

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.

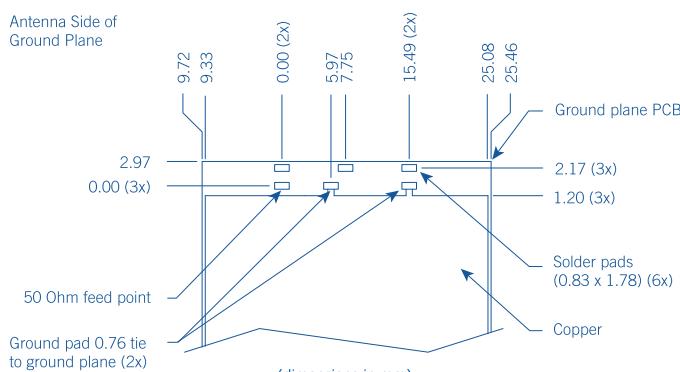
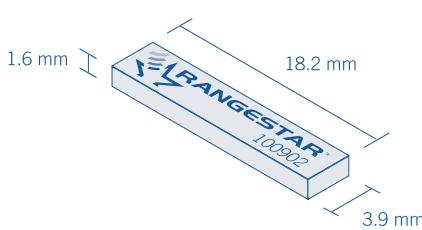
Appendix A:
RangeStar Wireless
Antenna
Specification
Sheet

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:

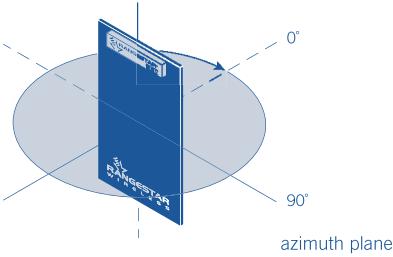
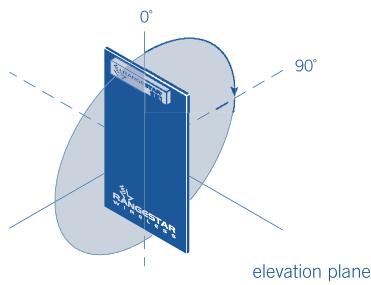
Rangestar Wireless
9565 Soquel Dr.
Aptos, CA 95003-4153
USA

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

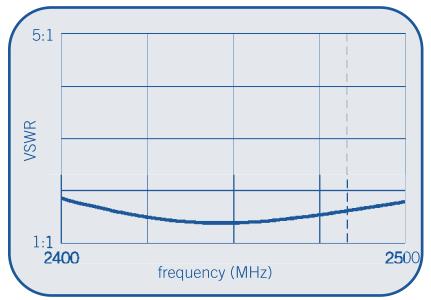
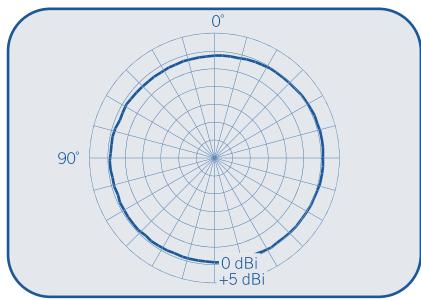
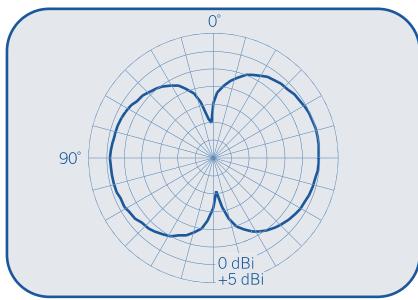
www.rangestar.com

Radiation Patterns

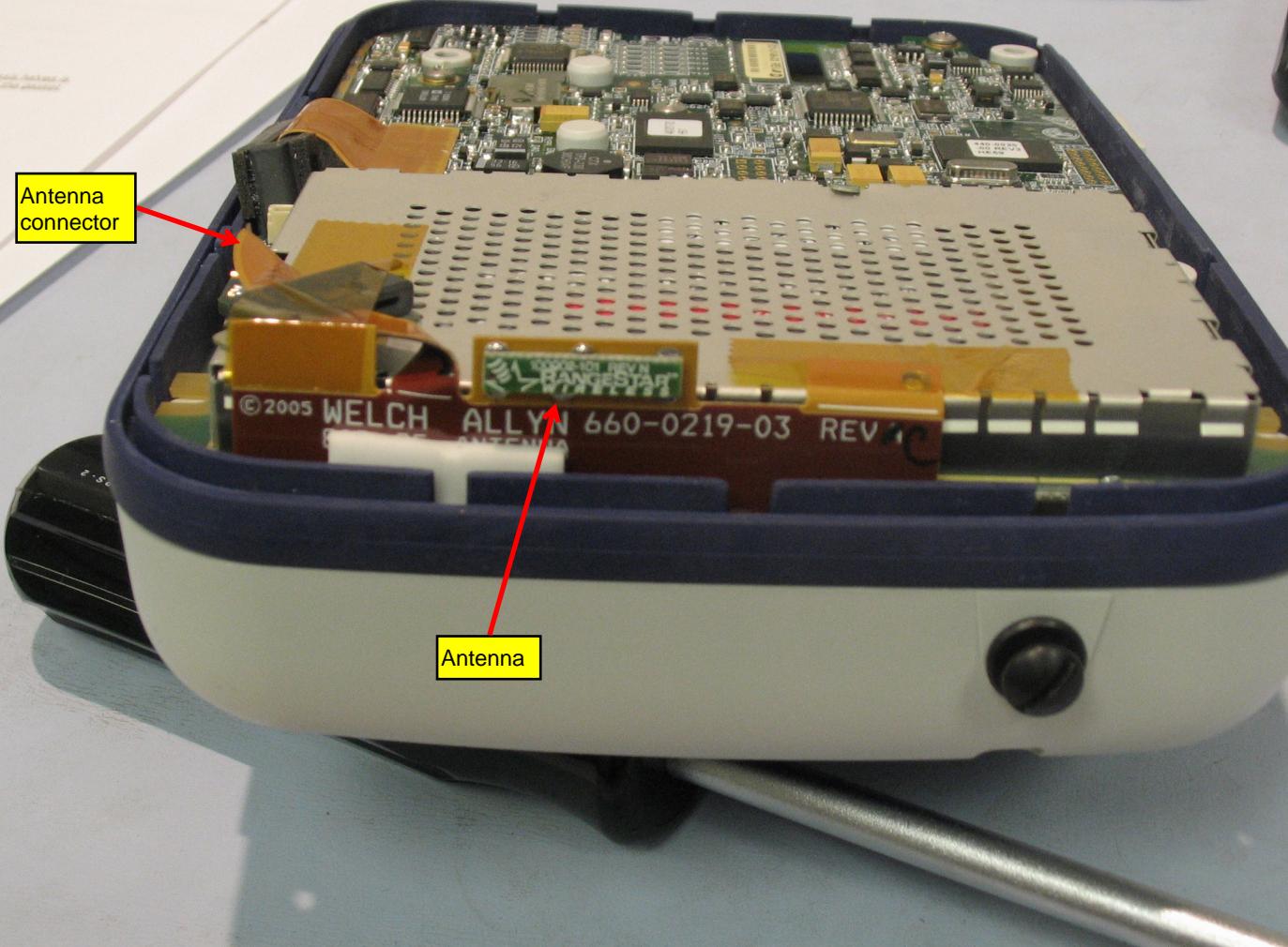
Legend



2400 MHz Band (ISM)



Appendix B:
Antenna and
Flex Circuit
Photographs



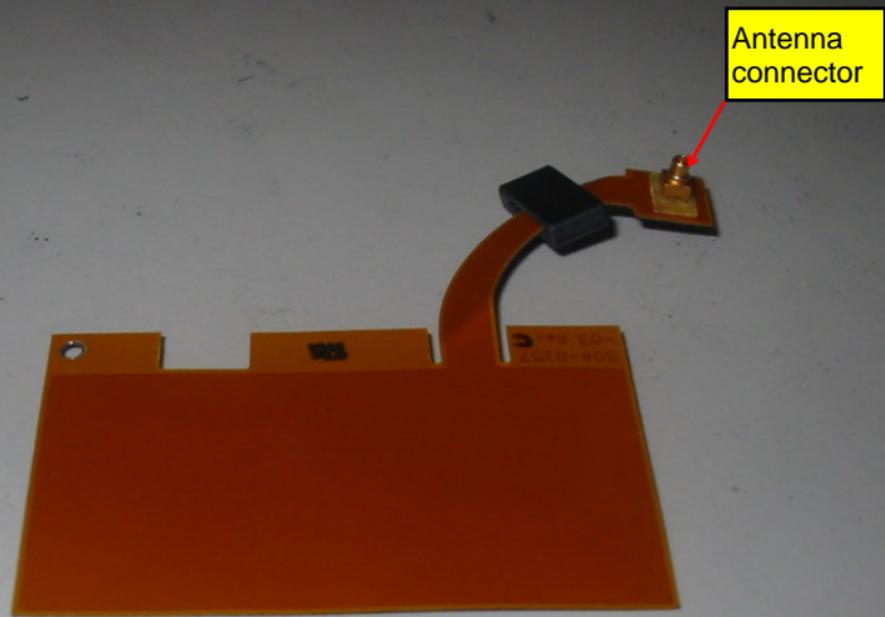
Antenna
connector

Antenna

© 2005 WELCH
802 RF ANTENNA
ALLYN 660-0219-03 REV A

pfc-2
©4
37-05

2



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.

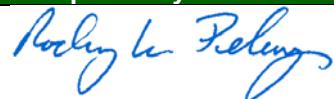
The peak conducted output power was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The EUT was transmitting at its maximum data rate in a no hop mode.

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.

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

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

Completed by:



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	 <i>Rod Peloquin</i> 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 EMC		Effective Radiated Power (EIRP)						PSA 2005.10.04 EMI 2005.11.30				
EUT: Propaq LTRN Serial Number: PG28B9 Customer: Welch Allyn Protocol, Inc. Attendees: none Project: Tested by: Rod Peloquin				Work Order: PROT0267 Date: 12/01/05 Temperature: 20 Humidity: 32% Barometric Pres.: 30.2								
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	Rocky L. Peloquin								
Configuration #	1											
Results	NA											
<p>dBm</p> <p>25.0 20.0 15.0 10.0 5.0 0.0 -5.0 -10.0 -15.0 -20.0 -25.0</p> <p>2400.000 2410.000 2420.000 2430.000 2440.000 2450.000 2460.000 2470.000 2480.000</p> <p>MHz</p>												
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
Customer Ref. No.:	N/A	Power:	5VDC

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

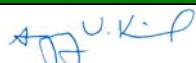
REQUIREMENTS

RESULTS

Pass AMPLITUDE

109.7 mW

SIGNATURE



Tested By: _____

DESCRIPTION OF TEST

Output Power - Low Channel

16:57:45 NOV 10, 2005



MKR 2.402005 GHz

REF 200.0 mW

#AT 20 dB

109.65 mW

No use
Men

PEAK

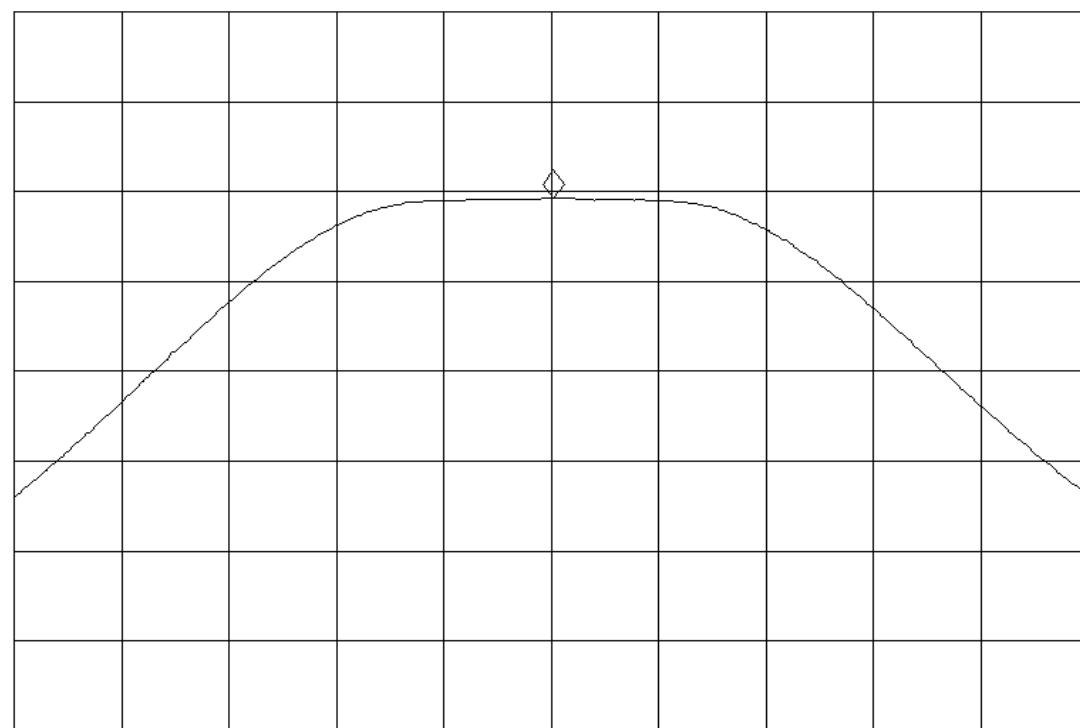
LIN

OFFST
21.9

dB

MA SB
SC FC

CORR



CENTER 2.402000 GHz

SPAN 2.000 MHz

#RES BW 1.0 MHz

#VBW 3 MHz

#SWP 200 msec

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
Customer Ref. No.:	N/A	Power:	5VDC

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

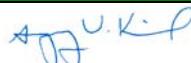
RESULTS

Pass

AMPLITUDE

101.9 mW

SIGNATURE



Tested By: _____

DESCRIPTION OF TEST

Output Power - Mid Channel

16:59:05 NOV 10, 2005



MKR 2.441995 GHz

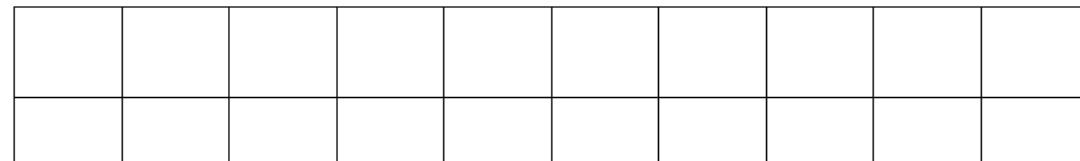
REF 200.0 mW

#AT 20 dB

101.86 mW

No use
Men

PEAK



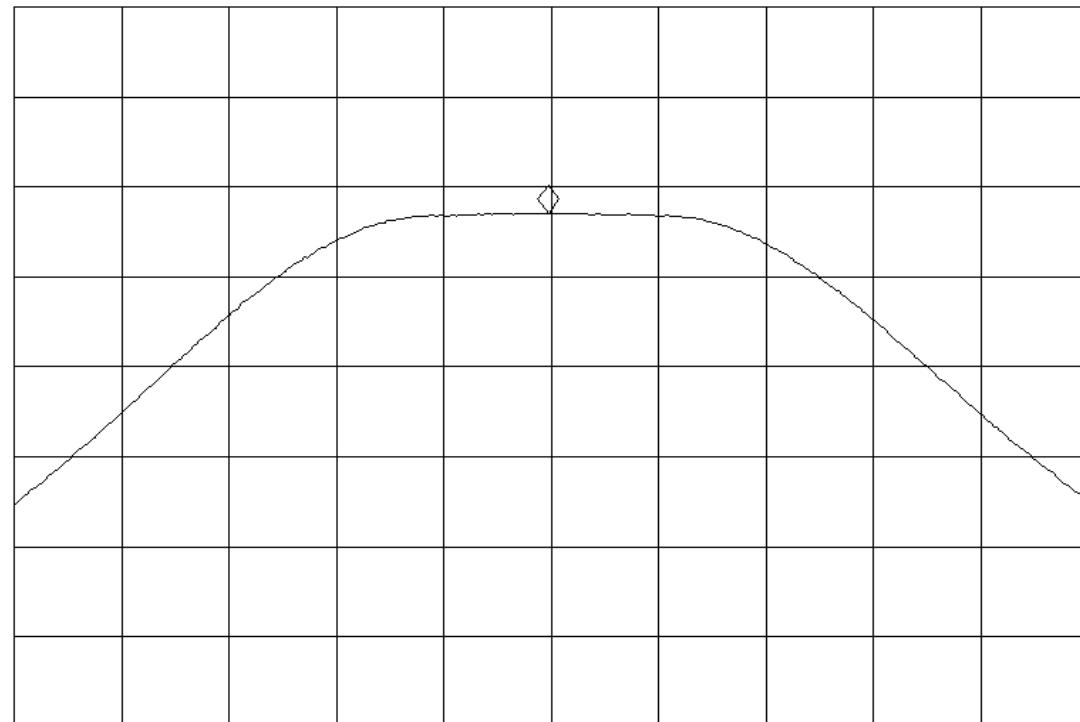
LIN

OFFST
21.9

dB

MA SB
SC FC

CORR



CENTER 2.442000 GHz

SPAN 2.000 MHz

#RES BW 1.0 MHz

#VBW 3 MHz

#SWP 200 msec

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
Customer Ref. No.:	N/A	Power:	5VDC

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

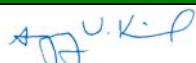
REQUIREMENTS

RESULTS

Pass AMPLITUDE

88.1 mW

SIGNATURE



Tested By: _____

DESCRIPTION OF TEST

Output Power - High Channel

17:00:30 NOV 10, 2005



MKR 2.479995 GHz

REF 200.0 mW

#AT 20 dB

88.105 mW

No use
Men

PEAK



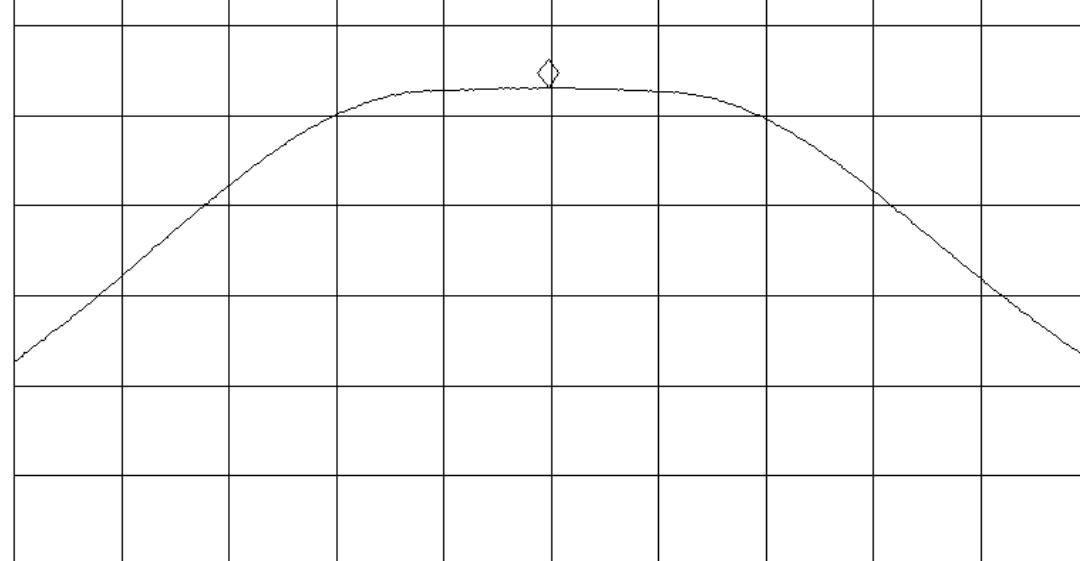
LIN

OFFST
21.9

dB

MA SB
SC FC

CORR



CENTER 2.480000 GHz

SPAN 2.000 MHz

#RES BW 1.0 MHz

#VBW 3 MHz

#SWP 200 msec





