

MEASUREMENT/TECHNICAL REPORT



**Intermec Technologies Corporation
700 With Novatel CDPD
Cellular Radio Module**

REPORT NO: 20010830-1

DATE: August 30, 2001

This report concerns: Original Grant <input checked="" type="checkbox"/> Class II change <input type="checkbox"/>	
Equipment Type: Cellular Radio Certified Under FCC Part 22.901(d)	
Request issue of the grant immediately upon completion of review.	
Measurement procedure used: FCC Rules Part 1, 2 and OET Bulletin 65	
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This report contains data that is outside the NVLAP scope of accreditation.

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APPENDIXES (may be file attachments for electronic applications of approval)

- A. 20010120A1.xxx Radio Module Internal Photos
- B. 20010120B1.xxx Radio Module External Photos
- C. 20010120C1.xxx Label and Placement Diagram
- D. 20010120D1.xxx 700 Computer Photos
- E. 20010120E1.xxx Typical Use Photos
- F. 20010120F1.xxx DoC insert
- G. 20010120G1.xxx FCC Part 22.901(d) REPORT; d98c0011, M. Flom Associates, Inc
- H. 20010120H1.xxx APREL Laboratories SAR Report
- I. 20010120I1.xxx APREL Laboratories EIRP Report

xxx = .pdf, .xls or .doc as needed

1.0 COMPLIANCE CERTIFICATION

The electromagnetic compatibility test and data evaluations findings of this report have been prepared by the EMC Test Lab, Intermec Technologies Corporation, in accordance with applicable specifications instructions required per-

FCC Part 22 Testing preformed by M. Flom Assoc. , Chandler Arizona
SAR Testing preformed by APREL Laboratories, Ottawa Canada

The data, data evaluation and equipment configuration represented herein are a true and accurate representation of the measurements of the test sample's electromagnetic compatibility characteristics as of the dates and at the times of the test under the conditions herein specified. The data presented herein is traceable to the National Institute of Standards and Technology.

This report is not an endorsement of the tested product by NVLAP or any agency of the U.S. Government.



Accredited by the National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code 100269-0.

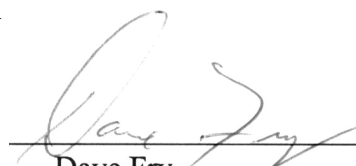
**Intermec Technologies Corporation
EMC Test Laboratory
550 Second Street S.E.
Cedar Rapids, Iowa 52401**

The scope of accreditation at the EMC Test Laboratory is limited to NVLAP codes:

12/CIS22 IEC/CISPR 22:1993: Limits and methods of measurement of radio disturbance characteristics of information technology equipment. 12/CIS22a IEC/CISPR 22:1993: Limits and methods of measurement of radio disturbance characteristics of information technology equipment, Amendment 1:1995, and Amendment 2:1996. 12/CIS22b CNS 13438:1997: Limits and methods of measurement of radio disturbance characteristics of information technology equipment.
12/F01 FCC Method - 47 CFR Part 15 - Digital Devices. 12/F01a Conducted Emissions, Power Lines, 450 kHz to 30 MHz. 12/F01b Radiated Emissions.
12/T51 AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment.



Interference Technology
International



Dave Fry
Regulatory Engineer II
Date 10/ 25/ 01
mm/dd/yy



Stu Adams
Manager, Safety and Compliance
Date 10/ 25/ 01
mm/dd/yy



National Association of Radio and
Telecommunications Engineers

1.1 Measurement Uncertainties:

Not Applicable, see M. Flom Associates and APREL test reports.

2.0 GENERAL INFORMATION

2.1 Product Description

This report addresses the request for certification for a 700 hand held computer with integrated cellular modem radio operating in the 824-849 MHz radio band. The Novatel radio will be used as a wireless wide-area LAN to communicate to mainframe computers or other terminal devices. This report and FCC application address the "Portable" radio specific absorption rate (SAR) requirements for the antenna used exclusively on the Intermec 700 family of hand held computers. The 700 unit shown within the SAR report is small enough to be considered a portable device.

The Novatel NRM-6832 (Expedite) radio is provided to Intermec Technologies Corp. by Novatel Wireless Technology Limited as an OEM radio. The radio remains unchanged from Novatel. The regulatory requirements under FCC Part 22 are represented under the original request for Grant report submitted to the FCC by Novatel. FCC ID: NBZNRM-6832. Copies of the supporting documents from the original FCC grant are contained within this application.

This report shows the radio to be used within the entire family of 700 hand held computers manufactured by Intermec. The 700 family of computers uses the same exterior shell, radio antenna coupling board and antenna. The options available change the processor, memory, display and peripheral interface options.

Intermec markets these computers to users in the route and delivery services industries for inventory control automation. As this radio is integrated within the 700 computer, the digital emissions will be verified to meet FCC Class B emissions. Digital emissions of the 700 with Novatel CDPD radio will be tested to demonstrate compliance to the Class B requirements under the FCC Declaration of Conformity. The digital emissions concerns related to the 700 Novatel radio integration will be addressed in separate reports.

The 700 and Novatel radio and antennas for this report are production versions.

2.2 Related Submittal(s)/Grants(s)

Novatel original FCC Grant FCC ID: NBZNRM-6832 issued 4/14/1999

2.3 Systems Details

Model Part Number Serial Number	FCC ID:	Description	Cable Description
700 Novatel CDPD Unit PN N/A SN N/A	EHANOVCDPD	Hand held computer with cellular Wide Area Network radio/modem	N/A
Mobile Mark PSTN2-815CI Intermec PN 805-572-003	N/A	Antenna -6 dBi Gain	Internal antenna coupling PCB and 5 cm long (1.0 dB loss)

2.4 Test Methodology

Transmitter radiated and conducted emissions are tested per ANSI C63.4-1992, EIA/IS-19-B-1988 and TIS/EIA/IS-137-A-1996.

FCC regulations regarding RF Exposure are addressed within the FCC Part 1, 2 and OET Bulletin 65. This report address the FCC requirements regarding a new FCC grant request. APREL Laboratories, Ottawa Canada, defined the SAR test procedure.

2.5 TEST FACILITY:

The location of the open area test site and conducted measurement facility used to collect the radiated data is 90 West Cemetery Road, Fairfax, Iowa 52228. This site has been fully described in report number 577-500-971, dated November 6, 2000, and submitted to the Federal Communication Commission USA, and accepted in a letter dated December 8, 2000 for ANSI C63.4: 1992 testing. The test site was also submitted to Industry Canada for the performance of radiated measurements and is reference by the file number IC 1223. Test site complies too CISPR Publication 22: 1993, Clauses 10 and 11 for methods of measurements for radiated and conducted emissions testing.

Details for the radio spurious emissions and operating characteristics is shown by the test report by M. Flom Associates, the facility details are contained with report d98c0011. Details of the EIRP and SAR test facility at APREL Laboratories is contained with Appendix G and H.

3.0 PRODUCT LABELING AND INFORMATION TO THE USER

3.1 PRODUCT LABELING

See label and label placement in appendix C

3.2 INFORMATION TO THE USER

The appendix F show the Declaration of Conformity inserts supplied and shipped with each 700 computer.

4.0 THEORIES OF OPERATION

Proprietary Novatel Wireless Technologies, Ltd. document. Supporting documents are confidential and are made available upon request when appropriate. Confidentiality requested for this document.

5.0 SCHEMATICS

Proprietary Novatel Wireless Technologies, Ltd. document. Supporting documents are confidential and are made available upon request when appropriate. Confidentiality requested for this document.

6.0 TRANSMITTER CHARACTERISTICS TEST RESULTS

Transmitter radiated, conducted spurious emission and occupied band complies with the FCC regulations outlined in Parts 2 and 22.

See Appendix G, FCC Part 22.901(d) Report; d98c0011, M. Flom Associates, Inc.

7.0 SAR TEST RESULTS

Testing for SAR is required to demonstrate compliance to the RF Exposure requirements defined by the FCC 2.1093 for portable products. The 700 terminals are small enough that the 20-cm (8-inch) spacing between the antenna and user cannot be maintained. The 700 terminals are operated within the hand and cannot be operated from within a holster that can be worn at the waist or shoulder. Normal usage photographs are shown for clarification within appendix x.

See Appendix H, APREL report. ITCC-Intermec 700 w. Novatel CDPD-3782

8.0 EIRP TEST RESULTS

The EIRP measured for the 700 antenna is also shown in appendix I. The EIRP for the Mobile Mark antennas was 0.110 watts.

Three 700 units with three Novatel Expedite radios were sent to APREL for evaluation. As noted in the EIRP report the radiated power observed is substantially low. The conducted power observed on the three units was 450 mW, also substantially low in comparison the 600mW power rating on FCC Grant NBZNRM-6832. We requested APREL perform SAR testing on the radio exhibiting the highest EIRP.

The resulting EIRP indicates a very poor antenna design with a gain of -6.5 dBi. The specifications for the antennas are from Mobile Mark at -4 dBi. We anticipate the antennas for production versions will exhibit a gain closer to -5.5 dBi. The losses of the antenna coupling board and cable also add 1.0 dB therefore the resulting EIRP measurements.

See Appendix I, APREL report. ITCC-Intermec 700 w. Novatel CDPD-3781

7.0 ANTENNAS AND USAGE DESCRIPTION

The Mobile Mark antenna is 1 and 3/4-inches (43.5-mm) long, $\frac{1}{4}$ over $\frac{5}{8}$ end wave end-fed dipole antenna part number (PN) PSTG0-859CI, Intermec PN 805-575-003. Gain -4 dBi, VSWR 2:1, 50 Ohms.

The 700 hand held computers operate the radio only with the unit held in the hands. The unit must be supported with one hand while the other hand presses buttons or touch screen to enable functions from the radio. Test conditions for SAR verified exposure when operated in the hand as well as exposure to the body of the user or bystanders. Testing at APREL set the transmitter for the maximum duty cycle transmission available from the cellular phone service. As required the users manual compliance insert will address RF exposure.

See appendix F for the Users Information regarding regulatory approvals and warnings.