FCC ID: PQSWAVENET-DUAL-V

Exhibit 2d

Engineering Report on

Spurious Emissions at Antenna Terminal (2.1051)

Assessment of Compliance

of

Spurious Emmissions at Antenna Terminal in accordance with the FCC Rules & Regulations Part 2.1051 and 90

PDA Wireless Modem
DWV 100D

Wavenet Technologies Pty Ltd.

June 2001

APREL Project No.:WVTB-Dual Wave V -3279

51 Spectrum Way Nepean ON K2R 1E6
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Engineering Report

Subject:	**Assessment of Spurious Emissions at Antenna Terminal in accordance with the FCC Rules & Regulations Part 2.1051 and 90**
FCC ID:	**PQSWAVENET-DUAL-V**
Equipment:	**PDA Wireless Modem attachment for Palm V/Vx**
Model:	**DWV 100D**
Client:	**Wavenet Technologies Pty Ltd.** 140 Burswood Rd Burswood, Perth, WA 6100 AUSTRALIA
Project #:	WVTB-Dual Wave V-3729
Prepared By:	**APREL Laboratories,** Regulatory Compliance Division 51 Spectrum Way Nepean, Ontario K2R 1E6

Approved by: Jay Sarkar Date: July 5, 2001
Jay Sarkar
Technical Director, Standards & Certification

Submitted by: Jay Sarkar Date: July 5, 2001
Jay Sarkar
Technical Director, Standards & Certification

Released by: Date: July 5/01
Dr. Jack J. Wojcik, P.Eng.

FCC ID: **PQSWAVENET-DUAL-V**
Applicant: Wavenet Technologies Pty Ltd.
Equipment: PDA Wireless Modem attachment for Palm V/Vx
Model: DWV 100D
Standard: FCC Rules and Regulations Part 2.1051 and 90

ENGINEERING SUMMARY

This report contains the results of the Spurious Emissions at antenna terminal measurement performed on a **Wavenet PDA Wireless Modem attachment for Palm V/Vx**. The measurements were carried out in accordance with the FCC Rules and Regulations Part 2.1051 and 90. The product was evaluated for the Spurious Emissions at the Antenna Terminal when it was set at the maximum power level and appropriately modulated.

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

The **DWV 100D Wavenet PDA Wireless Modem** was evaluated in three configurations:
1) PDA Wireless Modem attached to Palm V
2) PDA Wireless Modem attached to Palm V and connected to PC
3) PDA Wireless Modem connected to PC

No significant differences were observed in the test data when measured for above three configurations.

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

Table 1
Summary of the Results

Test Description	Page No.	Test Set-up Figure No.	Results Summary
Spurious Emissions at the Antenna Terminal Part 2.1051 and 90	8	1	Pass

INTRODUCTION

General

This report describes the results of the Spurious Emissions at the Antenna Terminal measurement conducted on a Wavenet Technologies PDA Wireless Modem attachment for Palm V/Vx model DWV 100D**.**

Test Facility

The evaluation for compliance was 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 2.1051 and the appropriate limits (90).

Test Equipment

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

Environmental Conditions

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

This report was written by Jayanta (Jay) Sarkar and the tests were performed by Roman Kuleba.

FCC SUBMISSION INFORMATION

FCC ID:	**PQSWAVENET-DUAL-V**
Equipment (Type): As marketed	**PDA Wireless Modem attachment for Palm V/Vx**
Model:	**DWV 100D**
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:	**PQSWAVENET-DUAL-V**
Equipment Type:	PDA Wireless Modem attachment for Palm V/Vx
Model:	DWV 100D
Reference:	FCC Rules and Regulations Parts 2 and Part 90
Manufacturer:	Wavenet Technologies Pty Ltd
Power Source:	3.6 VDC Battery, Lithium-ion
Development Stage of Unit:	Production

GENERAL SPECIFICATIONS

1. Frequency Range: 806.00 to 821.00 MHz (Transmitter)

2. Measured ERP: 1.862 W

3. Emission Designators (See 47 CFR § 2.201 and §2.202): 20K0F1D

4. Antenna Impedance: 50 Ohms

Test: **Spurious Emissions at Antenna Terminal**

Ref.: **FCC Part 2 paragraph 2.1051 and Part 90.210**

Criteria: *Emission Mask G.* The power of emissions must be attenuated below the power of the unmodulated carrier (P) 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. This is calculated to be –13 dBm.

Set-up: See Figure No. **1.**

Environmental Conditions: Temperature: 23 °C ± 2.
Air pressure: 101 ± 3 kPa.

Equipment: See Appendix A.

Procedure: The mobile was configured to operate at maximum power and applicable modulation applied to the transmitter. The PDA Wireless Modem was coupled to the spectrum analyzer through a 3 dB attenuator and a cable directly to the spectrum analyzer. The spectrum was searched from 9 kHz to the 10th harmonic of the operating frequency.

Part 2.991: Measurements required — Spurious emissions at antenna terminals — The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in paragraph 2.989 as appropriate.

Part 2.997: Frequency Spectrum to be investigated — In all of the spurious emissions measurements of spurious emissions at antenna terminals (2.991) and Field Strength of Spurious Emissions, the Spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9

kHz, up to at least to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower if the equipment operates below 10 GHz (the mobile under test operates below 10 GHz).

The amplitude of spurious emissions, which are attenuated more than 20 dB below the permissible value, need not be reported.

Particular attention should be paid to harmonics and sub-harmonics of the carrier frequency as well as to those frequencies removed from the carrier by multiples of the oscillator frequency. Radiation at the frequencies of multiplier stages should also be checked.

Measurements shown contain spectrum analyzer reading, correction factor, and final reading. The final spurious emission levels are derived from the analyzer measurement and the correction factor (3 dB attenuator and cable loss) as shown in the following example:

Sample Calculation:

A. Spectrum analyzer reading (Direct measurement)

At 1630.00 MHz a spurious level of –45.38 dBm is measured.

B. Correction factor (3 dB attenuator and 1.8 dB cable loss also included in Reading)

Total Correction Factor: 4.8 dB

C. Spurious Emission Level (Spurious Emissions at Antenna Terminal)

C = A+B = -45.4 dBm + 4.8 dB = -40.6 dBm
C= -40.6 dBm

D. The criteria level is derived from this equation:

P_{TX} is the power of the unmodulated carrier: 1.585 Watts (conducted), (32.0dBm)

$D = P_{TX} – [43 + (10 \cdot \log P_{TX(W)})]$
D = 32.0 dBm – [43 + (10·log 1.585 W)]
D = 32.0 dBm – 45.0 dB
D = -13.0 dBm

Criteria (reference) level is: –13.0 dBm.

E = Margin (spurious emission below the reference level)

E = D - C
E = (-13.0 dBm) – (–40.6 dBm)
E = 27.6 dB

Results: **PASSED.** See Tables 2, 3 and 4 and the plots (shown only for configuration 1).

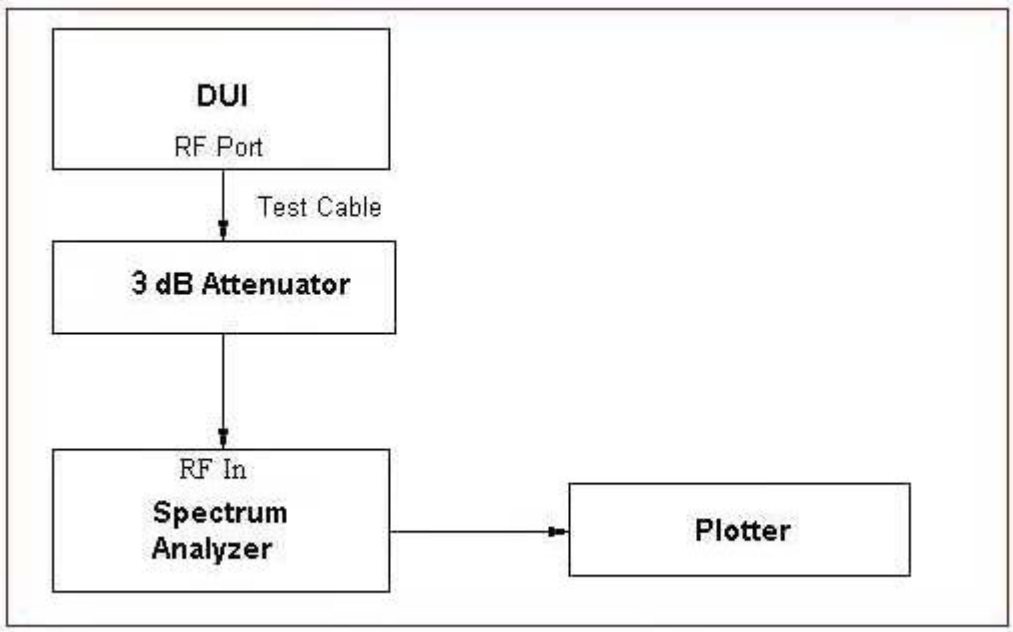


Figure 1: Set Up
Spurious Emissions at Antenna Terminal

Table 2
Spurious Emissions from Transmitter at Antenna Terminal
Fundamental Transmitter Frequency: 815.00 MHz
R.B.: 10 kHz
(Configuration 1)

Frequency (MHz)	Measured Level (dBm) "A"	Correction Factor (Cable Loss & Attenuator) (dB) "B"	Spurious Emission Level (dBm) "C"	Criteria Level (dBm) "D"	Margin (dB) "E
815.00	27.2	4.8	32.0		
1630.00	-45.4	4.8	-40.6	-13.0	27.6
2445.00	-56.5 noise level	4.8	-51.7	-13.0	38.7
3260.00	-54.0	4.8	-49.2	-13.0	36.2
4075.00	-42.9	4.8	-38.1	-13.0	25.1
4890.00	-36.5	4.8	-31.7	-13.0	18.7
5705.00	-36.7	4.8	-31.9	-13.0	18.9
6520.00	-47.9	4.8	-43.1	-13.0	30.1
7335.00	-50.7	4.8	-45.9	-13.0	32.9
8150.00	-47.6 noise level	4.8	-42.8	-13.0	29.8

No other signals were detected.

Test performed by: Ku Chen Rowan **Date:** June, 2001

Table 3
Spurious Emissions from Transmitter at Antenna Terminal
Fundamental Transmitter Frequency: 815.00 MHz
R.B.: 10 kHz
(Configuration 2)

Frequency (MHz)	Measured Level (dBm) "A"	Correction Factor (Cable Loss & Attenuator) (dB) "B"	Spurious Emission Level (dBm) "C"	Criteria Level (dBm) "D"	Margin (dB) "E
815.00	27.2	4.8	32.0		
1630.00	-47.2	4.8	-42.4	-13.0	29.4
2445.00	-58.2 noise level	4.8	-53.4	-13.0	40.4
3260.00	-56.5	4.8	-51.7	-13.0	38.7
4075.00	-43.0	4.8	-38.2	-13.0	25.2
4890.00	-37.9	4.8	-33.1	-13.0	20.1
5705.00	-38.4	4.8	-33.6	-13.0	20.6
6520.00	-48.2	4.8	-43.4	-13.0	30.4
7335.00	-53.1	4.8	-48.3	-13.0	35.3
8150.00	-47.6 noise level	4.8	-42.8	-13.0	29.8

No other signals were detected

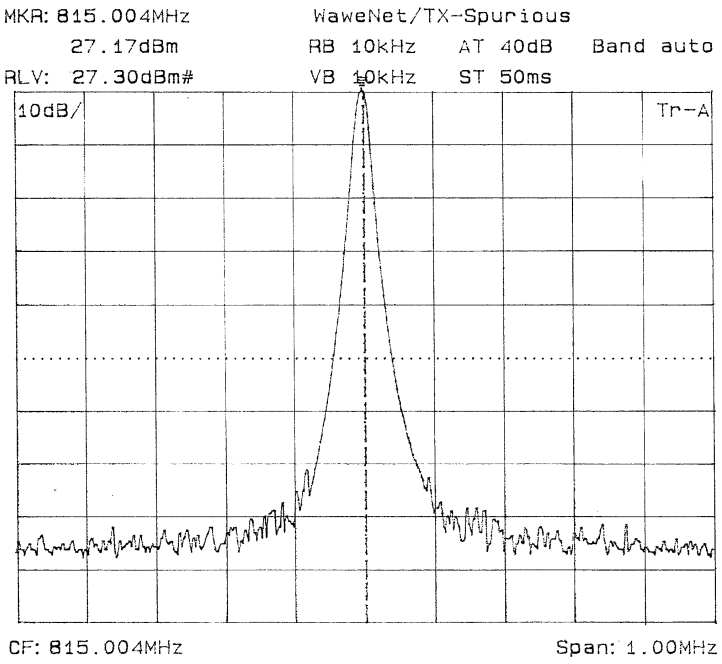
Test performed by: Kulika Rowan **Date:** June, 2001

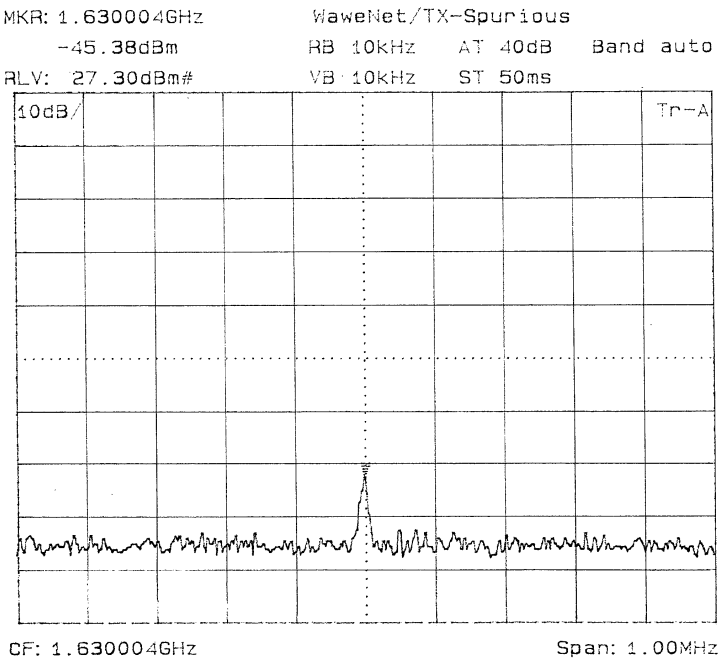
Table 4
Spurious Emissions from Transmitter at Antenna Terminal
Fundamental Transmitter Frequency: 815.00 MHz
R.B.: 10 kHz
(Configuration 3)

Frequency (MHz)	Measured Level (dBm) "A"	Correction Factor (Cable Loss & Attenuator) (dB) "B"	Spurious Emission Level (dBm) "C"	Criteria Level (dBm) "D"	Margin (dB) "E
815.00	27.2	4.8	32.0		
1630.00	-46.7	4.8	-41.9	-13.0	28.9
2445.00	-56.6 noise level	4.8	-51.8	-13.0	38.8
3260.00	-54.3	4.8	-49.5	-13.0	36.5
4075.00	-43.6	4.8	-38.8	-13.0	25.8
4890.00	-37.6	4.8	-32.8	-13.0	19.8
5705.00	-39.1	4.8	-34.3	-13.0	21.3
6520.00	-49.7	4.8	-44.9	-13.0	31.9
7335.00	-51.3	4.8	-46.5	-13.0	33.5
8150.00	-50.2 noise level	4.8	-45.4	-13.0	32.4

No other signals were detected.

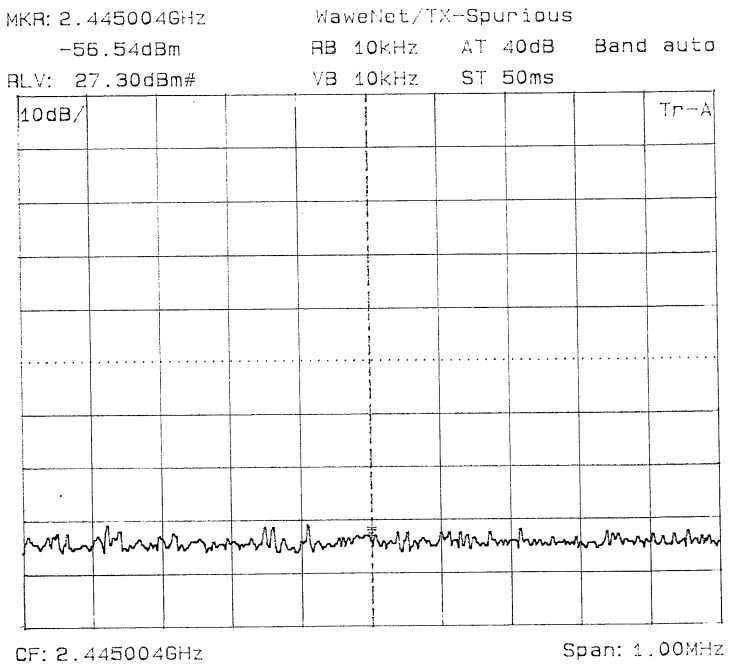
Test performed by: Kulcha Rowan **Date:** June, 2001

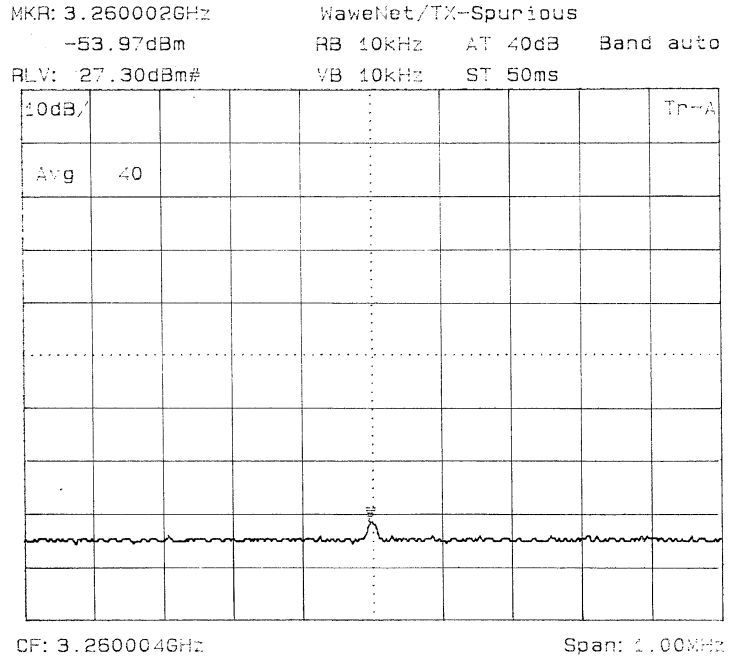




Configuration 1

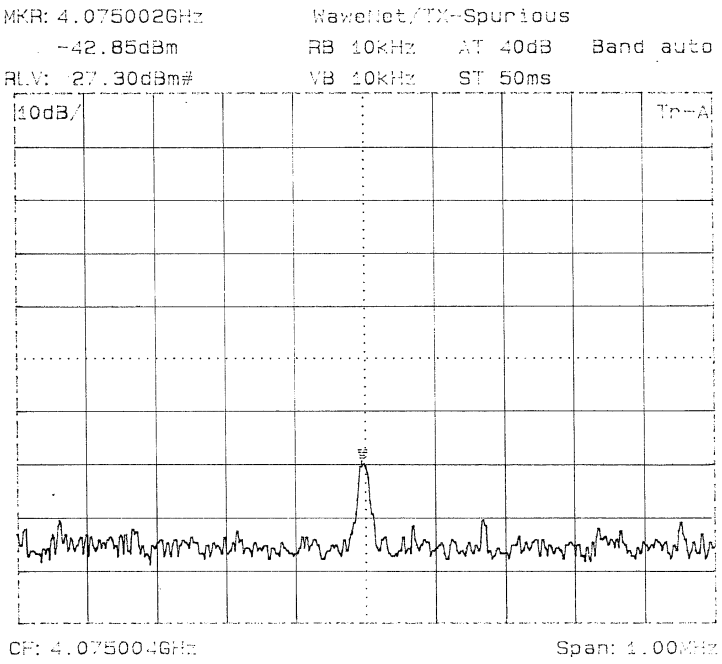
Spurious Emissions from Transmitter
(fundamental frequency and 2nd harmonic)

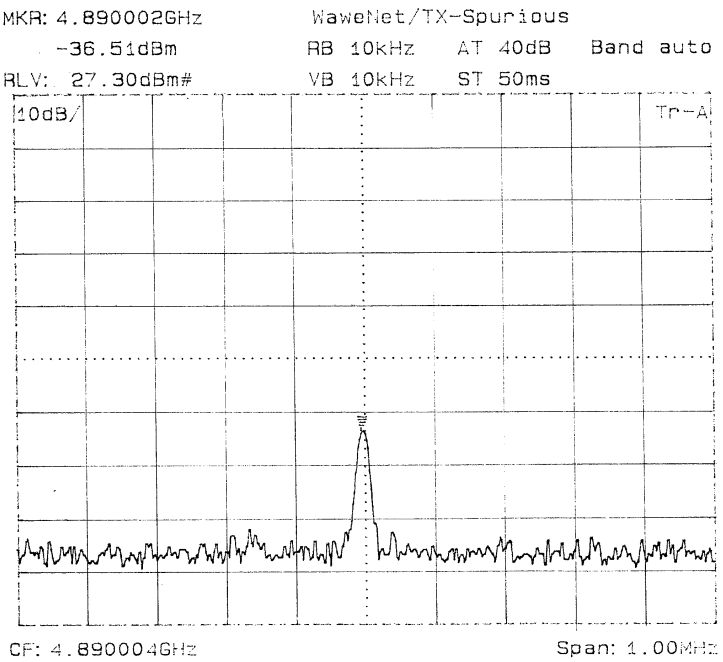




Configuration 1

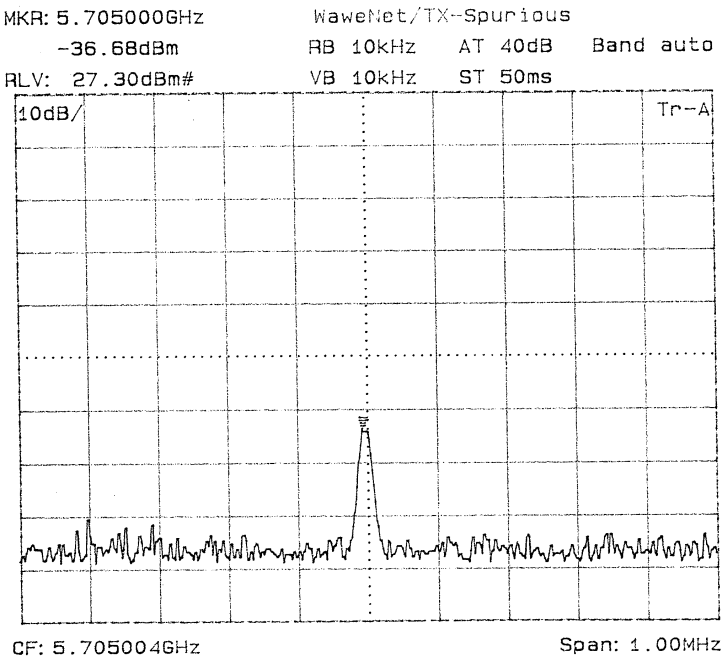
Spurious Emissions from Transmitter
(3rd and 4th harmonic)

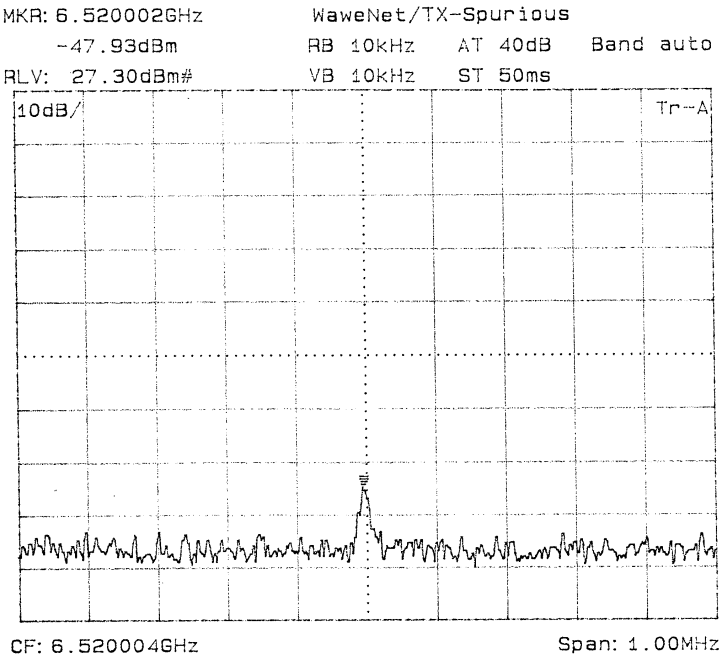




Configuration 1

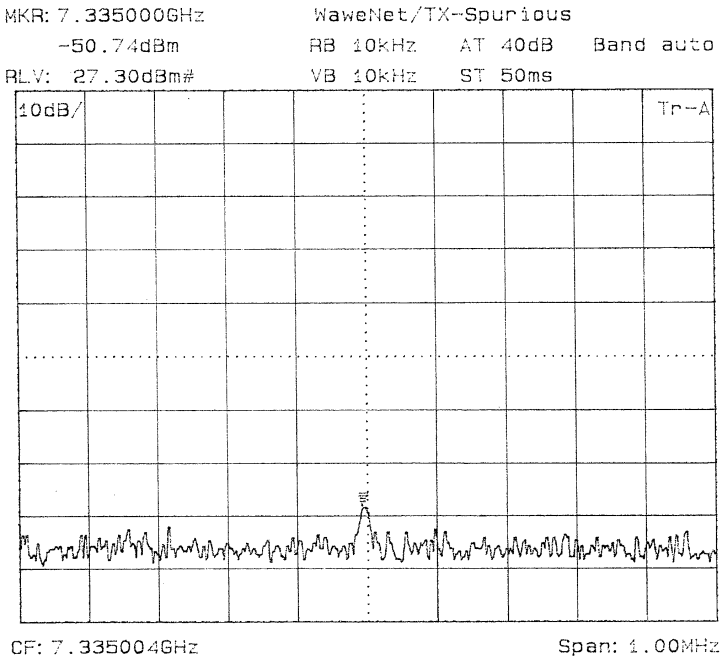
Spurious Emissions from Transmitter
(5th and 6th harmonic)

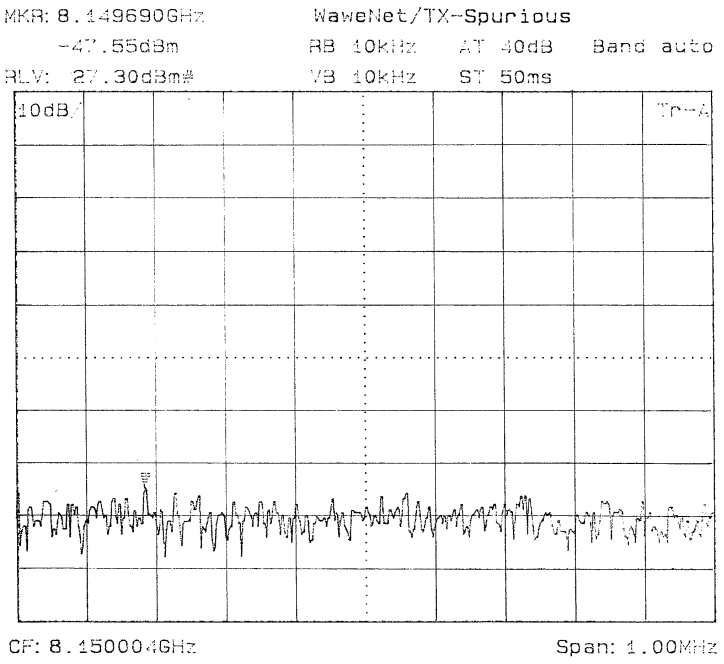




Configuration 1

Spurious Emissions from Transmitter
(7th and 8th harmonic)





Configuration 1

Spurious Emissions from Transmitter
(9th and 10th harmonic)
No other signals were detected.

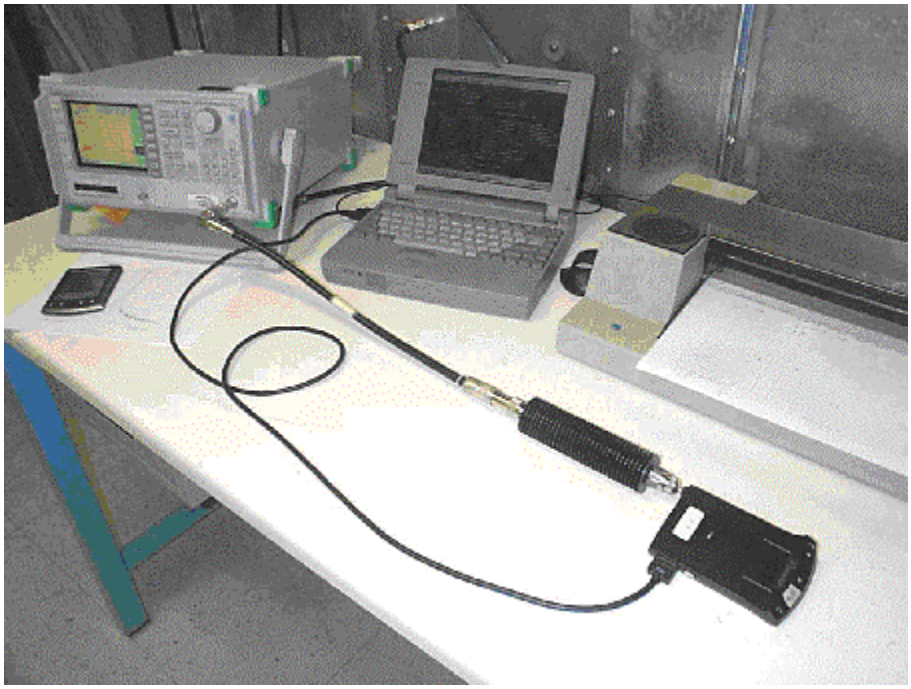
APPENDIX A
TESTING EQUIPMENT

List of Equipment used

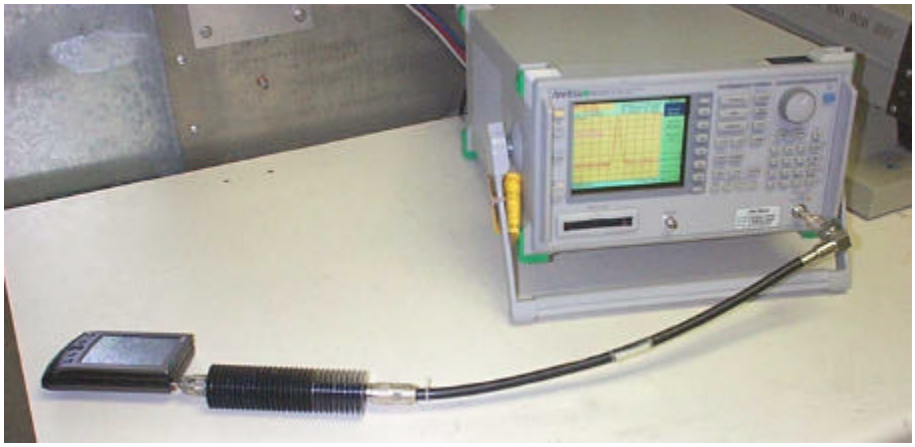
Description	Manufacturer	Model #	Asset #	Calibration Due Data
Spectrum Analyzer	Anritsu	MS2661C	301330	Dec 10, 2001
Power Meter	Rhode & Schwarz	NRVS	100851	July 21, 2001
3 dB Attenuator	Bird	8307-030-N	100889	CBT

APPENDIX B
PHOTOGRAPHS

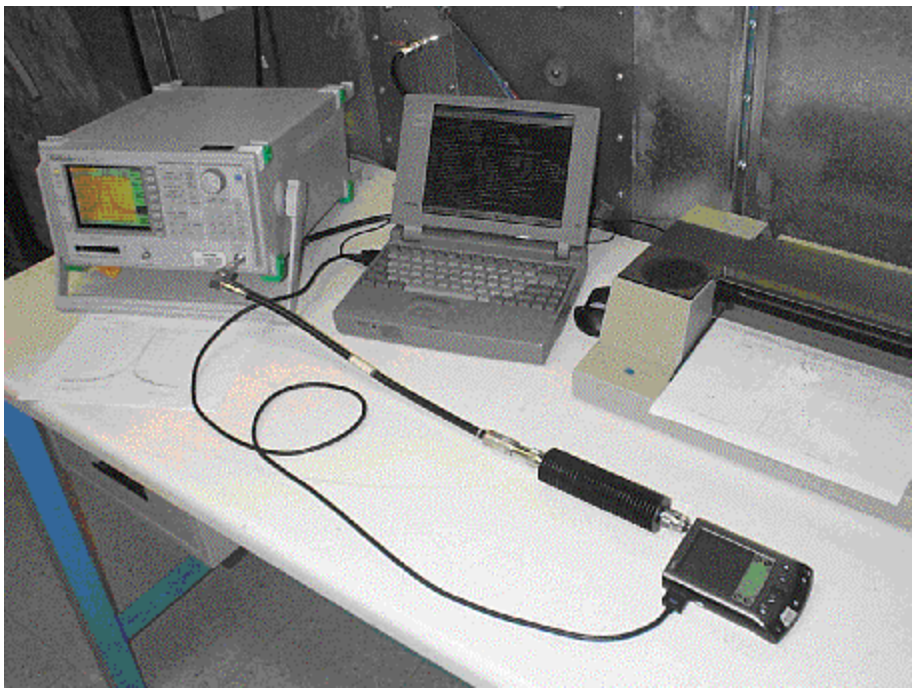
Palm V and PDA Wireless Modem DWV 100D



Testing Spurious Radiation from Transmitter at Antenna Port on DWV 100D Wireless Modem connected to PC only



Testing Spurious Radiation from Transmitter at Antenna Port on Palm V attached to DWV 100D Wireless Modem



Testing Spurious Radiation from Transmitter at Antenna Port on Palm V attached to DWV 100D Wireless Modem connected to PC