



Washington Laboratories, Ltd.

7560 Lindbergh Drive Gaithersburg, Maryland 20879 (301) 216-1500 Fax (301) 216-1590

website: <http://www.wll.com> email: info@wll.com

**FCC and Industry Canada
Class II Permissive Change Test Report
(FCC Part 15.247)**

For the

Cervis

BU-906F

FCC ID: LOBSBU900

**WLL Report# 11104
September 10, 2009**

Prepared for:

**Cervis
170 Thorn Hill Road
Warrendale, PA, 15086 USA**

Prepared By:

**Washington Laboratories, Ltd.
7560 Lindbergh Drive
Gaithersburg, Maryland 20879**



Testing Certificate 2675.01

**FCC Class II Permissive Change Test Report
(FCC Part 15.247)**

**For the
Cervis
BU-906F**

FCC ID: LOBSBU900

September 10, 2009

WLL Report# 11104 Rev.0



Prepared by: _____
Steven Dovell
EMC Compliance Engineer



Reviewed by: _____
Steven D. Koster
EMC Operations Manager

Abstract

This report has been prepared on behalf of Cervis to support Application for a Class II Permissive Change to existing certified equipment. The test report and application are submitted for a Digital Transmission System under Part 15.247 (7/2008) of the FCC Rules & Regulations. This Permissive Change Test Report documents the test configuration and test results for a Cervis BU-906F.

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by the American Association for Laboratory Accreditation (A2LA) under Certificate 2675.01 as an independent FCC test laboratory.

The Cervis BU-906F remains in compliance with the limits for a Digital Transmission System under Part 15.247 (7/2008).

Revision History	Reason	Date
Rev 0	Initial Release	September 10, 2009

Table of Contents

Abstract	ii
1 Introduction.....	1
1.1 Reason for Class II Permissive Change	1
1.2 Compliance Statement	1
1.3 Test Scope.....	1
1.4 Test Dates	1
1.5 Test and Support Personnel	1
1.6 Abbreviations.....	2
2 Equipment Under Test.....	3
2.1 EUT Identification & Description	3
2.2 Test Configuration	3
2.3 Testing Algorithm.....	4
2.4 Test Location	4
2.5 Measurements	4
2.5.1 References.....	4
2.6 Measurement Uncertainty	5
3 Test Equipment	6
4 Test Results.....	7
4.1 FCC Part15.247 (b) RF Power Output: (FCC Part §2.1046).....	7
4.2 Radiated Spurious Emissions: (FCC Part §15.247).....	8
4.2.1 Test Procedure	8

List of Tables

Table 1. Device Summary.....	3
Table 2: Test Equipment List.....	6
Table 3. Part 15.247 RF Power Output Results	7
Table 4: Radiated Emission Test Data, Low Frequency Data (<1GHz)	9
Table 5: Radiated Emission Test Data, High Frequency Data (>1GHz) Low channel @ 906 MHz	10
Table 6: Radiated Emission Test Data, High Frequency Data (>1GHz) Center channel @ 914 MHz	11
Table 7: Radiated Emission Test Data, High Frequency Data (>1GHz) High channel @ 924 MHz	12

List of Figures

Figure 1: Test Configuration.....	4
-----------------------------------	---

1 Introduction

1.1 Reason for Class II Permissive Change

The addition of an external Omni directional dipole antenna. The antenna has the following characteristics:

Frequency Range = 902 – 928MHz

Gain = 2.0dBi

1.2 Compliance Statement

The Cervis BU-906F remains in compliance with the limits for a Digital Transmission System under Part 15.247 (7/2008).

1.3 Test Scope

Tests for radiated emissions and conducted Peak Power (at antenna terminal) were performed. All measurements were performed in accordance with FCC Public Notice DA 00-705 and the 2003 version of ANSI C63.4. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation unless a different measurement technique is specified by the FCC.

Contract Information

Customer:	Cervis 170 Thorn Hill Road Warrendale, PA, 15086 USA
Purchase Order Number:	51230
Quotation Number:	65067A

1.4 Test Dates

Testing was performed on the following date(s): 8/19/2009 to 8/20/2009

1.5 Test and Support Personnel

Washington Laboratories, LTD	Steven Dovell
Client Representative	Anthony Di Tommaso

1.6 Abbreviations

A	A mpere
ac	a lternating current
AM	A mplitude Modulation
Amps	A mperes
b/s	b its per second
BW	B and W idth
CE	C onducted E mission
cm	c entimeter
CW	C ontinuous W ave
dB	d eci B el
dc	d irect current
EMI	E lectromagnetic I nterference
EUT	E quipment U nder T est
FM	F requency M odulation
G	g iga - prefix for 10^9 multiplier
Hz	H ertz
IF	I ntermediate F requency
k	k ilo - prefix for 10^3 multiplier
LISN	L ine I mpedance S tabilization N etwork
M	M ega - prefix for 10^6 multiplier
m	m eter
μ	m icro - prefix for 10^{-6} multiplier
NB	N arrow b and
QP	Q uasi- P eak
RE	R adiated E missions
RF	R adio F requency
rms	r oot- m ean- s quare
SN	S erial Nu MBER
S/A	S pectrum A nalyzer
V	V olt

2 Equipment Under Test

2.1 EUT Identification & Description

The Cervis device is a BU-906F.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Cervis
FCC ID:	LOBSBU900
Model:	BU-906F
FCC Rule Parts:	§15.247
Industry Canada Rule Parts:	RSS210 issue 6 annex 8
Frequency Range:	906MHz – 924MHz
Maximum Output Power:	2.34dBm
Antenna Connector	External TNC
Antenna Type	Half wave Dipole
Antenna Gain	2dBi
Power Source & Voltage:	12VDC
Highest TX spurious level	2718MHz @ 188.4uV/m
Highest RX spurious level	669.28MHz @ 44.3uV/m

2.2 Test Configuration

The BU-906F was configured with a lab supply set for 12VDC. Conducted power tests were performed with the antenna replaced by a cable. Radiated Emissions test were performed with the replacement antenna in place.

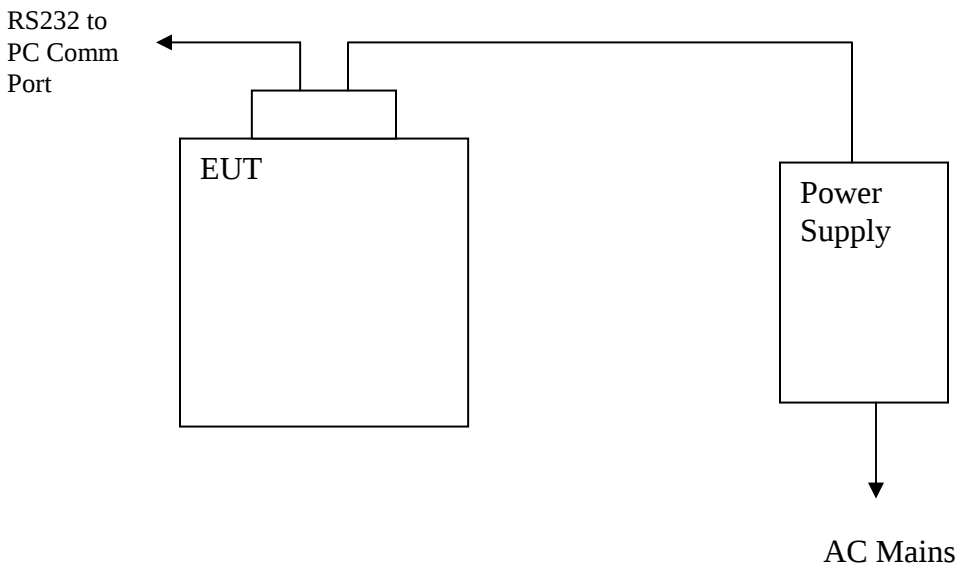


Figure 1: Test Configuration

2.3 Testing Algorithm

The BU-906F was programmed for operation via a serial cable connected to a laptop running Hyperterm. Channel selection and modulation was accomplished using the laptop to set the EUT into a continuous transmit pseudo-random data stream at the Low, Center and High channels. Once the channel was set, the laptop was removed from the setup.

Worst case emission levels are provided in the test results data.

2.4 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by the American Association for Laboratory Accreditation (A2LA) under Certificate 2675.01 as an independent FCC test laboratory.

2.5 Measurements

2.5.1 References

ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.4 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

FCC KDB 558074

2.6 Measurement Uncertainty

All results reported herein relate only to the equipment tested. For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ± 2.3 dB. This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

$$\text{Total Uncertainty} = (A^2 + B^2 + C^2)^{1/2}/(n-1)$$

where:

A = Antenna calibration uncertainty, in dB = 2 dB

B = Spectrum Analyzer uncertainty, in dB = 1 dB

C = Site uncertainty, in dB = 4 dB

n = number of factors in uncertainty calculation = 3

Thus, Total Uncertainty = $0.5 (2^2 + 1^2 + 4^2)^{1/2} = \pm 4.55$ dB.

3 Test Equipment

Table 2 shows a list of the test equipment used for measurements along with the calibration information.

Table 2: Test Equipment List

Test Name: Conducted Emissions at Antenna Terminal		Test Date: 08/19/09	
Asset #	Manufacturer/Model	Description	Cal. Due
67	HP, 8564E	Analyzer, Spectrum	10/10/2009
Test Name: Radiated Emissions		Test Date: 08/19/09	
Asset #	Manufacturer/Model	Description	Cal. Due
67	HP, 8564E	Analyzer, Spectrum	10/10/2009
626	ARA, DRG-118/A	Antenna, Horn	06/03/2011
522	HP, 8449B	Pre-Amplifier, 1-26.5GHz	07/21/2010
382	Sunol, JB1	Antenna, Biconlog	01/27/2010
68	HP, 85650A	Adapter, QP	07/10/2010
72	HP, 8568B	Analyzer, Spectrum	07/10/2010
70	HP, 85685A	Preselector, RF w/opt 8ZE	07/10/2010

4 Test Results

4.1 FCC Part 15.247 (b) RF Power Output: (FCC Part §2.1046)

To measure the output power the output from the transmitter was connected to the input of a spectrum analyzer. The original grant RF power levels and the original report filing levels are reported in the below tables along with the measured RF power levels.

This is applicable for the 906 – 924MHz band of this device.

Table 3. Part 15.247 RF Power Output Results

Grant listed as 0.0016 Watts for 906 - 924MHz

Channel and/or Frequency	Peak Measured Level (dBm)	Peak Measured Level (mWatts)	Original Grant Report Level (dBm)	Original Grant Report Level (mWatts)	Limit (dBm)
Low Channel 906MHz	2.34	1.714	2.09dBm	1.618	30
Mid Channel 914MHz	2.17	1.648	2.0dBm	1.585	30
High Channel 924MHz	1.84	1.528	1.58dBm	1.439	30

4.2 Radiated Spurious Emissions: (FCC Part §15.247)

The EUT must comply with the requirements for radiated spurious emissions that fall within the restricted bands. These emissions must meet the limits specified in §15.209 and §15.35(b) for peak measurements.

4.2.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The peripherals were placed on the table in accordance with ANSI C63.4-2003. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

3 Orthogonals of the EUT were scanned in the restricted bands up to the 10th harmonic with the worst case readings shown.

The unit was tested in the 802.11g mode (6Mbps) and the 802.11a (6Mbps) (non UNII channels) as these were the worse case scenarios.

The emissions were measured using the following resolution bandwidths:

Frequency Range	Resolution Bandwidth	Video Bandwidth
30MHz-1000 MHz	120kHz	>100 kHz
>1000 MHz	1 MHz	10 Hz (Avg.) 1MHz (Peak)

Table 4: Radiated Emission Test Data, Low Frequency Data (<1GHz)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)
52.36	V	245.00	1.00	24.30	8.4	43.0	100.0	-7.3
123.90	V	105.00	1.95	6.00	14.6	10.7	150.0	-22.9
209.81	V	168.00	2.80	15.50	11.6	22.7	150.0	-16.4
238.40	V	0.00	2.20	5.00	12.9	7.8	200.0	-28.2
519.30	V	181.00	1.50	6.90	20.4	23.2	200.0	-18.7
669.28	V	268.00	1.46	12.10	20.8	44.3	200.0	-13.1
54.72	H	147.00	4.00	19.00	8.0	22.3	100.0	-13.0
114.14	H	212.00	4.00	4.80	14.1	8.8	150.0	-24.6
162.12	H	280.00	3.75	7.00	12.3	9.2	150.0	-24.3
257.47	H	256.00	3.25	3.80	13.3	7.1	200.0	-28.9
450.04	H	166.00	3.14	8.60	19.2	24.6	200.0	-18.2

**Table 5: Radiated Emission Test Data, High Frequency Data (>1GHz) Low channel @ 906 MHz
(Restricted Bands)**

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
PEAK									
906.200	V	231.00	2.50	101.00	26.5	2369403.5	N/A	N/A	Fundamental
2718.280	V	92.00	2.62	50.20	-4.2	199.6	5000.0	-28.0	
3624.360	V	161.00	2.50	42.00	-2.0	100.0	5000.0	-34.0	
4530.820	V	0.00	2.40	45.70	-0.3	185.8	5000.0	-28.6	Ambient
5437.020	V	0.00	2.50	45.00	2.0	224.5	5000.0	-27.0	Ambient
8155.620	V	0.00	2.50	46.20	6.1	409.8	5000.0	-21.7	Ambient
9061.820	V	0.00	2.50	47.30	7.9	573.9	5000.0	-18.8	Ambient
AVG	V								
2718.280	V	92.00	2.62	37.70	-4.2	47.3	500.0	-20.5	
3624.360	V	161.00	2.50	30.80	-2.0	27.5	500.0	-25.2	
4530.820	V	0.00	2.40	31.50	-0.3	36.2	500.0	-22.8	Ambient
5437.020	V	0.00	2.50	31.50	2.0	47.5	500.0	-20.5	Ambient
8155.620	V	0.00	2.50	34.80	6.1	110.3	500.0	-13.1	Ambient
9061.820	0.00	0.00	2.50	34.30	7.9	128.5	500.0	-11.8	Ambient
Peak									
906.200	H	240.00	1.54	110.00	26.5	6677886.4	N/A	N/A	Fundamental
2718.280	H	224.00	1.62	55.80	-4.2	380.3	5000.0	-22.4	
3624.360	H	0.00	1.60	42.70	-2.0	108.3	5000.0	-33.3	
4530.820	H	300.00	1.56	44.50	-0.3	161.8	5000.0	-29.8	Ambient
5437.020	H	0.00	1.50	44.20	2.0	204.8	5000.0	-27.8	Ambient
8155.620	H	0.00	1.50	44.80	6.1	348.8	5000.0	-23.1	Ambient
9061.820	H	0.00	1.50	45.70	7.9	477.3	5000.0	-20.4	Ambient
AVG									
2718.280	H	224.00	1.62	49.70	-4.2	188.4	500.0	-8.5	
3624.360	H	0.00	1.60	30.20	-2.0	25.7	500.0	-25.8	
4530.820	H	300.00	1.56	30.80	-0.3	33.4	500.0	-23.5	Ambient
5437.020	H	0.00	1.50	30.80	2.0	43.8	500.0	-21.2	Ambient
8155.620	H	0.00	1.50	31.00	6.1	71.2	500.0	-16.9	Ambient
9061.820	H	0.00	1.50	34.00	7.9	124.1	500.0	-12.1	Ambient

Table 6: Radiated Emission Test Data, High Frequency Data (>1GHz) Center channel @ 914 MHz

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
PEAK									
914.015	V	315.00	1.38	61.40	26.0	23574.9	N/A	N/A	Fundamental
2742.390	V	99.00	2.40	52.67	-4.1	267.2	5000.0	-25.4	
3656.520	V	123.00	2.25	42.45	-1.9	106.2	5000.0	-33.5	
4570.650	V	326.00	2.72	41.33	-0.2	113.7	5000.0	-32.9	Ambient
7313.040	V	205.00	2.80	42.17	6.4	266.7	5000.0	-25.5	Ambient
8227.170	V	190.00	1.80	44.17	6.0	320.8	5000.0	-23.9	Ambient
9141.300	V	180.00	2.71	44.50	8.6	451.9	5000.0	-20.9	Ambient
AVG	V								
2742.390	V	99.00	2.40	44.83	-4.1	108.4	500.0	-13.3	
3656.520	V	123.00	2.25	30.20	-1.9	25.9	500.0	-25.7	
4570.650	V	326.00	2.72	29.67	-0.2	29.7	500.0	-24.5	Ambient
7313.040	V	205.00	2.80	31.50	6.4	78.1	500.0	-16.1	Ambient
8227.170	V	190.00	1.80	32.50	6.0	83.7	500.0	-15.5	Ambient
9141.300	V	180.00	2.71	32.67	8.6	115.8	500.0	-12.7	Ambient
Peak									
914.015	H	315.00	1.25	55.30	26.0	11680.2	N/A	N/A	Fund
2742.390	H	198.00	2.80	50.00	-4.1	196.5	5000.0	-28.1	
3656.520	H	7.00	2.79	41.60	-1.9	96.3	5000.0	-34.3	
4570.650	H	327.00	2.52	42.17	-0.2	125.3	5000.0	-32.0	Ambient
7313.040	H	8.00	2.70	43.33	6.4	304.8	5000.0	-24.3	Ambient
8227.170	H	143.00	2.80	44.83	6.0	346.1	5000.0	-23.2	Ambient
9141.300	H	180.00	2.80	44.17	8.6	435.1	5000.0	-21.2	Ambient
AVG									
2742.390	H	198.00	2.80	38.33	-4.1	51.3	500.0	-19.8	
3656.520	H	7.00	2.79	30.00	-1.9	25.3	500.0	-25.9	
4570.650	H	327.00	2.52	30.00	-0.2	30.9	500.0	-24.2	Ambient
7313.040	H	8.00	2.70	31.50	6.4	78.1	500.0	-16.1	Ambient
8227.170	H	143.00	2.80	32.84	6.0	87.0	500.0	-15.2	Ambient
9141.300	H	180.00	2.80	32.67	8.6	115.8	500.0	-12.7	Ambient

Table 7: Radiated Emission Test Data, High Frequency Data (>1GHz) High channel @ 924 MHz

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
PEAK									
924.025	V	100.00	1.26	62.60	26.0	26820.9	N/A	N/A	Fund
2772.600	V	214.00	3.18	51.00	-4.1	222.5	5000.0	-27.0	
3696.800	V	124.00	2.54	43.00	-1.8	114.4	5000.0	-32.8	
4621.000	V	165.00	2.70	41.83	-0.1	122.4	5000.0	-32.2	Ambient
7393.600	V	180.00	2.65	42.67	6.3	282.3	5000.0	-25.0	Ambient
8317.800	V	303.00	2.54	43.17	5.8	281.9	5000.0	-25.0	Ambient
AVG									
2772.600	V	214.00	3.18	39.76	-4.1	61.0	500.0	-18.3	
3696.800	V	124.00	2.54	30.10	-1.8	25.9	500.0	-25.7	
4621.000	V	165.00	2.70	29.83	-0.1	30.7	500.0	-24.2	Ambient
7393.600	V	180.00	2.65	31.17	6.3	75.1	500.0	-16.5	Ambient
8317.800	V	303.00	2.54	32.67	5.8	84.2	500.0	-15.5	Ambient
Peak									
924.025	H	300.00	1.24	55.50	26.0	11843.3	N/A	N/A	Fund
2772.600	H	160.00	3.18	52.83	-4.1	274.6	5000.0	-25.2	
3696.800	H	264.00	3.00	42.83	-1.8	112.2	5000.0	-33.0	
4621.000	H	338.00	2.75	42.67	-0.1	134.8	5000.0	-31.4	Ambient
7393.600	H	169.00	2.80	42.17	6.3	266.6	5000.0	-25.5	Ambient
8317.800	H	316.00	2.81	45.50	5.8	368.7	5000.0	-22.6	Ambient
AVG									
2772.600	H	160.00	3.18	46.00	-4.1	125.1	500.0	-12.0	
3696.800	H	264.00	3.00	29.67	-1.8	24.7	500.0	-26.1	
4621.000	H	338.00	2.75	29.67	-0.1	30.2	500.0	-24.4	Ambient
7393.600	H	169.00	2.80	31.00	6.3	73.7	500.0	-16.6	Ambient
8317.800	H	316.00	2.81	33.00	5.8	87.4	500.0	-15.1	Ambient