

Antenna Info Exhibit

The antenna assembly utilized for the 2.4GHz radio, FCC ID: PGUFN802FH, consists of an antenna manufactured by RangeStar Wireless, and a flex circuit manufactured by Welch Allyn. While the antenna has a specified peak gain of 0 dBi, when used with the flex circuit, the overall gain of the assembly is -6.8dBi as measured by NWEMC, Inc test labs.

Appendix A:
RangeStar Wireless
Antenna
Specification
Sheet



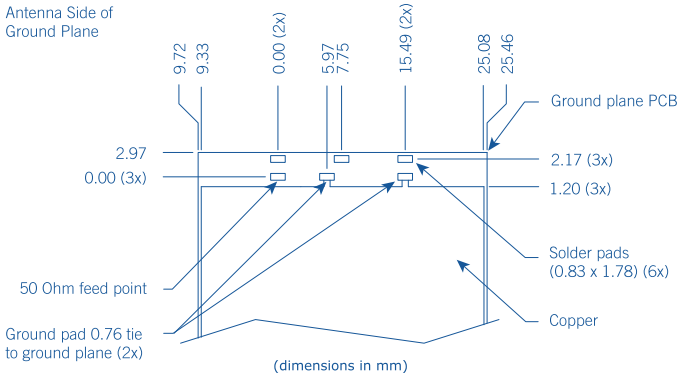
Features

- Small and lightweight
- No tuning components for standard installation
- Available in tape-and-reel or tray packaging for automatic mounting

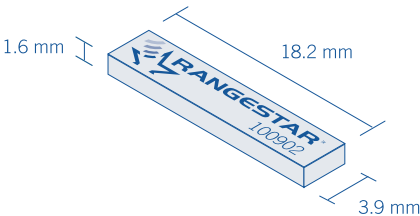
Specifications

Frequency Range (MHz)	2400–2483.5
Peak Gain	0 dBi
VSWR	< 2.0 : 1
Polarization	linear, vertical
Powerhandling	10 Watt cw
Feedpoint Impedance	50 Ohms
Weight	< 1 g

Mounting



Dimensions



Description

The 100902 is a surface-mount antenna intended for use in applications in the 2.4 GHz ISM band frequency. This antenna provides excellent performance at a low cost.

Typical Applications

- Cellular phones
- Notebooks
- PDAs
- Industrial applications
- Instruments

Customization and Integration

This standard antenna concept can be customized to your exact specifications and operational requirements. Because your device acts as the ground plane, you should consider the placement of the antenna early in the design process.

Using our design expertise and state-of-the-art facilities, our engineers will work with you to guide your product through our comprehensive six point integration process—from initial consultation and design to manufacturing and quality assurance.

For integration assistance, contact a Rangestar Wireless sales representative at:

Rangestar Wireless
9565 Soquel Dr.
Aptos, CA 95003-4153
USA

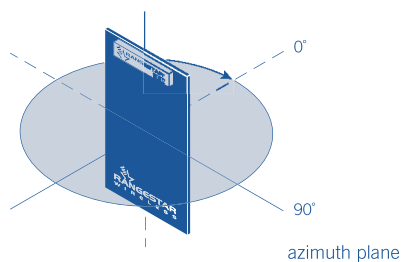
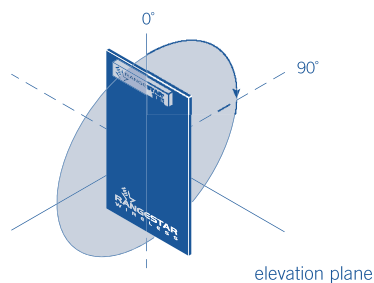
Tel: 831-661-4200
Fax: 831-661-4202

www.rangestar.com

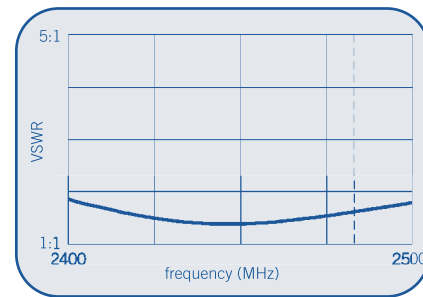
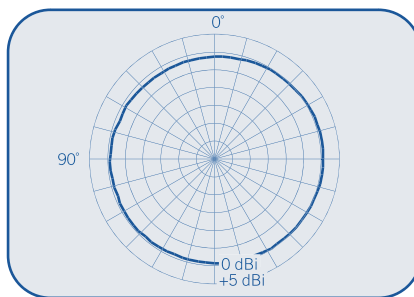
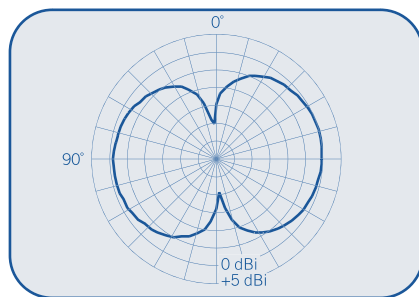
Radiation Patterns

VSWR

Legend



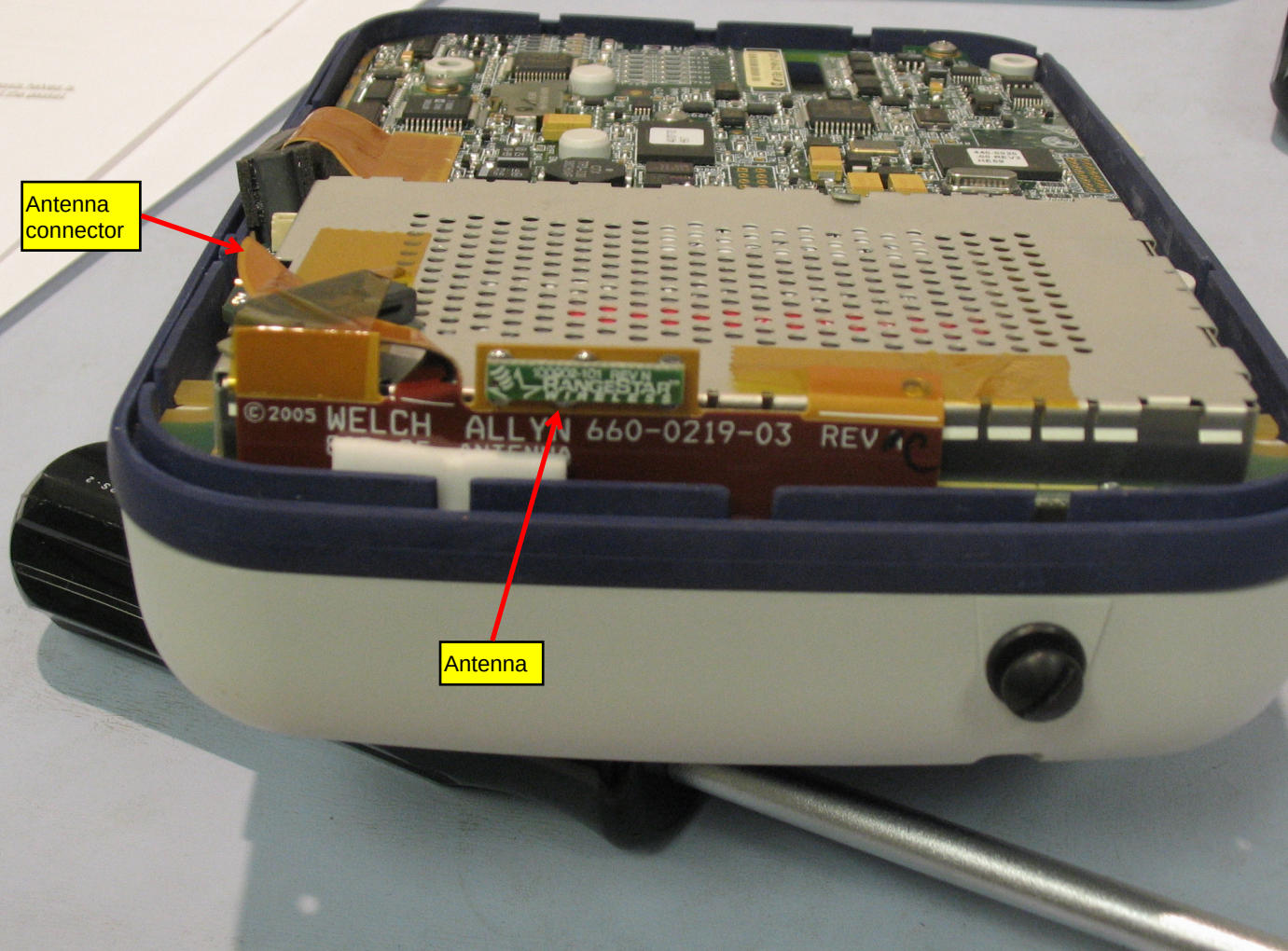
2400 MHz Band (ISM)



**Appendix B:
Antenna and
Flex Circuit
Photographs**

Antenna
connector

Antenna

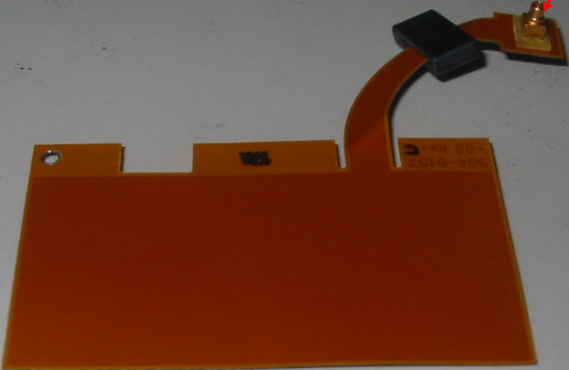


Antenna
connector

Antenna



Antenna
connector



Appendix C:
Antenna Assembly
Gain Test Data

Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:

Low

Mid

High

Operating Modes Investigated:

No Hop

Data Rates Investigated:

Maximum

Output Power Setting(s) Investigated:

Maximum

Power Input Settings Investigated:

5.0 VDC (normal power conditions)

Software\Firmware Applied During Test

Exercise software	Bench-24	Version	2.77
Description			
The system was tested using special software developed to test all functions of the device during the test.			

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
FHSS Radio Card (EUT)	Welch Allyn, Inc.	Propaq 802 LTRN	PG28B9
802 RF Antenna	Welch Allyn, Inc.	660-0219-03 Rev C	None
Host PC	Micron	NBK001337-00	5122110006281
AC Adapter for PC	Micron	NBP001049-00	5111542200081
DC Power Supply for EUT	CUI Stack	DTR050100-P1	0601
PCMCIA Extender Card	Vector Electronics, Inc.	31-00157 Rev.A	None

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Power	PA	1.0	PA	DC Power Supply for EUT	AC Mains
DC Leads	PA	1.8	PA	DC Power Supply for EUT	PCMCIA Extender Card
DC Leads	PA	1.2	PA	AC Adapter for PC	Host PC
AC Power	PA	1.0	PA	AC Adapter for PC	AC Mains
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Agilent	E4446A	AAQ	06/15/2005	13 mo
Spectrum Analyzer	Hewlett-Packard	8593E	AAN	12/15/2004	12 mo
Antenna, Horn	EMCO	3115	AHC	08/30/2005	12 mo
Antenna, Horn	EMCO	3115	AHF	03/18/2004	24 mo
Signal Generator	Hewlett Packard	8341B	TGN	02/07/2005	13 mo

Test Description

Requirement: The Effective Radiated Power measurements were taken to determine the antenna gain.

Configuration: The EUT was operated at its maximum output power with the EUT set to low, mid, and high transmit frequencies. The EUT was transmitting at its maximum data rate. While scanning, the fundamental emission from the EUT was maximized by rotating the EUT, adjusting the measurement antenna height (1-4 meters) and polarization. The amplitude and frequency of the highest levels were noted. The EUT was then replaced with a horn antenna. A signal generator was connected to the horn, and its output was adjusted to match the level previously noted for each field strength measurement. The output of the signal generator was recorded, and by factoring in the cable loss to the horn antenna and its gain (dBi); the effective radiated power for each fundamental transmit frequency was determined.

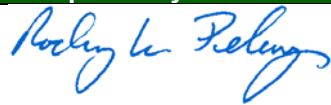
The peak conducted output power was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The EUT was transmitting at its maximum data rate in a no hop mode.

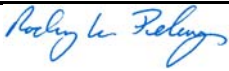
The antenna gain was determined by taking the highest effective radiated power for each fundamental transmit frequency measured, and subtracting the peak conducted output power measured for the same transmit frequency.

$\text{EIRP (peak, dBm)} - \text{peak conducted output power (dBm)} = \text{Antenna Gain (dBi)}$.

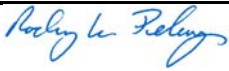
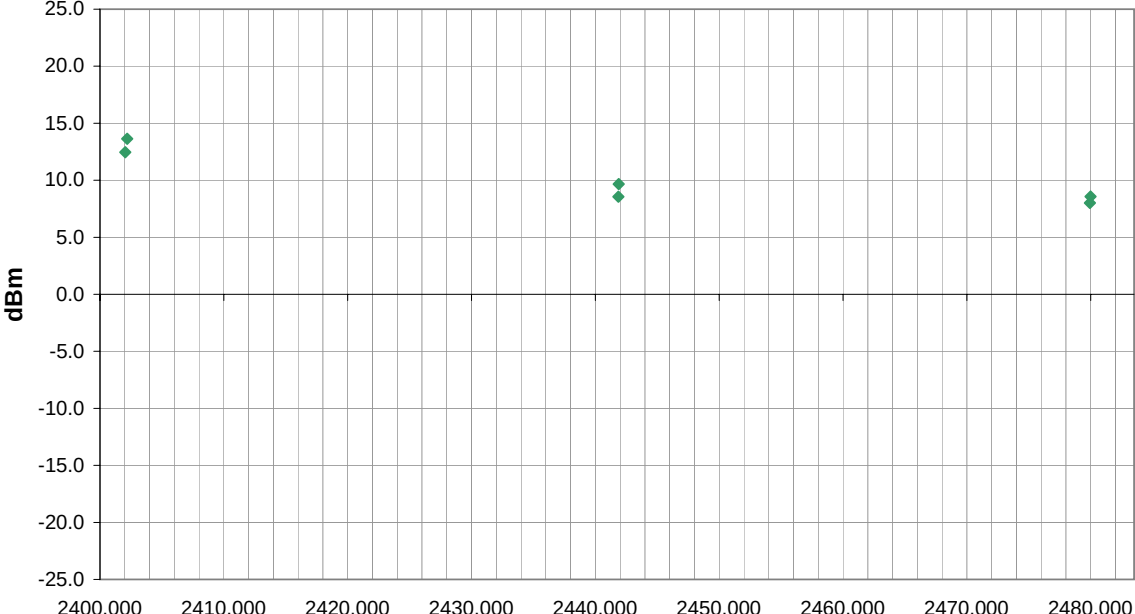
The maximum gain of the antenna assembly is -6.8 dBi.

Completed by:

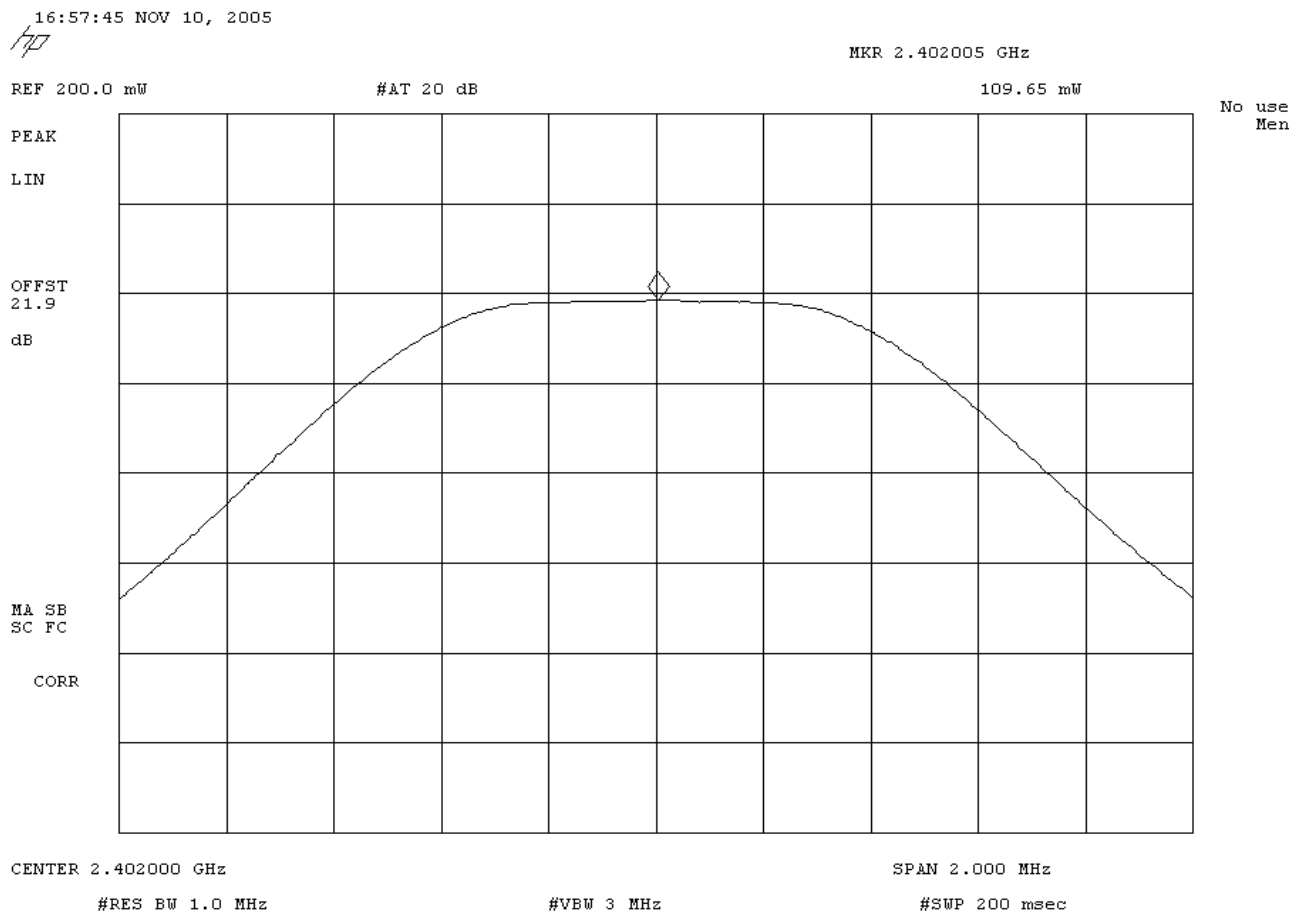


NORTHWEST		EMC		ANTENNA GAIN (dBi)		PSA 2005.10.04 EMI 2005.11.30	
EUT: Propaq LTRN				Work Order: PROT0267			
Serial Number: PG28B9				Date: 12/01/05			
Customer: Welch Allyn Protocol, Inc.				Temperature: 20			
Attendees: none				Humidity: 32%			
Project:				Barometric Pres.: 30.2			
Tested by: Rod Peloquin		Power: 5VDC		Job Site: EV01			
TEST PARAMETERS							
Antenna Height(s) (m)		1 - 4		Test Distance (m)		3	
COMMENTS							
Antenna #2							
EUT OPERATING MODES							
no hop							
DEVIATIONS FROM TEST STANDARD							
No deviations.							
Run #		9		 Signature			
Configuration #		1					
Results		NA					

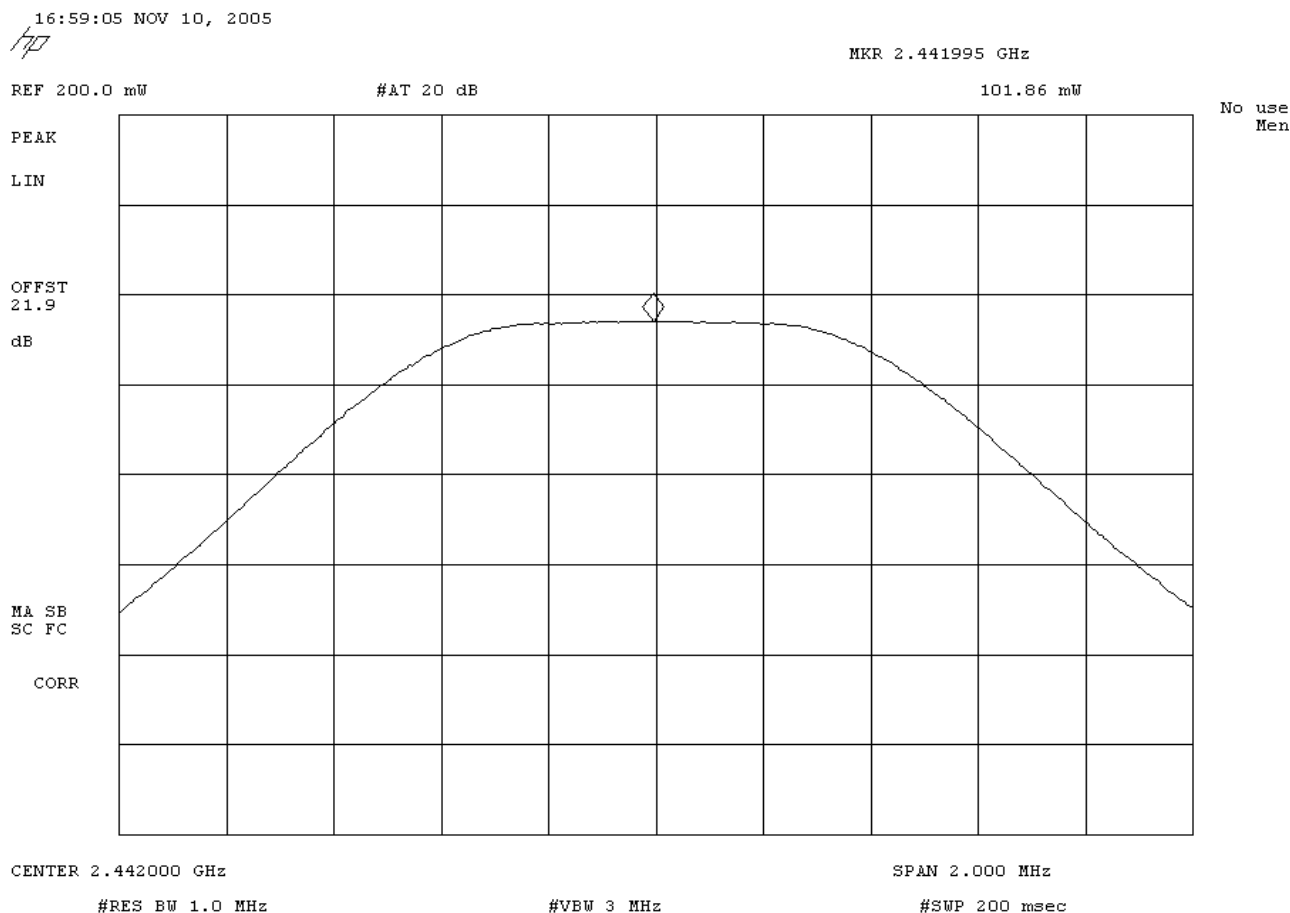
Transmit Channel	Antenna Polarity	Peak Conducted		Radiated EIRP		Antenna Gain (dBi)
		(mW)	(dBm)	(mW)	(dBm)	
Low	H	109.65	20.4	23.11	13.6	-6.8
	V	109.65	20.4	17.62	12.5	-7.9
Mid	H	101.86	20.1	9.27	9.7	-10.4
	V	101.86	20.1	7.19	8.6	-11.5
High	H	88.11	19.5	6.32	8.0	-11.4
	V	88.11	19.5	7.18	8.6	-10.9

NORTHWEST		Effective Radiated Power (EIRP)		PSA 2005.10.04					
EMC				EMI 2005.11.30					
EUT: Propaq LTRN		Work Order: PROT0267							
Serial Number: PG28B9		Date: 12/01/05							
Customer: Welch Allyn Protocol, Inc.		Temperature: 20							
Attendees: none		Humidity: 32%							
Project:		Barometric Pres.: 30.2							
Tested by: Rod Peloquin		Power: 5VDC		Job Site: EV01					
TEST PARAMETERS									
Antenna Height(s) (m)		1 - 4		Test Distance (m) 3					
COMMENTS									
Antenna #2									
EUT OPERATING MODES									
no hop									
DEVIATIONS FROM TEST STANDARD									
No deviations.									
Run #		9		Signature 					
Configuration #		1							
Results		NA							
dBm  MHz									
Freq (MHz)		Azimuth (degrees)	Height (meters)	Polarity	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)
2402.195		141.0	1.9	H-Horn	PK	2.31E-02	13.6	20.0	-6.4
2402.042		309.0	1.1	V-Horn	PK	1.76E-02	12.5	20.0	-7.5
2441.885		180.0	1.5	H-Horn	PK	9.27E-03	9.7	20.0	-10.3
2479.982		163.0	1.4	V-Horn	PK	7.19E-03	8.6	20.0	-11.4
2441.866		150.0	1.4	V-Horn	PK	7.18E-03	8.6	20.0	-11.4
2479.939		322.0	1.5	H-Horn	PK	6.32E-03	8.0	20.0	-12.0

NORTHWEST EMC				Output Power		Rev BETA 01/30/01	
EUT:	Propaq 802 LTRN			Work Order:	PROT0266		
Serial Number:	PG28B9			Date:	11/10/05		
Customer:	Welch Allyn Protocol, Inc.			Temperature:	22°		
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	38%		
Customer Ref. No.:	N/A	Power:	5VDC	Job Site:	EV06		
SAMPLE CALCULATIONS							
COMMENTS							
EUT OPERATING MODES							
Modulated by PRBS at maximum data rate							
DEVIATIONS FROM TEST STANDARD							
None							
REQUIREMENTS							
RESULTS				AMPLITUDE			
Pass				109.7 mW			
SIGNATURE							
 Tested By: _____							
DESCRIPTION OF TEST							
Output Power - Low Channel							



NORTHWEST EMC				Output Power		Rev BETA 01/30/01	
EUT:	Propaq 802 LTRN			Work Order:	PROT0266		
Serial Number:	PG28B9			Date:	11/10/05		
Customer:	Welch Allyn Protocol, Inc.			Temperature:	22°		
Attendees:	none		Tested by:	Greg Kiemel	Humidity:	38%	
Customer Ref. No.:	N/A		Power:	5VDC	Job Site:	EV06	
SAMPLE CALCULATIONS							
COMMENTS							
EUT OPERATING MODES							
Modulated by PRBS at maximum data rate							
DEVIATIONS FROM TEST STANDARD							
None							
REQUIREMENTS							
RESULTS				AMPLITUDE			
Pass				101.9 mW			
SIGNATURE							
Tested By: 							
DESCRIPTION OF TEST							
Output Power - Mid Channel							



NORTHWEST EMC				Output Power		Rev BETA 01/30/01	
EUT:	Propaq 802 LTRN			Work Order:	PROT0266		
Serial Number:	PG28B9			Date:	11/10/05		
Customer:	Welch Allyn Protocol, Inc.			Temperature:	22°		
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	38%		
Customer Ref. No.:	N/A	Power:	5VDC	Job Site:	EV06		
SAMPLE CALCULATIONS							
COMMENTS							
EUT OPERATING MODES							
Modulated by PRBS at maximum data rate							
DEVIATIONS FROM TEST STANDARD							
None							
REQUIREMENTS							
RESULTS				AMPLITUDE			
Pass				88.1 mW			
SIGNATURE							
Tested By: _____ 							
DESCRIPTION OF TEST							
Output Power - High Channel							

