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# REPORT OF MEASUREMENTS FOR LAB PARTNERS ASSOCIATES, INC.

# FLASH CONTROL TRANSCEIVER

MODEL: POCKETWIZARD PLUS II

FCC ID: KDS-PW2-103 IC: 2170A-PW103

Company Name:	Lab Partners Associates, Inc
Date of Report:	January 23, 2008
Test Report No:	R-4955N-1
Test Start Date:	January 14, 2008
Test Finish Date:	January 15, 2008
Test Technician:	Matthew Seamans
Lab Supervisor:	Todd Hannemann
eport Prepared By:	Jamie Ramsey

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## **Certification and Signatures**

We certify that this report is a true report of the results obtained from the tests of the equipment stated and relates only to the equipment tested. We further certify that the measurements shown in this report were made in accordance with the procedures indicated and vouch for the qualifications of all Retlif Testing Laboratories personnel taking them.

Scott Wentworth Branch Manager

State Wenter

**NVLAP** Approved Signatory

Todd Hannemann

Laboratory Supervisor

#### Non-Warranty Provision

The testing services have been performed, findings obtained, and reports prepared in accordance with generally accepted testing laboratory principles and practices. This warranty is in lieu of all other warranties, either express or implied.

#### Non-Endorsement

This test report contains only findings and results arrived at after employing the specific test procedures and standards listed herein. It is not intended to constitute a recommendation, endorsement, or certification of the product or material tested. This report must not be used by the client to claim product endorsement by NVLAP, NIST or any agency of the U.S. Government.

### **APPLICANT**

Lab Partners Associates, Inc 41 IDX Drive South Burlington, VT 05403

TEST SPECIFICATIONS: FCC Rules and Regulations Part 15, Subpart C, Para. 15.231

RSS 210, Issue 7

TEST PROCEDURE: ANSI C63.4:2003/RSS-210, Issue 7

### **PURPOSE:**

The purpose of this test program was to demonstrate compliance of the PocketWizard PLUS II Transceiver to the requirements of FCC Part 15.231 and RSS, 210, Issue 7.

### **TEST SAMPLE DESCRIPTION:**

BRANDNAME: PocketWizard

MODEL: PocketWizard PLUS II

TYPE: Flash Control Transceiver

POWER REQUIREMENTS: 3VDC via 120VAC, 60Hz AC/DC Power Adapter

FREQUENCY OF OPERATION: 344.04MHz

MODULATION: OOK (On/Off Keying)

TYPE OF TRANSMISSION: Control Signal (Pulse Recognition Codes)

APPLICATION: Remote Triggering of Flashpack

FREQUENCIES TESTED: 344.04MHz

**TESTS PERFORMED:** 

15.231 (b)/RSS-210 Annex 1, Spurious Radiated Emissions (30MHz to 3.6GHz)

15.231 (b)/RSS-210 Annex 1, Field Strength of Fundamental

15.231 (c) Occupied Bandwidth, 0.25% of Fundamental Frequency

RSS-210, Annex 1, A1.1.3, 99% bandwidth, 0.25% of Center Frequency

**Duty Cycle Determination** 

TEST SAMPLE OPERATION:

The device is normally manually operated and transmits a control signal for remote triggering of a flashpack. Normal operation of the EUT complies with the parameters required in Part 15, Subpart

C, Section 15.231 and RSS 210 for momentary operated devices. For testing purposes only the EUT

was configured to continuously transmit.

TEST SAMPLE / TEST PROGRAM

• The transmitter is manually activated and employs a switch that automatically deactivates the

transmitter within 5 seconds of being released.

• The transmitter does not perform periodic transmissions at regularly predetermined intervals.

• The device can not be employed for RC purposes involving security.

• The device uses an external permanently attached rubber coated helix coiled spring antenna.

• The fundamental field strength at 344.04MHz did not exceed 7252µV/M (Average) at a test

distance of 3 meters.

• The peak value of fundamental emissions did not exceed a peak field strength limit

corresponding to 20dB above the maximum permitted average limit.

• The field strength of harmonic and spurious emissions did not exceed  $725\mu V/M$  or  $500\mu V/M$ 

as applicable for a fundamental frequency of 344.04MHz.

No harmonic or spurious emissions were observed within 10dB of the specified limit at test

distances of 1 or 3 meters.

Radiated Emissions from the EUT were measured in all three axis. The attached Radiated

Emissions test data is representative of the worst case orientation.

## **TEST SAMPLE / TEST PROGRAM (continued)**

• The device operates at 344.04. The 20dB bandwidth and 99% bandwidth of emissions did not exceed 0.25% of the center operating frequency and was determined as follows:

Fundamental Frequency = 344.04MHz 0.25% of Center Frequency = 0.860MHz 0.860 divided by 2 = 0.430MHz

Bandwidth Range = Fundamental Frequency + and - 0.430MHz

344.04MHz - 0.430MHz = 343.61MHz344.04MHz + 0.430MHz = 344.47MHz

Bandwidth Range = 343.61MHz - 344.47MHz

#### **DETERMINATION OF FIELD STRENGTH LIMITS**

The field strength limits shown below were calculated as instructed in Section 15.231.

### Fundamental Frequency: 344.04MHz

Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strength for the band 260-470MHz,  $\mu V/m$  at 3 meters is as follows:

41.6667(F) - 7083.3333 = Field Strength Limit ( $\mu$ V/m)

 $41.6667 \times 344.04 = 14335.011$ 

14335.011 - 7083.3333 = 7252

Field Strength Limit =  $7252\mu V/m = 77.21dBuV/M$ 

The maximum permitted unwanted emission level is 20dB below the maximum permitted fundamental level which equals  $725\mu V/m = 57.21 dBuV/M$ .

### **TEST SAMPLE / TEST PROGRAM (continued)**

### **DETERMINATION OF DUTY CYCLE**

The transmitter controls were adjusted to maximize the transmitted duty cycle. The analyzer was set for a frequency span of 0Hz. The sweep time was then adjusted in order to display one full pulse train. The transmitter on time was then summed and compared to the time for one full cycle in order to obtain the duty cycle. As the cycle time exceeded 100msec then 100msec was used as the cycle time. The on times were determined as follows:

The transmitter pulse train consisted of multiple pulse bursts. The individual pulses within each burst were measured and summed in order to obtain the total "on time".

### Fundamental Frequency: 344.04MHz

Transmitter On Time = 1.074milliseconds
Transmitter Cycle Time = 100milliseconds

Transmitter Duty Cycle = 1.074%

On Time divided by Cycle Time = Duty Cycle Factor

1.074 divided by 100 = 0.01074 0.01074 converted to dB (LOG<sub>10</sub> .01074)20 = -39.37 **Duty Cycle Factor** = -39.37dB

Duty Cycle Factor Determination Plots are included with this application as a separate attachment.

#### **Test Methods**

### 15.231 (b) Fundamental & Spurious Radiated Emissions

The test sample was placed on a 80cm high wooden test stand which was located 3 meters from the test antenna on an FCC listed open area test site. Emissions from the EUT were maximized by rotating the test sample and adjusting the test sample orientation and antenna polarization. The maximized peak field strength of each emission was measured and recorded and compared to the limit specified in 15.35 (b) (peak limit corresponds to 20dB above the maximum permitted average limit). The duty cycle factor was applied to the peak readings in order to determine the average field strength of the emissions for comparison to the specified average limits.

**Test Results:** The worst case maximum peak field strength of the fundamental frequency at 344.04MHz was 91.45dBuV/M which met the peak limit of 97.21dBuV. The maximum average field strength at 344.04MHz was 52.08dBuV which met the specified average limit of 77.21dBuV. No harmonic/spurious frequencies were observed above the noise floor of the test equipment which was a minimum of 10dB below the specified limit.

### 15.231 (c) Occupied Bandwidth

The test sample was placed on a test bench and configured to transmit its normal modulated signal at maximum power. The spectrum analyzers resolution bandwidth, sweep rate and span were adjusted for the frequency being measured. The upper and lower frequency points corresponding to levels 20dB down from the peak of the modulated carrier frequency were used to determine the occupied bandwidth.

**Test Results:** The bandwidth of the emission at 344.04MHz was less than 0.25% of the center frequency and met the requirements of 15.231 (c).

RSS 210, A1.1.3, 99% Bandwidth

The test sample was placed on a test bench and configured to transmit its normal modulated signal at maximum power. The spectrum analyzers resolution bandwidth, sweep rate and span were adjusted for the frequency being measured. Using the spectrum analyzer 99% bandwidth function the 99% bandwidth of the modulated carrier frequency was measured and recorded.

**Test Results:** The 99% bandwidth of the emission at 344.04MHz was less than 0.25% of the center frequency and met the requirements of RSS-210.

Test Report No. R-4955N-1 FCC ID: KDS-PW2-103 IC: 2170A-PW103

### 15.207 (a) AC Line Conducted Emissions

The test sample was placed on a 0.8m high wooden test stand above the floor of the test area (ground plane). The rear of the test sample was aligned flush with the rear of the test stand. The test stand was situated such that the test sample was located 0.4m from all other grounded surfaces. The power cord of the test sample was connected to an artificial mains network (LISN). The spectrum analyzer was connected to the RF port of the LISN and peak/quasipeak and average measurements were taken in the frequency range of 150kHz to 30MHz on each the hot and neutral leads.

**Test Results:** The AC line conducted emissions met the limit specified in 15.207 (a).

Test Report No. R-4955N-1 FCC ID: KDS-PW2-103

IC: 2170A-PW103

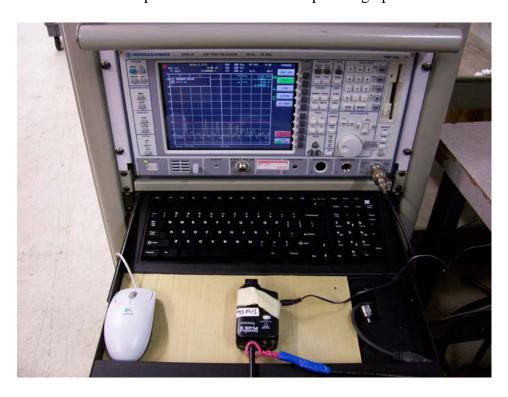
# Radiated Emissions Setup Photographs





R-4955N-1 FCC ID: KDS-PW-103 IC: 2170A-PW103

# Occupied/99% Bandwidth Setup Photograph



Conducted Emissions Setup Photograph



R-4955N-1 FCC ID: KDS-PW-103 IC: 2170A-PW103

# **EQUIPMENT LIST**

# Fundamental & Spurious Radiated Emissions

EN	Type	Manufacturer	Description	Model No.	Cal Date	<b>Due Date</b>
3116	Pre-Amplifier	Miteq	0.1 GHz - 18 GHz	AFS42-35	8/27/2007	8/27/2008
3117	Power Supply	B&K Precision	0-30 Vdc, 3.0 A	1630	1/23/2007	1/23/2008
3258	Double Ridge Guide	EMCO	1 - 18 GHz	3115	11/14/2007	11/14/2008
4029B	Test Site Attenuation	Retlif	3 / 10 Meters	RNH	6/20/2007	6/20/2008
5053	Biconilog	EMCO	26 MHz - 3 GHz	3142C	10/4/2007	10/4/2008
R425A	Spectrum Analyzer	Agilent	100 Hz - 26.5GHz	E7405A;A	3/6/2007	4/23/2008

# **Conducted Emissions**

EN	Туре	Manufacturer	Description	Model No.	Cal Date	<b>Due Date</b>
5030D	10 DB Atten. (50 ohm)	Narda	DC - 12.4 GHz	757C-10	1/25/2007	1/25/2008
7032	LISN	Rohde & Schwarz	N/A	ESH 3-Z5	10/19/2007	10/19/2008
R425A	Spectrum Analyzer	Agilent	100 Hz - 26.5GHz	E7405A;A	3/6/2007	4/23/2008

# Occupied Bandwidth and Duty Cycle

EN	Type	Manufacturer	Description	Model No.	Cal Date	<b>Due Date</b>
5070	EMI Test Receiver	Rohde & Schwarz	20Hz - 40GHz	ESIB40	12/7/2007	12/7/2008

# 99% Bandwidth

EN	Type	Manufacturer	Description	Model No.	Cal Date	<b>Due Date</b>
5070	EMI Test Receiver	Rohde & Schwarz	20Hz - 40GHz	ESIB40	12/7/2007	12/7/2008

Test Report No. R-4955N-1 FCC ID: KDS-PW2-103

IC: 2170A-PW103

Test Method: Customer: Test Sample: Model No: Test Specification:	Fundamental F LPA Design, In PocketWizard I	C.		AR DATA	-				
Test Sample:	PocketWizard I				-				
Model No:	PocketWizard I	PLUS II Trans			Job No:	R-4955N-1			
			sceiver						
Test Specification:		PLUS II			Serial No:	N/A			
	FCC Part 15, S	Subpart C							
					Paragraph: 1	5.231(b)			
Operating Mode:	Continuously T	ransmitting							
Technician:	M.Seamans				Date:	January 16, 2	008		
Notes:	Corrected peak	readings me	et peak limit (2	?0dB above av	erage limit) pe	er 15.35			
Transmit	Antenna/EUT	Meter	Correction	Corrected	Duty Cycle	Corrected	Average Limit	Converted	Limit
Frequency	Position	Reading	Factor	Peak	Correction	Reading	at 3 Meters	Reading	at 3 Meters
MHz 344.04	Polarization/Axis H/Y	dBuV 76.60	dB 14.85	dBuV/m 91.45	dB -39.37	dBuV/m 52.08	dBuV 77.21	uV/m 401.69	uVm 7251.78
344.04	11/1	70.00	14.05	91.43	-39.31	32.00	11.21	401.09	7231.70
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Data Sheet 1 of 1									R-4955N-1

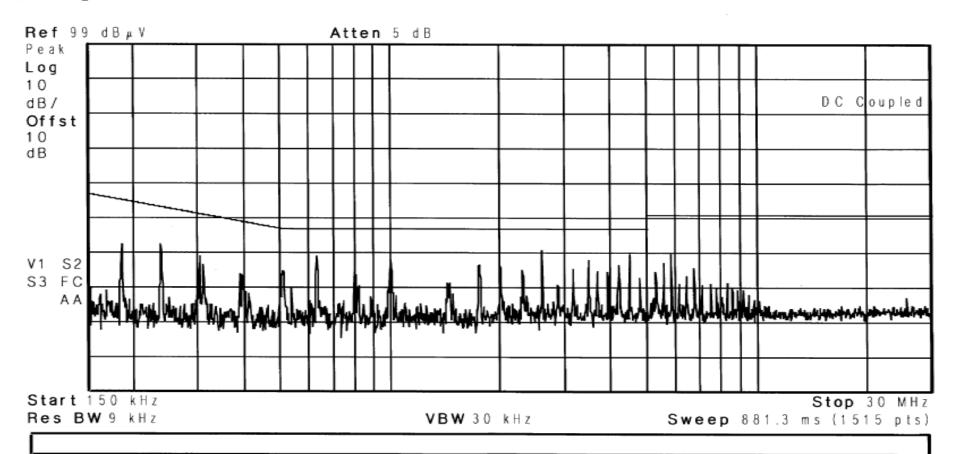
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Test Method		Spurious Emis	sions 30MHz		ANDAIA	UILLI								
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Customer:		LPA Design, In				Job No:	1-NGC684-1							
Test Sample	:	PocketWizard	PLUS II Trans	sceiver										
Model No:		PocketWizard	PLUS II			Serial No:	N/A							
Test Specific	cation:	FCC Part 15, S	FCC Part 15, Subpart C											
		Paragraph: 15.231(b)												
Operating M	ode:	Continuously T	Continuously Transmitting											
Technician:		M.Seamans				Date:	1/15/2008							
Notes:		Fundamental F	requency: 34	4.04MHz										
Harmonic		Antenna/EUT	Meter	Correction	Duty Cycle	Corrected		Converted	Limit					
Frequency		Position	Reading	Factor	Correction	Reading		Reading	at 3 Meters					
MHz		Polarization/Axis	dBuV	dB	dB	dBuV/m		uV/m	u∨m					
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1720.22		-	-	-	-	-		-	725.18					
2064.26 2408.31		-	-	-	-	-	+	-	725.18 725.18					
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-		sign, Inc.			Test Sample:	PocketWizard F	PLUS II Transceiv	er			Job No:	R-495
		Vizard PLUS II			Serial No:	N/A	LOC II Francociv				Technician:	
L		rt 15, Subpart C			ociiai ito:	15.231(c)					Date:	1/15/2
-		usly Transmiting				13.231(0)					Date.	1/10/2
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Γest Method:	99% Bandwidth										
Customer:	LPA Design, Inc.			Test Sample:	PocketWizard	PLUS II Transceive	er		Job No:	R-4955	5N-1
Model No:	PocketWizard PLUS II			Serial No:	N/A				Technicia	n: M. Sea	amans
Test Specification:	RSS-210								Date:	1/15/20	
Operating Mode:	Continously Transmiting										
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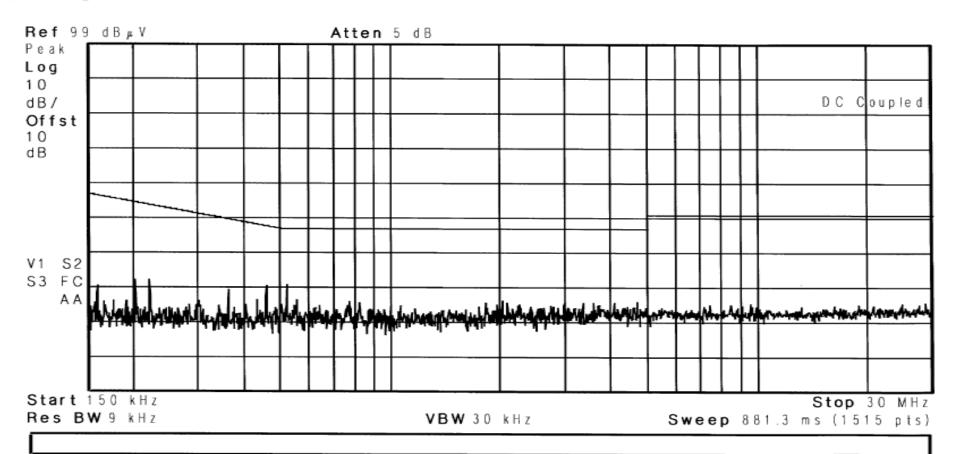
#### **RETLIF TESTING LABORATORIES EMISSIONS DATA SHEET** Conducted Emissions 150 kHz to 30 MHz Test Method: PocketWizard PLUS II Transceiver LPA Design, Inc. Job No: R-4955N-1 Customer: Test Sample: PocketWizard PLUS II Model No: Serial No: Technician: M. Seamans FCC Part 15, Subpart C Paragraph: 15.207 (a) Test Specification: January 14, 2008 Date: Operating Mode: Continously Transmitting Lead Tested: 120 VAC 60 Hz Hot Peak Readings to Average Limits. Notes:

\* Agilent 10:31:24 Jan 14, 2008



#### **RETLIF TESTING LABORATORIES EMISSIONS DATA SHEET** Conducted Emissions 150 kHz to 30 MHz **Test Method:** PocketWizard PLUS II Transceiver Customer: LPA Design, Inc. Job No: R-4955N-1 Test Sample: PocketWizard PLUS II Serial No: Model No: Technician: M. Seamans FCC Part 15, Subpart C Paragraph: 15.207 (a) **Test Specification:** Date: January 14, 2008 Operating Mode: Continously Transmitting Lead Tested: 120VAC 60Hz Neutral Notes: Peak Readings to Average Limits

\* Agilent 10:33:22 Jan 14, 2008

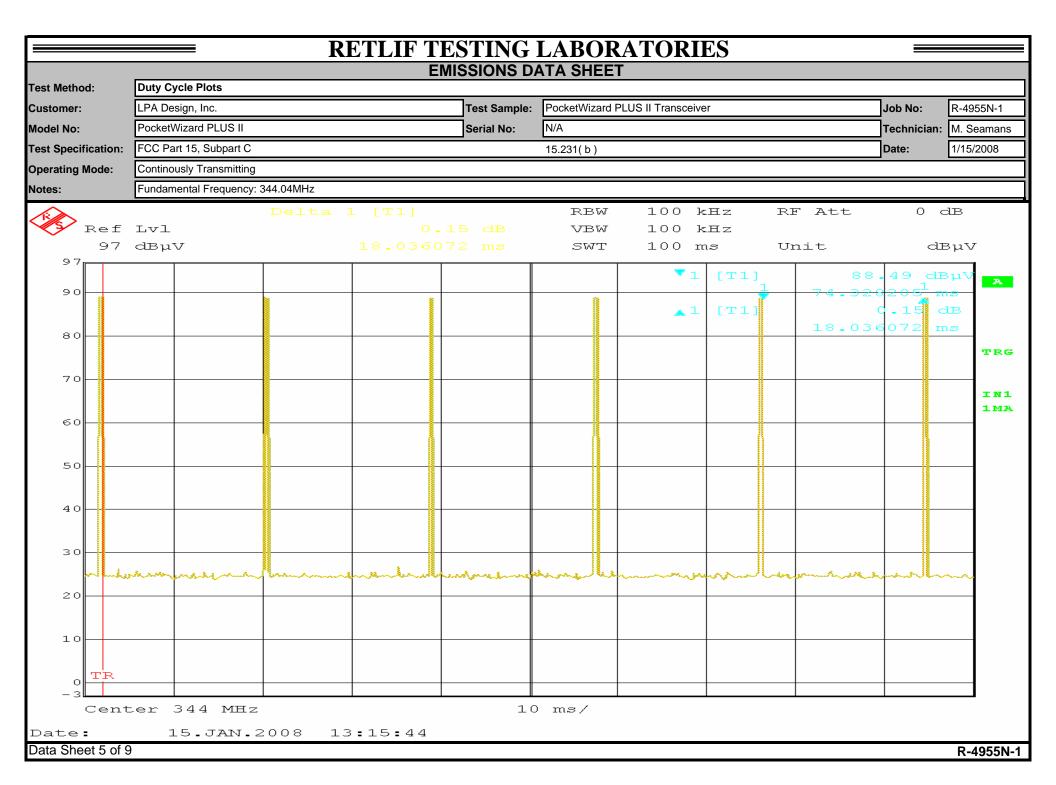


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Method:	Duty Cycle Plots		_			•				
	LPA Design, Inc.			Test Sample:	PocketWizard	PLUS II Transceive	er		Job No:	R-4955
l No:	PocketWizard PLUS I			Serial No:	N/A	Technician				
	FCC Part 15, Subpart			oonan no	15.231(b)				Date:	1/15/20
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#### RETLIF TESTING LABORATORIES **EMISSIONS DATA SHEET Duty Cycle Plots** Test Method: LPA Design, Inc. PocketWizard PLUS II Transceiver Job No: R-4955N-1 Customer: Test Sample: PocketWizard PLUS II N/A Model No: Serial No: Technician: M. Seamans FCC Part 15, Subpart C Test Specification: 15.231(b) Date: 1/15/2008 Operating Mode: Continously Transmitting Fundamental Frequency: 344.04MHz Notes: RBW 100 kHz RF Att 0 dB Ref Lvl VBW 100 kHz 97 dBµV SWT 100 ms Unit $dB\mu V$ [T1] A 90 .02 18.436 874 ms 80 TRG 70 IN1 1MA 60 50 40 30 TR Center 344 MHz 10 ms/ 15.JAN.2008 13:01:01 Date: Data Sheet 2 of 9 R-4955N-1

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			EN	MISSIONS D	ATA SHEET					
Γest Method:	Duty Cycle Plots									
Customer:	LPA Design, Inc.			Test Sample:		PLUS II Transceive	er			R-4955N-1
Model No:	PocketWizard PLUS II			Serial No:	N/A				Technician:	
Test Specification:	FCC Part 15, Subpart C				15.231(b)				Date:	1/15/2008
Operating Mode:	Continously Transmitting									
Notes:	Fundamental Frequency	: 344.04MHz								
Ref	Lvl	Delta :	1 [T1] 0.	07 dB	RBW VBW		Hz Hz	RF Att	0 d	В
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Date:	15.JAN.	2008 13	3:10:38							
Data Sheet 3 of 9		2000 10								R-4955N-

#### **RETLIF TESTING LABORATORIES EMISSIONS DATA SHEET Duty Cycle Plots** Test Method: LPA Design, Inc. PocketWizard PLUS II Transceiver Job No: R-4955N-1 Customer: Test Sample: PocketWizard PLUS II N/A Model No: Serial No: Technician: M. Seamans FCC Part 15, Subpart C Test Specification: 15.231(b) Date: 1/15/2008 Operating Mode: Continously Transmitting 0.5 & 1.0 Fundamental Frequency: 344.04MHz Notes: kHz dB 100 RF Att RBW Ref Lvl VBW 100 kHz 97 dBµV dΒμV SWT 100 ms Unit dB<sub>µ</sub>V A 90 [T1 . 0 1 18.436 874 ms 80 TRG 70 INL 1MA 60 50 40 3.0 20 10 TR ol 10 ms/ Center 344 MHz Date: 15.JAN.2008 13:11:24 Data Sheet 4 of 9 R-4955N-1



#### **RETLIF TESTING LABORATORIES EMISSIONS DATA SHEET Duty Cycle Plots** Test Method: LPA Design, Inc. PocketWizard PLUS II Transceiver R-4955N-1 Customer: Test Sample: Job No: PocketWizard PLUS II N/A Model No: Serial No: Technician: M. Seamans FCC Part 15, Subpart C Test Specification: 15.231(b) Date: 1/15/2008 Operating Mode: Continously Transmitting Fundamental Frequency: 344.04MHz Notes: 0 dB 100 kHz RF Att RBW Ref Lvl VBW 100 kHz 97 dBuV SWT 600 µs Unit dBuV 44 dBµ [T1] A 90 [T1] 104.609 218 µs 80 TRG 70 IN1 1MA 60 50 40 30 20 10 Center 344 MHz 60 µs/ 15.JAN.2008 13:22:18 Date: Data Sheet 6 of 9 R-4955N-1

#### **RETLIF TESTING LABORATORIES EMISSIONS DATA SHEET Duty Cycle Plots** Test Method: LPA Design, Inc. PocketWizard PLUS II Transceiver Job No: R-4955N-1 Customer: Test Sample: PocketWizard PLUS II N/A Model No: Serial No: Technician: M. Seamans FCC Part 15, Subpart C Test Specification: 15.231(b) Date: 1/15/2008 Operating Mode: Continously Transmitting Fundamental Frequency: 344.04MHz Notes: 0 dB 100 kHz RF Att RBW Ref Lvl 100 kHz VBW 97 dBuV SWT 600 µs Unit $dB\mu V$ 99 dBu [T1] A 90 [T1] 667 16.833 μs 80 TRG 70 IN1 1MA 60 50 40 30 20 10 Center 344 MHz 60 µs/ Date: 15.JAN.2008 13:22:57 Data Sheet 7 of 9 R-4955N-1

#### RETLIF TESTING LABORATORIES **EMISSIONS DATA SHEET Duty Cycle Plots** Test Method: LPA Design, Inc. PocketWizard PLUS II Transceiver Job No: R-4955N-1 Customer: Test Sample: PocketWizard PLUS II N/A Model No: Serial No: Technician: M. Seamans FCC Part 15, Subpart C Test Specification: 15.231(b) Date: 1/15/2008 Operating Mode: Continously Transmitting Fundamental Frequency: 344.04MHz Notes: RBW 100 kHz RF Att 0 dB Ref Lvl VBW 100 kHz 97 dBµV SWT 600 µs Unit dΒμV [T1] A 90 [T1] 16.833 667 µs TRG IN1 1MA 60 50 40 3.0 20 10 60 µs/ Center 344 MHz Date: 15.JAN.2008 13:25:37 Data Sheet 8 of 9 R-4955N-1

