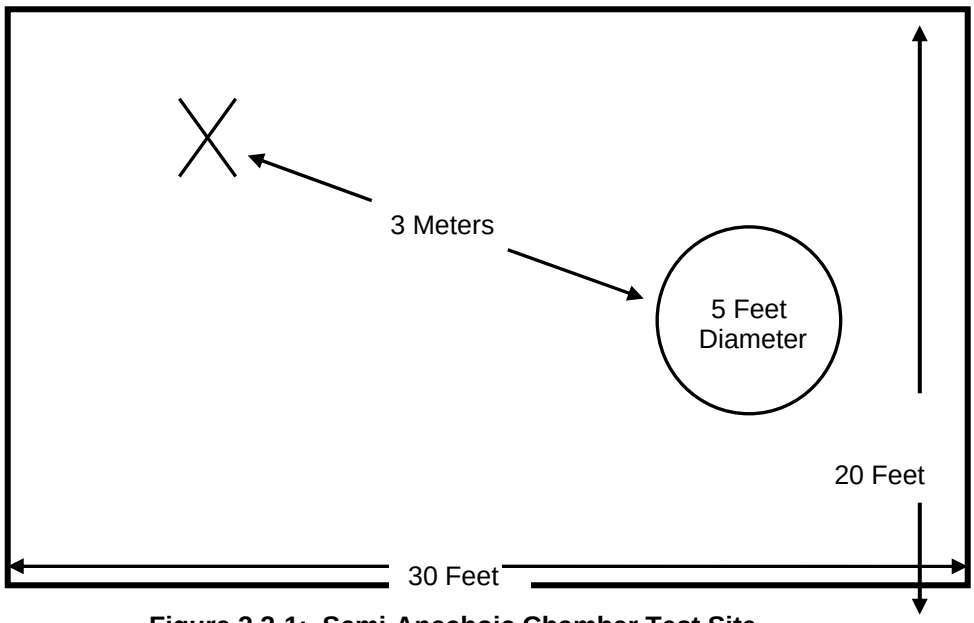

Figure 2.3-1: Semi-Anechoic Chamber Test Site

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:

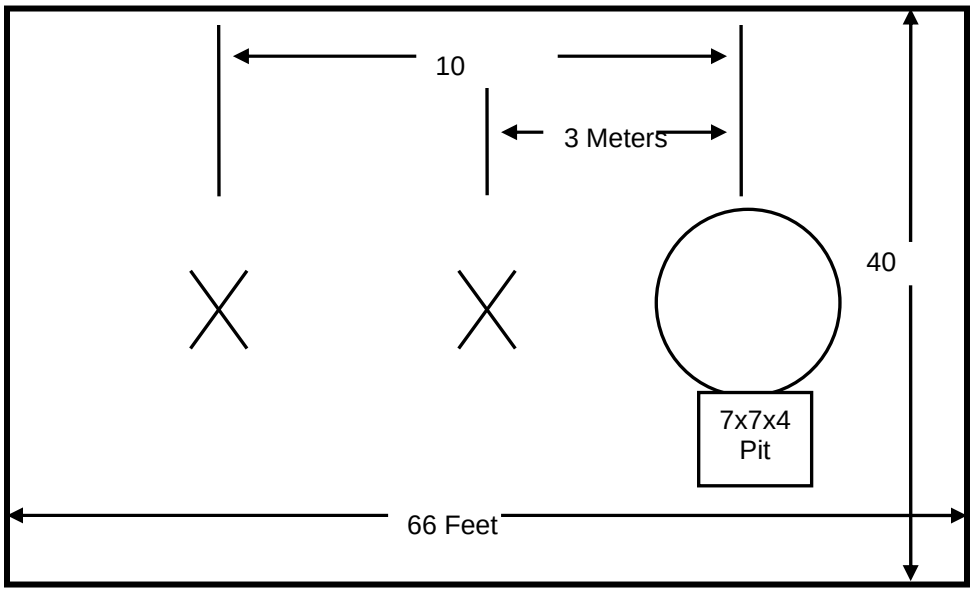

Figure 2.3-2: Open Area Test Site

3 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, 2011
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2011
- FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems, March 30, 2000
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 8 December 2010
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue 3 December 2010.

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
1	Rohde & Schwarz	ESMI - Display	Spectrum Analyzers	833771/007	9/23/2010	9/23/2012
2	Rohde & Schwarz	ESMI-Receiver	Spectrum Analyzers	839587/003	9/23/2010	9/23/2012
30	Spectrum Technologies	DRH-0118	Antennas	970102	4/27/2011	4/27/2013
40	EMCO	3104	Antennas	3211	2/11/2011	2/11/2013
73	Agilent	8447D	Amplifiers	2727A05624	3/21/2011	3/21/2012
167	ACS	Chamber EMI Cable Set	Cable Set	167	1/26/2011	1/26/2012
283	Rohde & Schwarz	FSP40	Spectrum Analyzers	1000033	8/26/2011	8/26/2012
291	Florida RF Cables	SMRE-200W-12.0-SMRE	Cables	None	12/7/2010	12/7/2011
292	Florida RF Cables	SMR-290AW-480.0-SMR	Cables	None	4/11/2011	4/11/2012
331	Microwave Circuits	H1G513G1	Filters	31417	7/11/2011	7/11/2012
338	Hewlett Packard	8449B	Amplifiers	3008A01111	3/24/2011	3/24/2012
412	Electro Metrics	LPA-25	Antennas	1241	7/28/2010	7/28/2012
422	Florida RF	SMS-200AW-72.0-SMR	Cables	805	12/29/2010	12/29/2011

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	Evaluation Board	RFM/Cirronet	Radio Eval Board	800610
2	DC Power Supply	CUI Inc.	EPAS-101W-05	DPS050200UPS-PSP-SZ

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

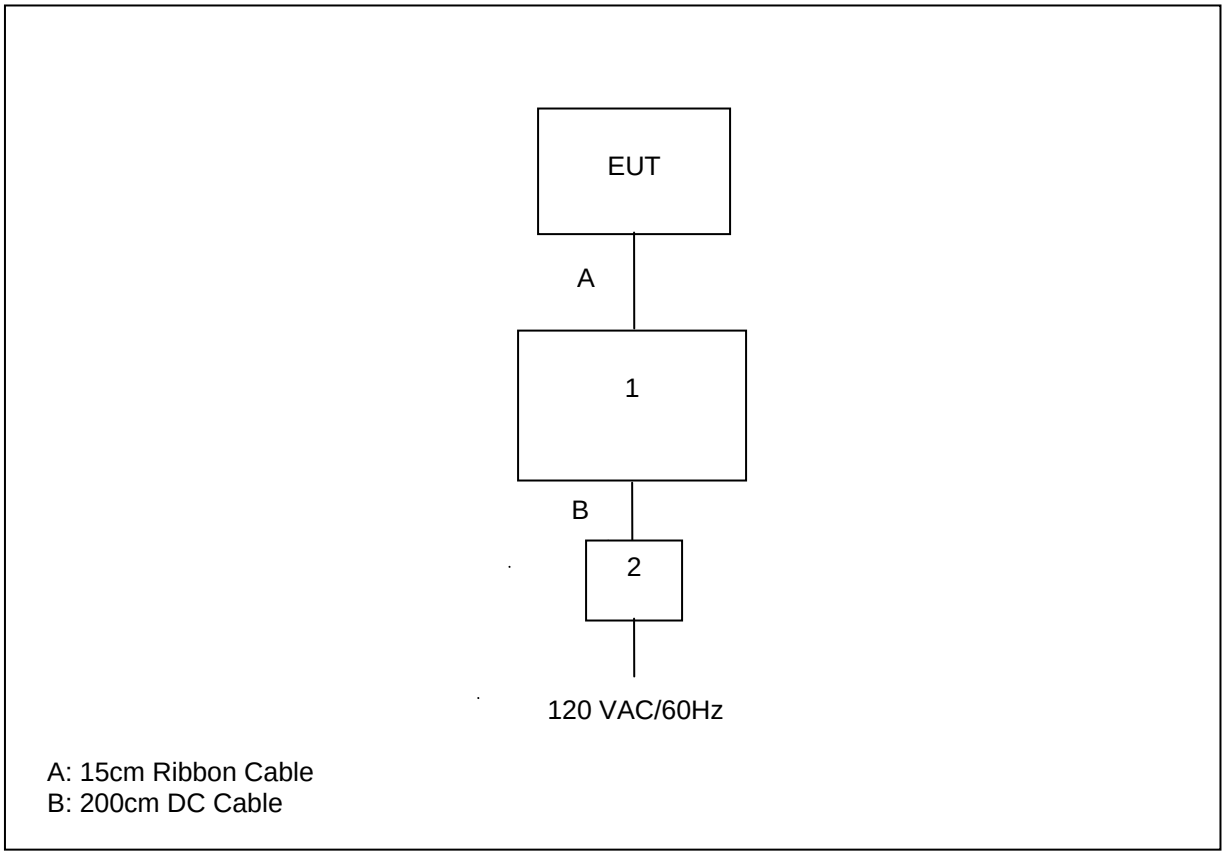

Figure 6-1: EUT Test Setup

7 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 antenna is a PIFA 915MHz detachable antenna with a Hirose U.FL / IPEX connector and a gain of 0.5 dBi.

7.2 Radiated Spurious Emissions - FCC Section 15.205 IC: RSS-210 2.2

7.2.1 Measurement Procedure

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 and average measurements were made with RBW and VBW of 1 MHz and 3 MHz respectively.

The EUT was caused to generate a continuous carrier signal on the hopping channel.

7.2.2 Duty Cycle Correction

For average radiated measurements, using a 7.41% duty cycle, the measured level was reduced by a factor 22.6dB. The duty cycle correction factor is determined using the formula: 20log (7.41/100) = -22.6dB.

The duty cycle justification is provided in the original certification filing with details provided below.

Each remote WIT-934 (which can be a portable or mobile device) can transmit only once during a dwell time. The maximum length of the transmitted packet from each remote is set by the system design and cannot be adjusted by the user. That packet length is calculated as follows:

Preamble 9 bytes
Sync and CRC 10 bytes
Data Payload 13 bytes
Maximum packet length 32 bytes
Bit time (1/345.6 Kbps) 2.984 us
Byte time (bit time * 8) 23.15 us
Maximum packet time (byte time * 32) 740.7 us

The maximum amount of time that the Remote transmitter can operate in any 10 millisecond period is 740.74 us. Therefore, our source-averaged transmit duty cycle becomes 0.07407(0.7407 ms / 10 ms).

Note that this duty cycle is not dependent on the use of Frequency Hopping. RFM does not claim to average their power over the number of hops. The above calculation is strictly based on the

maximum amount of time the transmitter can transmit in any 10 ms time period – regardless of the channel the radio happens to be on at the time.

7.2.3 Measurement Results

Radiated spurious emissions found in the band of 30MHz to 10GHz are reported in the Table 7.2.3-1 below.

Table 7.2.3-1: Radiated Spurious Emissions – XPOS

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
902.57MHz										
2707.71	53.49	46.56	H	-4.10	49.39	19.86	74.0	54.0	24.6	34.1
2707.71	56.31	49.74	V	-4.10	52.21	23.04	74.0	54.0	21.8	31.0
4512.85	56.21	47.30	H	1.30	57.51	26.00	74.0	54.0	16.5	28.0
4512.85	52.15	43.18	V	1.30	53.45	21.88	74.0	54.0	20.5	32.1
5415.42	50.31	39.27	V	3.77	54.08	20.44	74.0	54.0	19.9	33.6
915.28MHz										
2745.84	54.18	47.35	H	-4.00	50.18	20.74	74.0	54.0	23.8	33.3
2745.84	56.71	51.03	V	-4.00	52.71	24.42	74.0	54.0	21.3	29.6
4576.4	54.44	45.01	H	1.42	55.86	23.83	74.0	54.0	18.1	30.2
4576.4	50.24	39.81	V	1.42	51.66	18.63	74.0	54.0	22.3	35.4
926.65MHz										
2779.95	55.19	47.60	H	-3.92	51.27	21.08	74.0	54.0	22.7	32.9
2779.95	59.08	52.76	V	-3.92	55.16	26.24	74.0	54.0	18.8	27.8
3706.6	49.59	38.97	V	-0.32	49.27	16.05	74.0	54.0	24.7	38.0
4633.25	55.18	46.56	H	1.53	56.71	25.49	74.0	54.0	17.3	28.5
4633.25	54.18	44.66	V	1.53	55.71	23.59	74.0	54.0	18.3	30.4

7.2.4 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: 53.49 - 4.10 = 49.39dBuV/m
Margin: 74dBuV/m – 49.39dBuV/m = 24.6dB

Example Calculation: Average
Corrected Level: 46.56 - 22.6 – 0 = 19.86dBuV
Margin: 54dBuV – 19.86dBuV = 34.1dB

8 CONCLUSION

In the opinion of ACS, Inc. the WIT-934, manufactured by Cirronet Corporation meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210 as applicable.

END REPORT