

FCC ID: PQS-DWM0001

Exhibit 2c

Engineering Report on

Bandwidth (2.1049) Modulation Characteristics (2.1047)



Assessment of Compliance

for

**Measurement of Modulation Characteristic/ Occupied Bandwidth in
accordance with the FCC Rules & Regulations Part 2.1047/49 and
90**

**Wireless Modem
DUALWAVE M**

Wavenet Technologies Pty Ltd.



February 2002

APREL Project No.:WVTB-Dual Wave M-3861

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Engineering Report

**Subject: Measurements of Modulation Characteristics/
Occupied Bandwidth in accordance with the
FCC Rules & Regulations Part 2.1047/49 and 90**

FCC ID: PQS-DWVM0001

Equipment: Wireless Modem for Palm m125/m500/m505/PDA

Model: DUALWAVE M

**Client: Wavenet Technologies Pty Ltd.
140 Burswood Rd.
Burswood, Perth, WA 6100
AUSTRALIA**

Project #: WWTB-Dual Wave M-3861

**Prepared By: APREL Laboratories,
Regulatory Compliance Division
51 Spectrum Way
Nepean, Ontario
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Approved by:


Jay Sarkar
Technical Director, Standards & Certification

Date:

Feb 15, 2002

Submitted by:


Jay Sarkar
Technical Director, Standards & Certification

Date:

Feb 15, 2002

Released by:


Dr. Jack J. Wojcik, P.Eng.

Date:

Feb 15/02



THE LABORATORY FOR WIRELESS

FCC ID: PQS-DWM0001
Applicant: Wavenet Technologies Pty Ltd.
Equipment: Wireless Modem for Palm m125/m500/m505/PDA
Model: DUALWAVE M
Standard: FCC Rules and Regulations Part 2.1047/49 and 90

ENGINEERING SUMMARY

This report contains the results of the Occupied Bandwidth/Bandwidth Limitation measurement performed on a **Wavenet PDA Wireless Modem** for Palm m125/m500/m505_x model DUALWAVE M. The measurements were carried out in accordance with the FCC Rules and Regulations Part 2.1049. The product was evaluated for bandwidth when it was set at the maximum power level. **The DUALWAVE M was tested with Palm m500.**

The Wireless Modem is an attachment for a Palm and it can be attached to a PC.

However, the Bandwidth Limitation was carried out only on Wireless Modem attached to Palm m500, as bandwidth does not change due to different configurations.

Modulation Characteristics (FCC Rule PART 2.1047): This test is not applicable, as the device is not capable of voice transmission.

Limiting of Modulation: The Modulation levels are fixed for digital modulation levels only and are digitally generated. The Modulation deviation is set during manufacture to the standard RD LAP 19.2 kbps 4 level FSK modulation and MDC 4.8 kbps 2 level FSK. This format is digital non-voice data only, continuous frequency, continuous phase, and frequency shift keying, narrow band frequency modulation.

The results presented in this report relate only to the sample tested.

Summary of the Results

Test Description	Page No.	Test Set-up Figure No.	Results Summary
Bandwidth/bandwidth Limitation Ref. Paragraph 2.1049 and 90	8	1	Passed

INTRODUCTION

General

This report describes the results of the occupied bandwidth measurement conducted on a Wavenet Wireless Modem model DUALWAVE M ATTACHMENT FOR Palm m125/m500/m505/PDA.

Test Facility

The tests were performed for Wavenet Technologies Pty Ltd. by APREL Laboratories at APREL's EMI facility located in Nepean, Ontario, Canada. The laboratory operates an (3m and 10m) Open Area Test Site (OATS). The measurement facility is calibrated in accordance with ANSI C63.4-1992.

A description of the measurement facility in accordance with the radiated and AC line conducted test site criteria per ANSI C63.4-1992 is on file with the Federal Communications Commission and is in compliance with the requirements of Section 2.948 of the Commissions rules and regulations.

APREL's registration number is: 90416

APREL is accredited by Standard Council of Canada. APREL is also accredited by Industry Canada and recognised by the Federal Communications Commissions (FCC).

Standard

The evaluation and analysis were conducted in accordance with FCC Rules and Regulations Parts 2.1049/47.

Personnel: The equipment was tested by Y. Chen, EMC Engineer. Methodology was developed and the report written by Jayanta (Jay) K. Sarkar, Technical Director, Standards and Certification.

Test Equipment

The test equipment used during the evaluation is listed in Appendix A with calibration due dates.

Environmental Conditions

Measurements were conducted in the EMC Laboratory.

Temperature: 25 °C ± 2, Relative Humidity: 30 - 50 %, Air Pressure: 101 kPa ± 3

FCC SUBMISSION INFORMATION

FCC ID: **PQS-DWM0001**

Equipment (type): **Wireless Modem attachment for Palm 125/m500/m505/PDA**
As Marketed

Model: **DUALWAVE M**

For: Certification

Applicant: **Wavenet Technologies Pty Ltd.**
140 Burswood Rd
Burswood, Perth, WA 6100
AUSTRALIA

Manufacturer: **Wavenet Technologies Pty Ltd.**
140 Burswood Rd
Burswood, Perth, WA 6100
AUSTRALIA

Evaluated by: **APREL Laboratories**
51 Spectrum Way
Nepean, Ontario
Canada K2R 1E6

MANUFACTURER'S DATA

FCC ID No:	PQS-DWM0001
Equipment Type:	Wireless Modem attachment for Palm
Model:	DUALWAVE M
Reference:	FCC Rules and Regulations Parts 2 and Part 90
Manufacturer:	Wavenet Technologies Pty Ltd
Power Source:	3.6 (nominal) VDC, Lithium Battery
Development Stage of Unit:	Production

GENERAL SPECIFICATIONS

1. Frequency Range: 806.00 to 821.00 MHz (Transmitter)
2. Measured ERP 1.622 (32.1 dBm)
3. Emission Designators (See 47 CFR § 2.201 and §2.202): 20K0F1D
4. Antenna Impedance: 50 Ohms

Test: Occupied Bandwidth

Ref: FCC Part 90.210 (g) and 2.1049

Criteria: Emission Mask G. For transmitters that are not equipped with an audio low-pass filter pursuant to 90.211(b), the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

- (1) On any frequency removed from the centre of the authorized bandwidth by displacement frequency (f_d in kHz) of more than 5 kHz, but no more than 10 kHz: At least $83 \log (f_d/5)$ dB.
- (2) On any frequency removed from the centre of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but no more than 250 percent of the authorized bandwidth: At least $116 \log f_d/6.1$ dB, or $50 + 10 \log (P)$ dB, or 70 dB, whichever is the lesser attenuation.
- (3) On any frequency removed from the centre of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

Below is the description of the mask for band 806-821/851-866 MHz: 1.622 Watts ERP transmitter ($P = 1.622 \text{ W ERP}$)

Frequency (MHz)	Formula	Limit (dB)
-26500	$43 + 10 \log (P)$	45
-0.050	$43 + 10 \log (P)$	45
-0.050	$50 + 10 \log (P)$	52
-0.0175	$116 \log (f_d / 6.1)$	53
-0.010	$116 \log (f_d / 6.1)$ or $83 \log (f_d / 5)$	25
-0.005	$83 \log (f_d / 5)$	0
0.005	$83 \log (f_d / 5)$	0
0.010	$116 \log (f_d / 6.1)$ or $83 \log (f_d / 5)$	25
0.0175	$116 \log (f_d / 6.1)$	53
0.050	$50 + 10 \log (P)$	52
0.050	$43 + 10 \log (P)$	45
26500	$43 + 10 \log (P)$	45

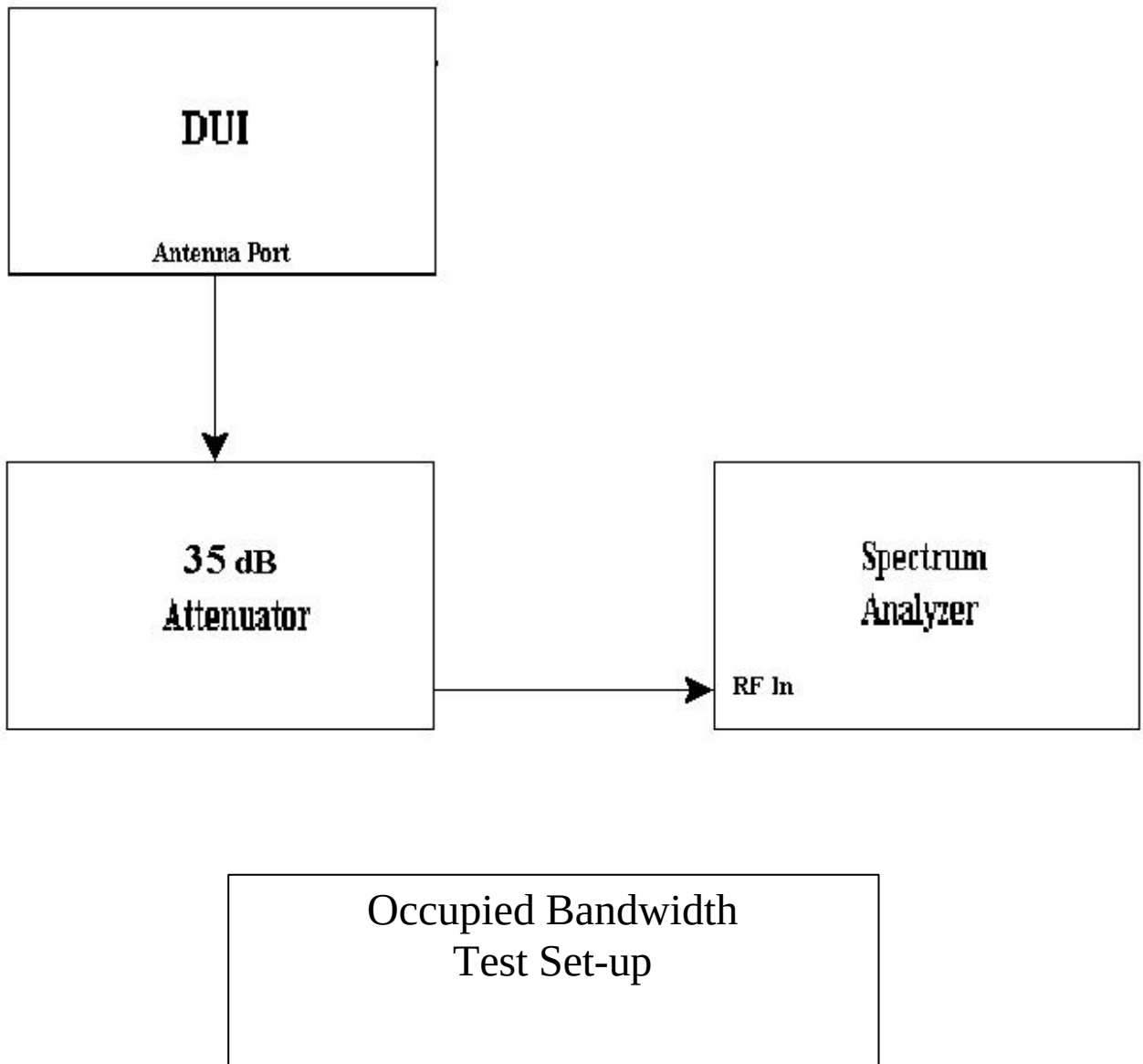
Set-up: See Figure: Test Set-up

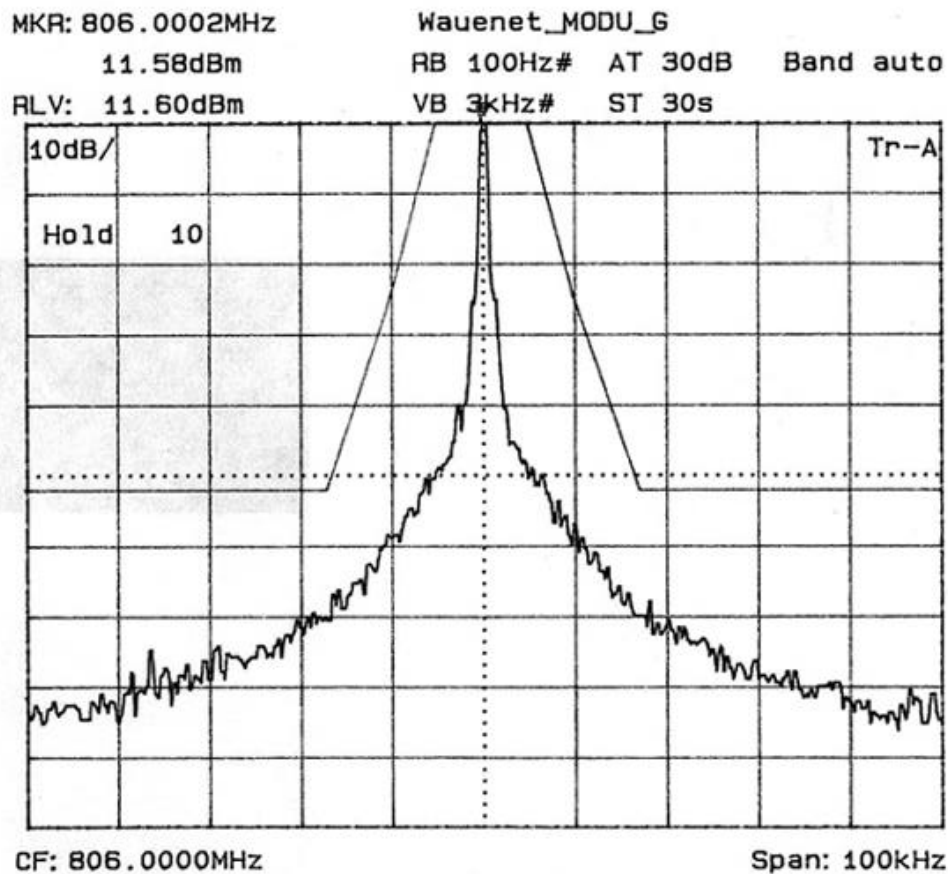
Conditions: Temperature: $23^{\circ}\text{C} \pm 2$
Voltage Supply: 3.6 VDC

Equipment: See Appendix A.

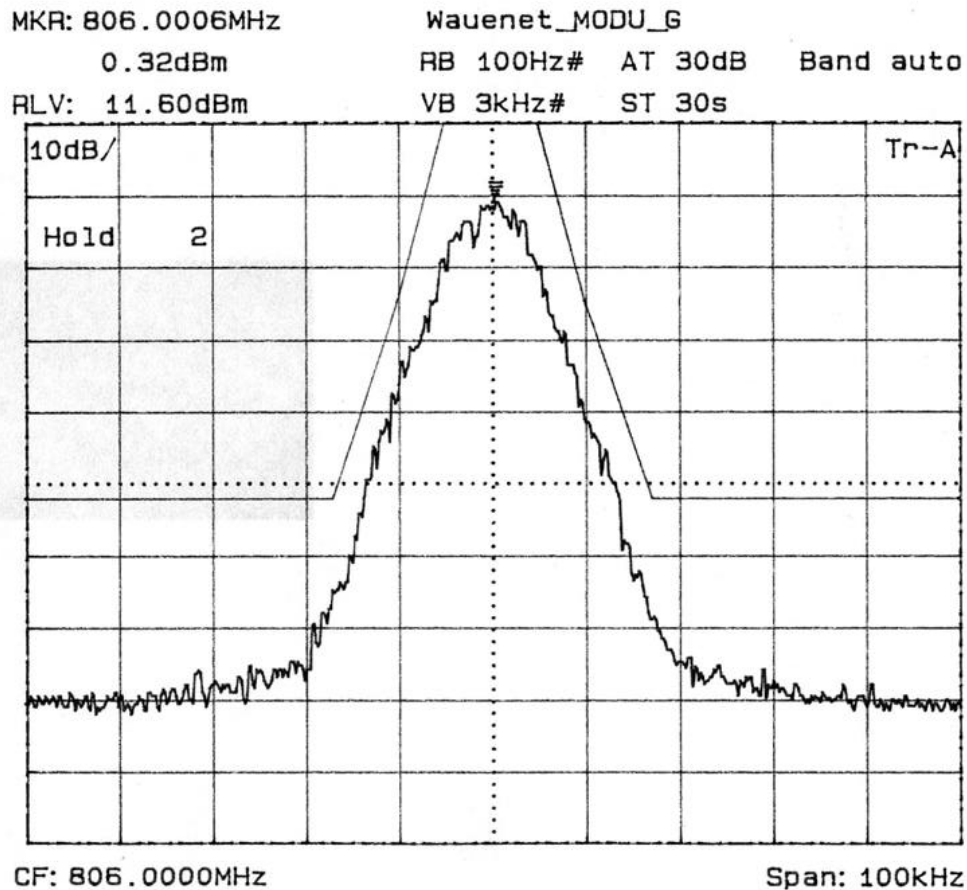
Procedure: Occupied bandwidth was measured in accordance with the above noted paragraphs of the F.C.C. Rules and Regulations. A sample of the transmitter output was observed on a spectrum analyzer and side bands were observed and recorded.

Results: Passed . See Plots

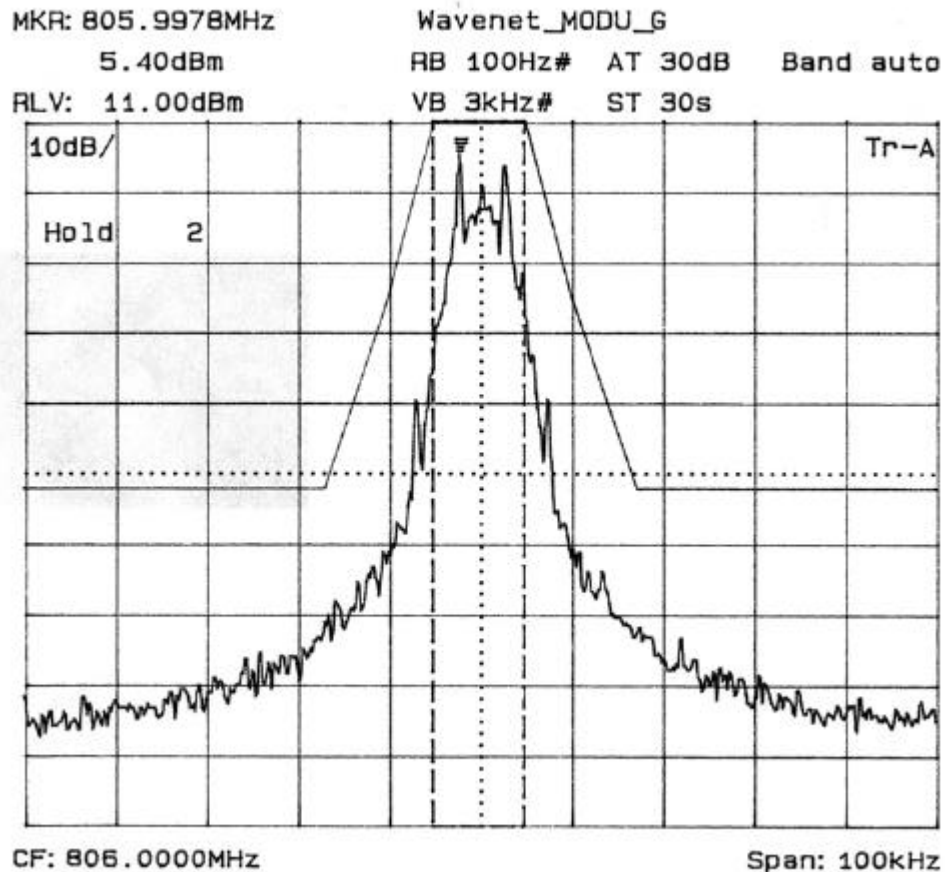




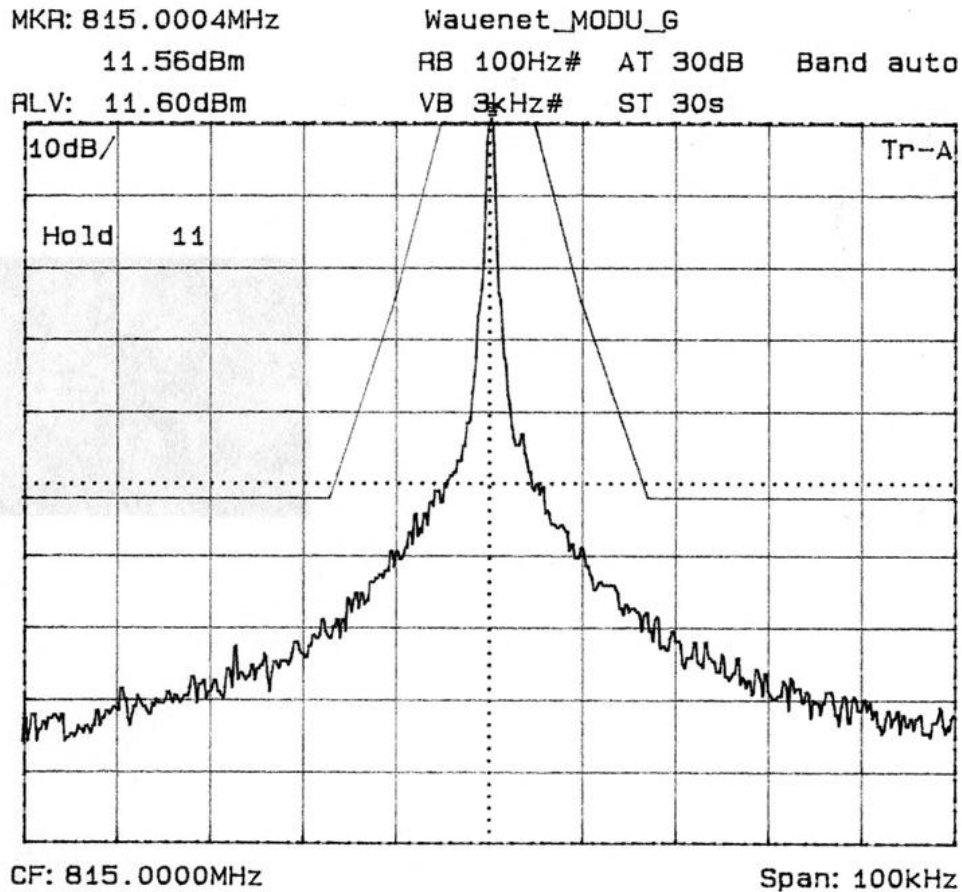
Occupied Bandwidth
Transmit Frequency: 806.00 MHz
Unmodulated Carrier



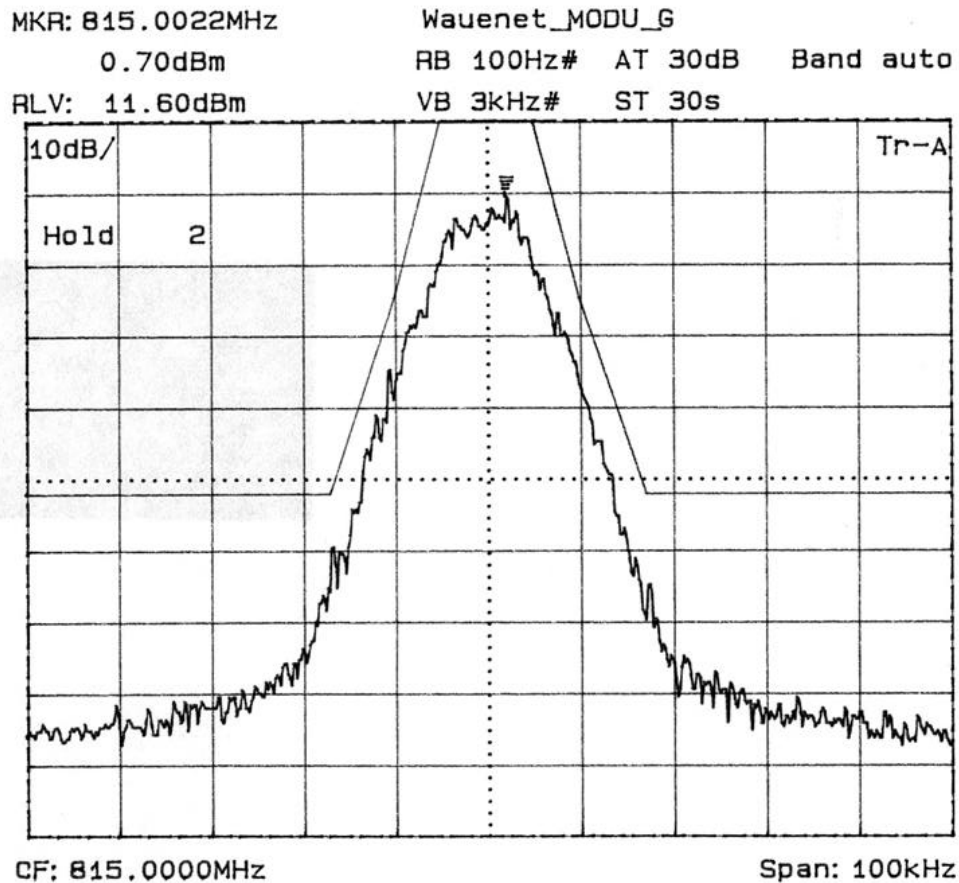
Occupied Bandwidth
Transmit Frequency: 806.00 MHz
Modulated Carrier-RD-LAP



Occupied Bandwidth
Transmit Frequency: 806.00 MHz
Modulated Carrier-MDC

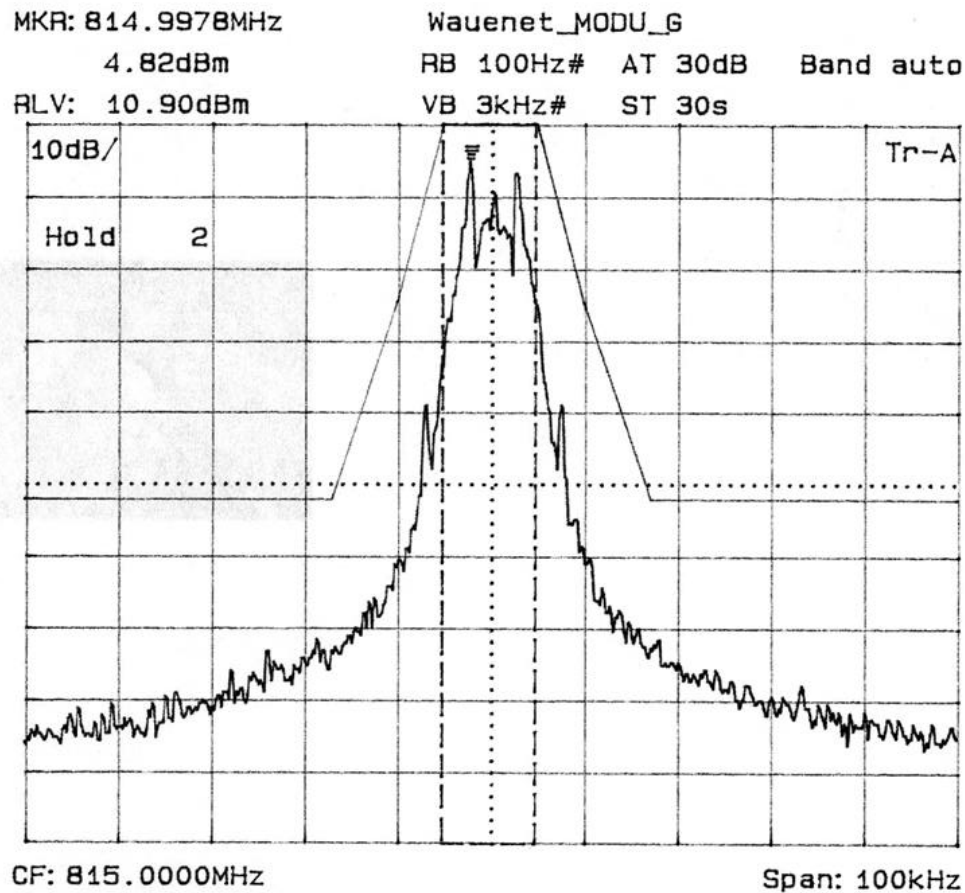


Occupied Bandwidth
Transmit Frequency: 815.00 MHz
Unmodulated Carrier

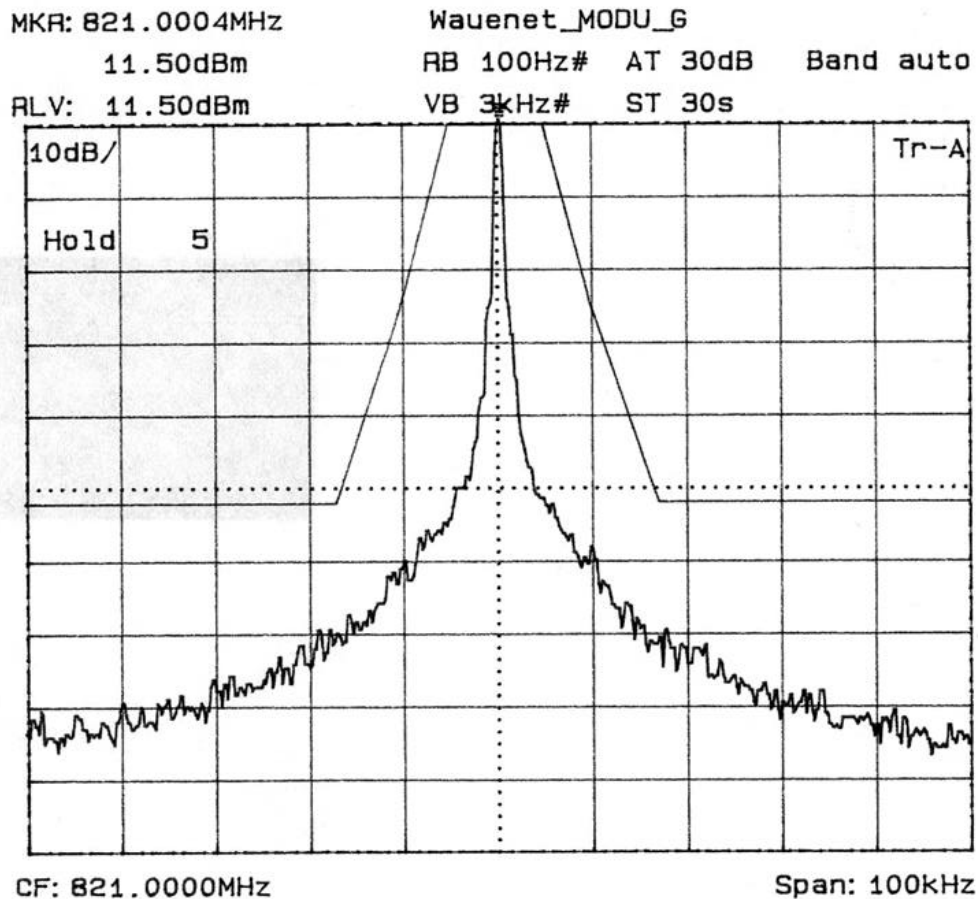


Occupied Bandwidth
Transmit Frequency: 815.00 MHz
Modulated Carrier-RD-LAP

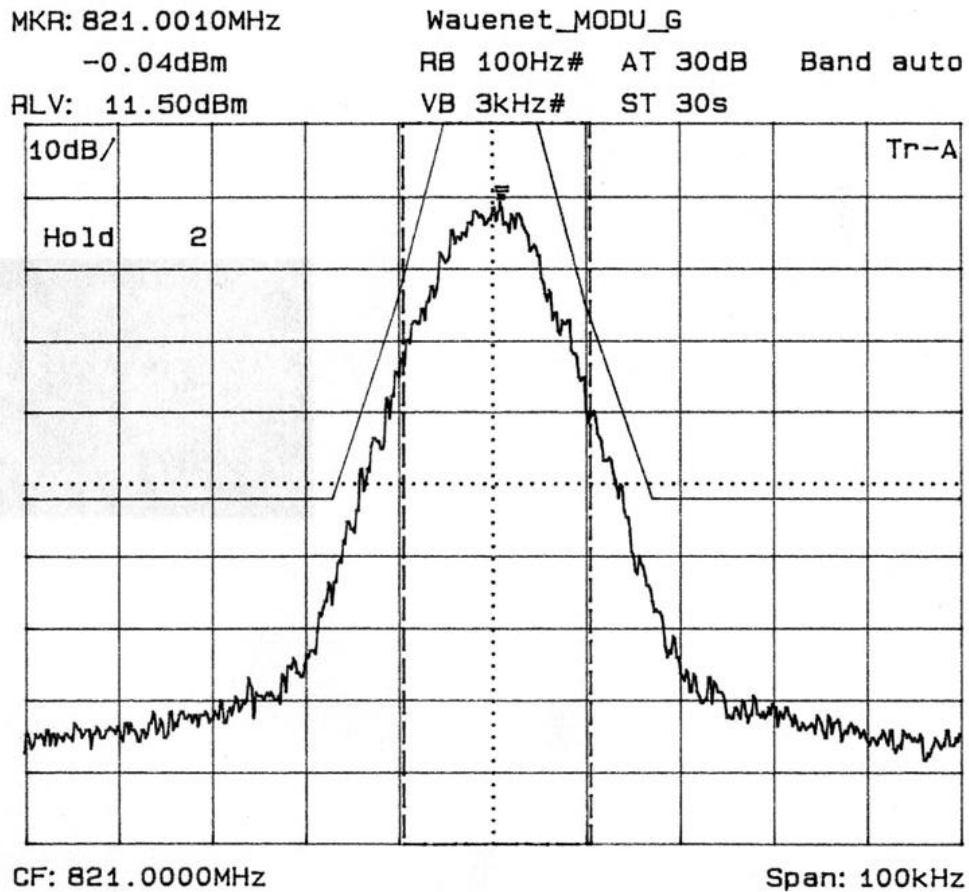
Occupied Bandwidth



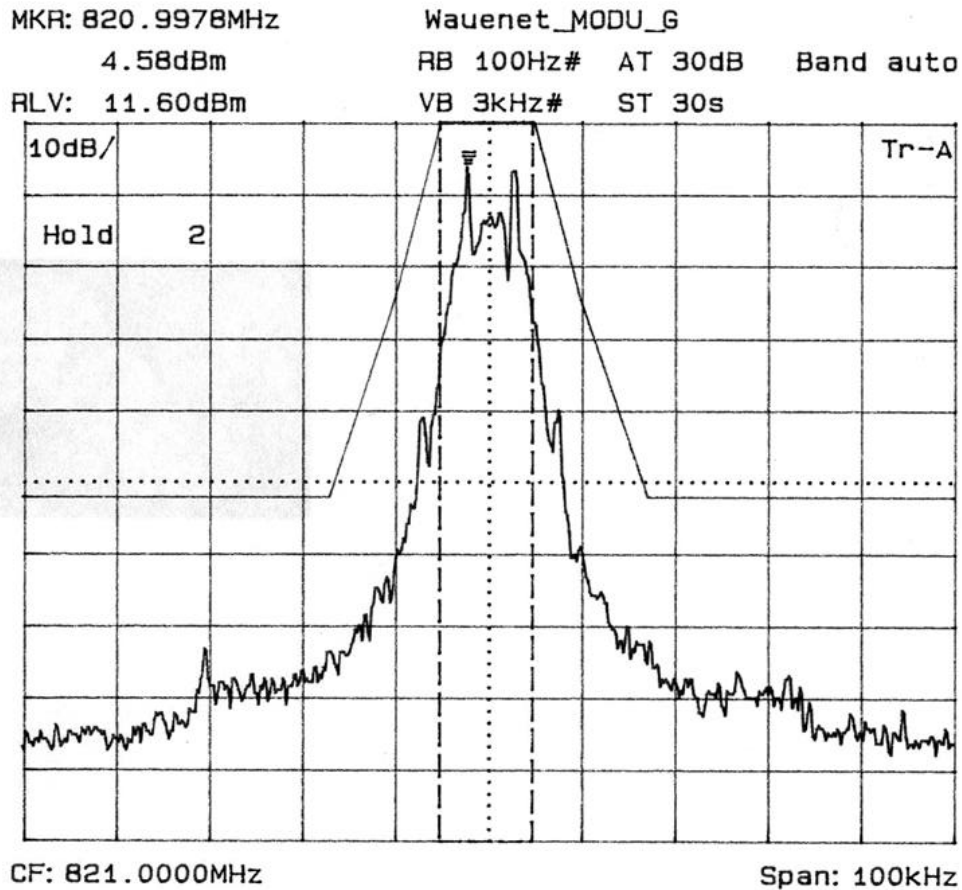
Transmit Frequency: 815.00 MHz
Modulated Carrier-MDC



Occupied Bandwidth
Transmit Frequency: 821.00 MHz
Unmodulated Carrier



Occupied Bandwidth
Transmit Frequency: 821.00 MHz
Modulated Carrier-RD-LAP



Occupied Bandwidth
Transmit Frequency: 821.00 MHz
Modulated Carrier-MDC

Test Equipment

List of Equipment used

Description	Manufacturer	Model #	Asset #	Calibration Due Data
Spectrum Analyser	Anritsu	MS2661C	301330	Dec 10, 2002
Power Meter	Rhode & Schwarz	NRVS	100851	July 21, 2002
35 dB Attenuator	Microlab	FXR AD-30N	-	CBT

Appendix

Photographs



Wireless Modem DUALWAVE M with Palm



**Testing Occupied Bandwidth on
Palm and DUALWAVE M Wireless Modem**