

Exhibit 2

Minstrel S

Novatel Wireless Technologies Ltd.

FCC ID: NBZNRM6834

Engineering Reports
(With Test Set-up Photographs)

(Two Reports ERP & Spurious)



Assessment of Compliance

for

Measurement of Field Strength of Spurious Radiation in Accordance with the FCC Rules & Regulations Part 2.1053

Wireless CDPD Modem Minstrel S

Novatel Wireless Technologies Ltd.



August 2000

NVWB-MINSTREL S -3509

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Engineering Report

Subject: Measurement of Field Strength of Spurious Radiation in
Accordance with the FCC Rules & Regulations Part 2.1053

Product: Wireless CDPD Modem

Model: Minstrel S

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

Project #: NVWB-MINSTREL S-3538

Prepared By: *APREL Laboratories,*
Regulatory Compliance Division

Approved by:

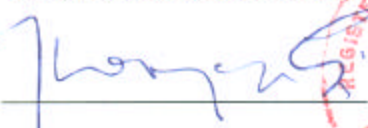


Date:

Aug. 16, 2000

Jay Sarkar
Director, Standards & Certification

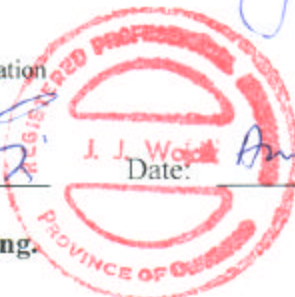
Released by:



Date:

Aug 17/2000

Dr. Jack J. Wojcik, P.Eng.



"SOLUTIONS FOR THE WIRELESS FUTURE"

FCC ID: NBZNRM6834
Applicant: Novatel Wireless Technologies Ltd.
Equipment: Wireless CDPD Modem
Model: Minstrel S
Standard: FCC Rules and Regulations Part 2.1046

ENGINEERING SUMMARY

This report contains the results of Field Strength of Spurious Radiation measurement performed on a Novatel Wireless Minstrel S wireless CDPD modem. The measurements were carried out in accordance with the FCC Rules and Regulations Part 2.1053. The product was evaluated for spurious when it was set at the maximum power level.

The Minstrel S wireless CDPD modem is an attachment for the Handspring Visor PDA.

(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
Field Strength of Spurious Radiation Ref. Paragraph 2.1053	8	1	Passed

INTRODUCTION

General

This report describes the results of the Field Strength of Spurious Radiation measurement conducted on a Novatel Wireless Minstrel S wireless CDPD modem herein referred to as DUI (Device Under Investigation).

Test Facility

The tests were performed for Novatel Wireless 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 2.1053 and the appropriate limits.

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: 20 °C ± 2
- Relative Humidity: 30 - 50 %

- Air Pressure: 101 kPa $\pm$ 3

FCC SUBMISSION INFORMATION

FCC ID: NBZNRM6834

Equipment: Wireless CDPD Modem

Model: Minstrel S

For: Certification

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

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

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

MANUFACTURER'S DATA

FCC ID No:	NBZNRM6834
Equipment Type:	Wireless CDPD Modem
Model:	Minstrel S
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: 0.191 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

Field Strength of Spurious Radiation
Of
Novatel Wireless Minstrel S CDPD
Modem

Novatel Wireless.

Test: Field Strength of Spurious Radiation

Ref: FCC Parts 2.1046 and 22.917 (e)

Criteria: Emission :
The permitted maximum level of spurious emission is $43 + 10 \log (P)$ dB below the unmodulated carrier power of the transmitter (P). This was calculated to be 84.6 dBuV/m at 3 meters.

Set-up: See Figure 1.a

Conditions: Voltage Supply: 7.4/8.4 DC Battery

Equipment: See Appendix A.

Procedure: The final measurements were taken at APREL Laboratory's open area test site (OATS) measurement facility. 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 requirements of Section 2.948 of the Commissions rules and regulations.
(FCC Registration No.:90416).

The **Minstrel S** was configured to operate at maximum power with appropriate modulation. Special software was employed in order that the transmitter was processing data in a normal manner.

Prior to final measurement in the OATS, preliminary radiated spurious emissions were scanned in a shielded enclosure at a distance of 1 m using biconical, log-periodic and horn antennas in order to determine the characteristic frequencies of the field strength of spurious emissions. Based on this information, measurements were performed in the OATS at these characteristic frequencies using calibrated antennas.

All field strength measurements were made with a spectrum analyser and the appropriate calibrated antenna for the frequency range from 9 kHz up to 10th harmonics of the transmit frequency (see equipment list for the calibrated antenna used). **The Power of the carrier frequency was also measured in the OATS.**

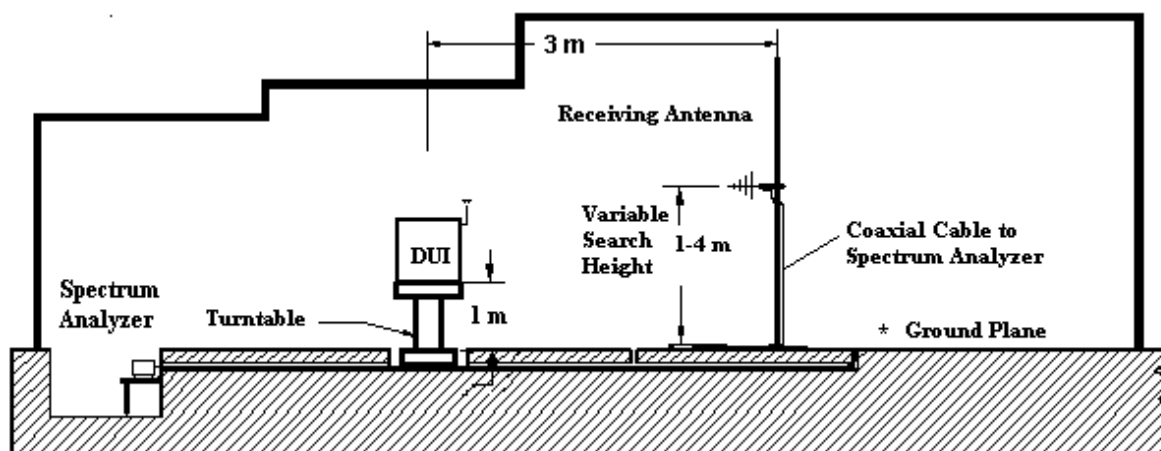


Figure 1.a Test set up for the Field Strength of Spurious Radiation Measurement in OATS
(Not to scale)



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

The equipment under test was placed on a turntable positioned 3 meters away from the calibrated receiving antenna, which in turn was connected to the spectrum analyzer. For each identified frequency, the received signal was maximized by the positioning of the turntable and the height of the antenna. The process was repeated for both horizontal and vertical polarisation.

Information submitted includes the relative radiated power of each spurious emissions with reference to the calculated 84.6 dB μ V/m limit per 22.917(e), assuming all emissions are radiated from half-wave dipole antenna.

Measurements given in the spurious emissions test result tables contain: analyzer reading, correction factor, and final reading. The final field strength level are derived from the analyzer measurement and the correction factor (antenna factor and cable loss) as shown in the following example:

Sample Calculation

A. Spectrum analyzer reading

at 1648.08 MHz (2nd harmonic) a spurious level of 23.4 dB μ V @ 3 meters is measured.

B. Correction factor (antenna factor and cable loss)

Cable loss: 0.5 dB

Antenna Factor: 34 dB

Total Correction Factor: $0.5 + 34 = 34.5$ dB/m

C. Final reading (Field Strength of spurious emission):

$$C = A + B$$

$$C = 23.4 \text{ dB}\mu\text{V} + 34.5 \text{ dB}$$

$$C = 57.9 \text{ dB}\mu\text{V/m @ 3 meters}$$

D. The criteria level.

The field intensity, which would be produced by the transmitter carrier operating into a half-wave dipole antenna (gain of 1.64), at a distance of 3 m, was calculated using the following formula:

Field Strength of unmodulated carrier (dB μ V/m) = $10 \log_{10} (\text{PtG}/4\pi r^2) + 146 \text{ dB}$

Pt is transmitter carrier power, unmodulated

G is gain, 1.64

R is distance, 3 meters

Criteria (reference) level at 3 meters from 0.191 Watt (ERP) into half-wave dipole antenna is 84.6 dB μ V/m.

E = Margin (spurious emission below the reference level)

$$E = D - C$$

$$E = 84.6 \text{ dB}\mu\text{V/m} - 57.9 \text{ dB}\mu\text{V/m}$$

$$E = 26.7 \text{ dB}\mu\text{V/m}$$

Results: **Passed** . **See Tables 1 and 2**

Table one
 Field Strength of Spurious Radiation
 Transmitter Frequency: 824.04 MHz
 Antenna Polarization: Vertical
Resolution Bandwidth:
 10 kHz (below 1 GHz)
 100 kHz (above 1 GHz)

Frequency (MHz)	Measured Level (dB μ V)	Correction Factor (dB/m)	Field Strength (dB μ V/m)	Criteria Level (dB μ V/m)	Margin (dB)
	"A"	"B"	"C"	"D"	"E"
824.04 1 st harmonic (carrier)	90.6	29.9	120.5	-	-
1648.08 2 nd harmonic	23.4	34.5	57.9	84.6	26.7
2472.12 3 rd harmonic	15.9	35.3	51.2	84.6	33.4
3296.16 4 th harmonic	0.7	41.0	41.7	84.6	42.9

Test performed by: Lu C. L. Roman

Date: August 16, 2000

Table 2

Field Strength of Spurious Radiation

Transmitter Frequency: 824.04 MHz

Antenna Polarization: Horizontal

Resolution Bandwidth:

10 kHz (below 1 GHz)

100 kHz (above 1 GHz)

Frequency (MHz)	Measured Level (dB μ V)	Correction Factor (dB/m)	Field Strength (dB μ V/m)	Criteria Level (dB μ V/m)	Margin (dB)
	"A"	"B"	"C"	"D"	"E"
1648.08 2 nd harmonic	7.8	34.5	42.3	84.6	42.3
2472.12 3 rd harmonic	6.4	35.3	41.7	84.6	42.9
3296.16 4 th harmonic	-0.9	41.0	40.1	84.6	44.5

Test performed by: Julio RomanDate: August 16, 2000

APPENDIX A

List of Test Equipment

List of Equipment

Description	Range	Manufacturer	Model #	APREL Asset #	Cal. Due Date
Spectrum Analyzer	9 kHz - 3 GHz	Anritsu	MS2661C	301330	Dec 10, 2000
Spectrum Analyzer	9 kHz - 30 GHz	Anritsu	MS2667C	301436	Nov 3, 2000
Biconical Antenna	20 MHz - 200 MHz	Eaton	94455-1	100890	July 21, 2001
Log - Periodic Antenna	200 MHz -1.0 GHz	Eaton	ALP-1	100761	July 21, 2001
Horn Antenna	1 – 18 GHz	Aprel	AA – 118	100553	March 12, 2001
Anechoic Shielded Room	10 kHz - 10 GHz	APREL Inc.	–	301329	N/A
OATS	30 MHz – 1 GHz	APREL Inc.	3 m & 10 m	N/A	N/A
Mast with the Controller	1 m – 4 m	EMCO	1051 – 12	100507	N/A
Turntable with the Controller	0° - 360°	EMCO	1060 – 1.241	100506	N/A
Notch Filter	820-850 MHz	APREL	NFLT-835	301470	CBT
Attenuator	20 dB	APREL	4779-20	301370	May 18, 2001
Amplifier (LNA)	30-1500 MHz	APREL Inc.	APRLNA-001	301415	June 20, 2001
Microwave Amplifier	2 – 20 GHz	Hewlett-Packard	HP8349B	100952	CBT
Travelling-Wave Tube Amplifier	1.4 – 2.4 GHz	Hughes Aircraft Company	TWTA	100424	CBT

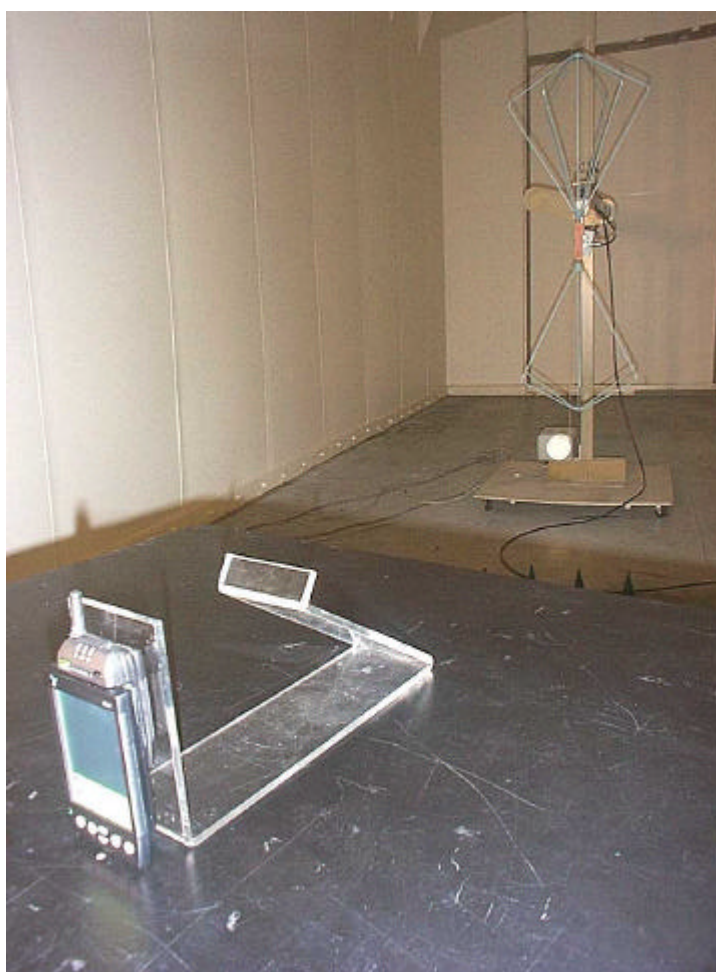
*CBT stands for Calibrated Before Test

APPENDIX B

PHOTOGRAPHS



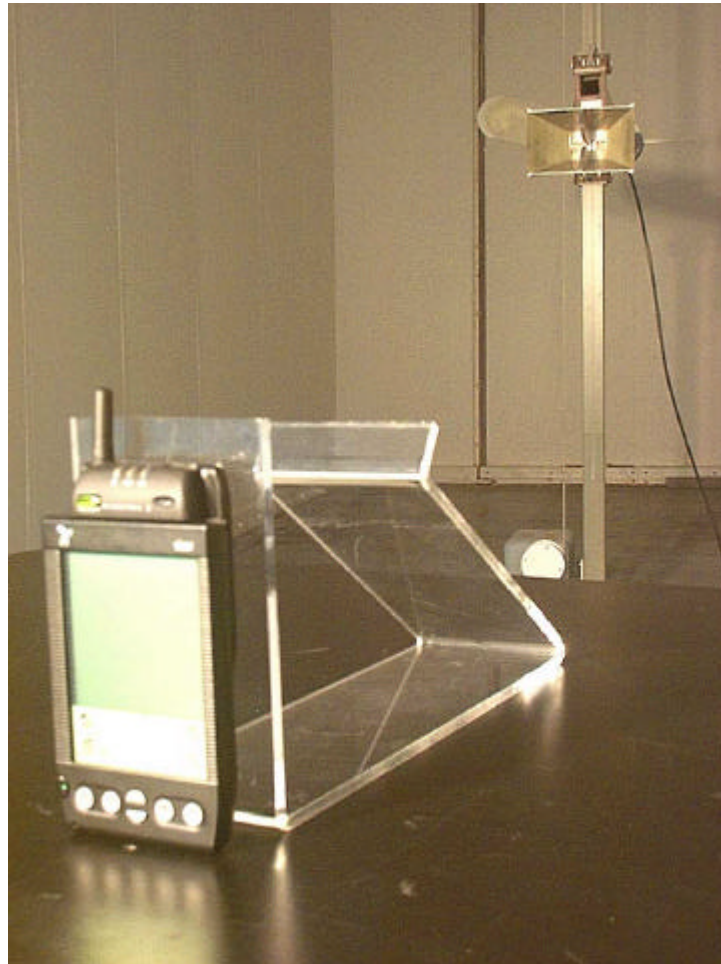
***Novatel Wireless
Minstrel S***



***Spurious Measurements in OATS
(frequency range: 30 MHz – 200 MHz)***



***Spurious Measurements in OATS
(frequency range: 200 MHz – 1 GHz)***



***Spurious Measurements in OATS
(for frequencies above 1 GHz)***