

**FCC ID: NBZNRM-6835**

**Exhibit 2**

**Engineering Report  
a)ERP (2.1046)**



# Assessment of Compliance

for

Measurement of Effective radiated Power (ERP) in  
Accordance with the FCC Rules & Regulations Part 2.1046

## Wireless CDPD Modem

Minstrel m500

Novatel Wireless Technologies Ltd.



March 2001

NVWB-Palm Xyclone Minstrel M500-3689

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## **Engineering Report**

**Subject:** Measurement of Effective Radiated Power (ERP) in accordance with the FCC Rules & Regulations Part 2.1046 & 22

**Equipment:** Wireless CDPD Modem

**Model:** Minstrel m500

**Client:** Novatel Wireless Technologies Ltd.,  
Suite 200  
6715-8<sup>th</sup> Street, N.E.  
Calgary, Alberta  
Canada, T2E 7H7

**Prepared By:** APREL Laboratories,  
Regulatory Compliance Division

**Project #:** NVWB- Palm Xyclone Minstrel M500-3689

**Approved by:**  Date: March 23, 2001  
Jay Sarkar  
Technical Director, Standards & Certification

**Submitted by:**  Date: March 23, 2001  
Jay Sarkar  
Technical Director, Standards & Certification

**Released by:**  Date: March 23/01  
Dr. Jacek Wojcik P.Eng.  
J. J. Wojcik

"SOLUTIONS FOR THE WIRELESS FUTURE"

**FCC ID:** NBZNRM-6835  
**Applicant:** Novatel Wireless Technologies Ltd.  
**Equipment:** Wireless CDPD Modem  
**Model:** Minstrel m500  
**Standard:** FCC Rules and Regulations Part 2.1046 & 22

## ENGINEERING SUMMARY

This report contains the results of the effective radiated power (ERP) measurement performed on a NOVATEL WIRELESS Minstrel m500 wireless CDPD modem. The measurements were carried out in accordance with the FCC Rules and Regulations Part 2.1046 & 22. The product was evaluated for ERP when it was set at the maximum power level.

Minstrel m500 was tested for ERP at high, middle, and low frequencies with the maximum ERP obtained at channel No.: 991 with the frequency being 824.0 MHz. The test data is presented in this report under the section: Test Results. The measured ERP is 0.372 W.

(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
RF Power Output as Radiated Ref. Paragraph 2.1046 & 22	8	1	<b>Passed</b>

## INTRODUCTION

### General

This report describes the results of the effective radiated power (ERP) measurement conducted on a Novatel Wireless Minstrel m500 wireless CDPD modem herein referred to as DUI (Device under Investigation)

### Test Facility

The tests were performed for Novatel 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, under PALCAN program (ISO Guide 25). APREL is also accredited by Industry Canada (formerly DOC) and recognised by the Federal Communications Commissions (FCC).

### Standard

The evaluation and analysis were conducted in accordance with FCC Rules and Regulations Parts 2.1046 and 22.

### Test Equipment

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

### Environmental Conditions

Measurements were conducted in open area test site.

- Temperature: 15 °C ± 2
- Relative Humidity: 30 - 50 %

- Air Pressure: 101 kPa  $\pm$  3

## FCC SUBMISSION INFORMATION

**FCC ID:** NBZNRM-6835

Equipment: Wireless CDPD Modem

Model: Minstrel m500

For: Certification

Applicant: Novatel Wireless Technologies Ltd.  
Suite 200  
6715-8<sup>th</sup> Street, N.E.  
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Manufacturer: Novatel Wireless Technologies Ltd.  
Suite 200  
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Calgary, Alberta  
Canada, T2E 7H7

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

## MANUFACTURER'S DATA

**FCC ID No:** NBZNRM-6835

**Equipment Type:** Wireless CDPD Modem

**Model:** Minstrel m500

**Reference:** FCC Rules and Regulations Parts 2 and Part 22

**Manufacturer:** Novatel Wireless Technologies Ltd.

**Power Source:** DC Battery

**Development Stage of Unit:** Production

## GENERAL SPECIFICATIONS

1. Frequency Range: 824 to 849 MHz (Transmitter)
2. Output Power: 0.372 W ERP
3. Frequency Tolerance: 2.5 ppm
4. Type of Modulation: GMSK
5. Emission Designators(See 47 CFR § 2.201 and §2.202) 28K8FXW
6. Antenna Impedance: 50 Ohms



**TEST RESULTS**

**FOR**

**Effective Radiated Power (ERP)**

**Of**

**Novatel Minstrel m500 Wireless**

**CDPD modem**

***Novatel Wireless***

**Test:** RF Power Output as Radiated (ERP)

**Ref.:** FCC Part 2 paragraph 2.1046 and 22

**Criteria:** N/A

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

**Equipment:** See Appendix A.

**Methodology:** RF Power Measurement by Radiated Method (ERP):

Test site: The radiated RF power measurement was taken at APREL Laboratory's open area test site (OATS). This open area test site is calibrated to ANSI C63.4 document and a description of the measurement facility is on file with the Federal Communications Commission and is in compliance with the requirement of Section 2.948 of the Commissions rules and regulations. (FCC File No.: 90416)

The test was set-up as illustrated in Fig.1. The Minstrel m500 was configured to operate at maximum power with carrier **unmodulated**. The equipment under test was placed on a turntable positioned 3 m away from the calibrated receiving antenna, which in turn was connected to the spectrum analyzer.

For each transmitter frequency, the received signal was **maximised** by rotating the turntable and adjusting the height of the receiving antenna. To obtain the actual ERP, the Minstrel m500 was replaced by a vertically polarised half-wave dipole antenna resonant to that frequency and fed by a RF power amplifier and signal generator. The center of the dipole antenna was placed precisely in the same location as the Minstrel m500. It was ensured that the orientation of the rotating table and the height of the receiving antenna were unmoved. The signal generator level was adjusted until the peak reading on the spectrum analyzer was identical to that obtained when the Minstrel m500 was on the turntable. The two signals were matched by superimposing one signal to the other on the spectrum analyzer screen. The output of power amplifier was disconnected from the substitute dipole antenna and connected to a RF power meter. **The effective radiated power was read directly from the power meter.**

**The process was repeated for two more channels.**

**Results:** See Table 1

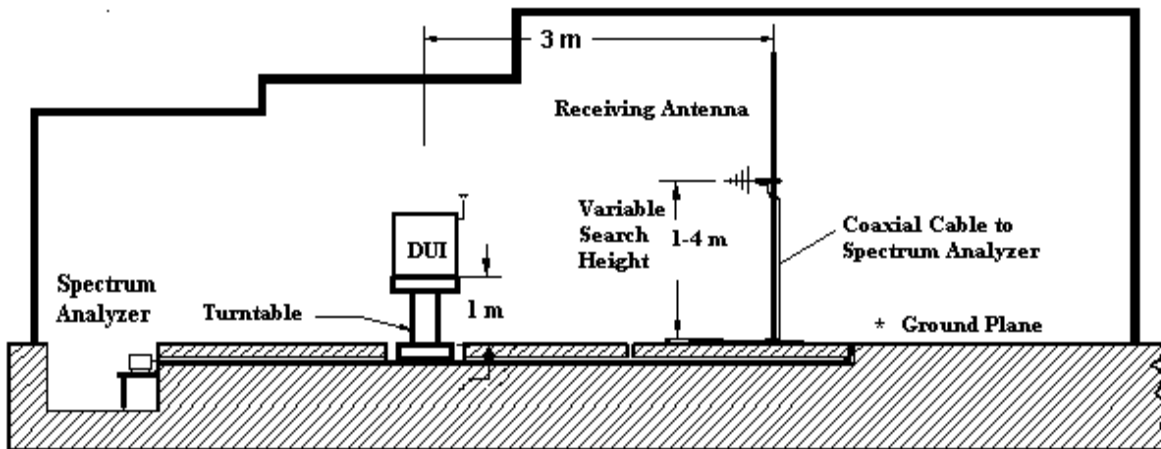


Figure 1.a Test set up for the Radiated Power (ERP) Measurement in OATS (not to scale)



Fig. 1.b APREL's OATS (Open Area Test Site)

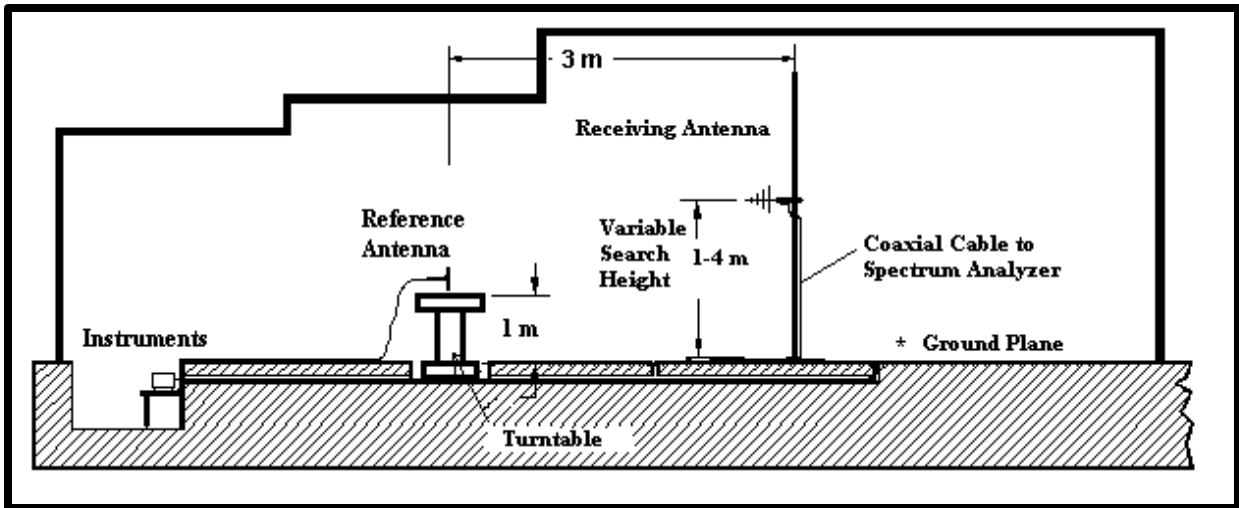


Figure 1.c Test set up for the Radiated Power (ERP) Measurement in OATS (not to scale)  
The DUI is replaced by Reference Dipole Antenna.

Table 1.  
RF Output Power Measurement  
ERP  
Minstrel m500

Channel No.	Nominal Transmit Frequency	Measured Output Power ERP	ERP
	(MHz)	(dBm)	(W)
991	824.00	25.7	0.372
383	836.49	25.3	0.335
799	849.00	24.9	0.305

Test Engineer... *K. C. Polson* Date... *March, 2001*

# APPENDIX A

## List of Test 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	00851	July 21, 2001
20 dB Attenuator	Narda	4779-20	301370	May 18, 2001
Signal Generator	Hewlett-Packard	HP 8662A	100456	Nov 1, 2001
RF Power Amplifier	Amplifier Research	25W100M	100735	Sep 16, 2001
Reference Half wave Dipole	APREL Inc.	D-8355	N/A	June 16, 2001
Log Periodic Antenna	Eaton	ALP-1	100553	July 21, 2001
Turntable with Controller	EMCO	1060-1.241	100506	CNR
Computer Controlled Antenna Position Mast	EMCO	1051-12	100507	CNR
OATS	APREL Inc.	3m & 10m	N/A	N/A

# APPENDIX B

## PHOTOGRAPHS





**Novatel Wireless  
Minstrel m500**



### **ERP Measurements in OATS**



**Reference Dipole Antenna Used for ERP Measurement**