



# Novatel Wireless Inc Collocated MPE Report for

FCC ID # NBZNRM-MIFI2372R  
IC ID # 3229A-MIFI2372R

Project Code CG-1436

(Report CG-1436-RA-3-2)

Revision: 2

(Supersedes CG-1436-RA-3-1)

August 3, 2010

**Prepared for:** Novatel Wireless Inc  
**Author:** Deniz Demirci  
Senior Wireless / EMC Technologist

---

**Approved by:** Nick Kobrosly  
Director of Canadian operations

---

**Confidentiality Statement:** This report and the information contained herein represent the results of testing articles/products identified and selected by the client. The tests were performed to specifications and/or procedures approved by the client. National Technical Systems ("NTS") makes no representations expressed or implied that such testing fully demonstrates efficiency, performance, reliability, or any other characteristic of the articles being tested, or similar products. This report should not be relied upon as an endorsement or certification by NTS of the equipment tested, nor does it represent any statement whatsoever as to its merchantability or fitness of the test article or similar products for a particular purpose. This document shall not be reproduced except in full without written approval from National Technical Systems ("NTS") and the customer.

<b>Test Facility:</b>	<b>National Technical Systems, Canada</b> Product Integrity Laboratory 5151-47 <sup>th</sup> Street, N.E. Calgary Alberta T3J 3R2
<b>Accreditation Numbers:</b>	0214.22 Electrical 0214.23 Mechanical Accredited by A2LA The American Association for Laboratory Accreditation  CLIENTS SERVED: All interested parties FIELDS OF TESTING: Electrical/Electronic, Mechanical/Physical ACCREDITATION DATE:: May 14, 2009 VALID TO: February 28, 2010
<b>Applicant:</b>	<b>FCC:</b> Novatel Wireless Inc. 9645 Scranton Rd, Suite 205 San Diego, CA 92121  <b>IC:</b> Novatel Wireless Technologies Ltd 6715 – 8th St N.E. Suite 200 Calgary, Alta. T2E-7H7
<b>Customer Representative:</b>	Mr. Jim Turner Regulatory Specialist Ph: (403) 295-4855 Fax: (403) 295-4801 E Mail: jturner@nvtl.com

The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

NTS Product Integrity Laboratory, 5151-47<sup>th</sup> Street N.E. Tel: 403-568-6605, Fax: 403-568-6970

---

## Register of revisions

Revision	Date	Description of Revisions
Revision 1	February 8, 2010	Initial release
Revision 2	August 3, 2010	Edits based on FCC review

---

The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

NTS Product Integrity Laboratory, 5151-47<sup>th</sup> Street N.E. Tel: 403-568-6605, Fax: 403-568-6970

## 1.0 INTRODUCTION

### 1.1 PURPOSE

This Maximum Permissible Exposure report demonstrates compliance with FCC CFR 47 1.1310 and 2.1091 for collocated transmitters used in simultaneous conditions with the Model MiFi2372R mobile Hotspot EUT which is categorized as “mobile”. The mobile classification applies when 20 cm or greater separation distance is maintained between the end user and all transmission antennas. The users documentation available to consumers indicates that the modem must not be used closer than 20 cm to head or body.

This product contains an 802.11 b/g transceiver and PCS/Cell transceiver.

The 802.11 transceiver may be operated simultaneously with either the Cell or PCS mode of operation

## 2.0 DESCRIPTION OF COLLOCATED DEVICES

### 2.1 COLLOCATION CONFIGURATIONS

As described above the MiFi2352R is a mobile hotspot product which allows simultaneous operation of the following radio pairs:

- 1) Cellular / 802.11 b/g
- 2) PCS / 802.11 b/g

All power values used in this MPE report are based on measured values reported in the following test reports:

- 1) For Cellular / PCS – NTS Report CG-1436-RA-1-2
- 2) For 802.11 b/g – NTS Report CG-1436-RA-2-1

### 2.2 ANTENNA SPECIFICATIONS

The Model NRM-MIFI 2372R has the following antenna gain specifications:

Cell mode: 1.88 dBi  
PCS mode : 2.60 dBi  
802.11 mode: 2.20 dBi

### 3.0 RF EXPOSURE LIMITS AND EQUATIONS

In compliance with FCC CFR 47 1.1310, the criteria listed in the table below shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1303 (b).

#### Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mw/cm <sup>2</sup> )	Average Time (minutes)
(A) Limits for Occupational/Control Exposures (f=frequency)				
30-300	61.4	0.2	1.0	6.0
300-1500	-	-	f/300	6.0
1500-100,000	-	-	5.0	6.0
(B) Limits for General Population/Uncontrolled Exposure (f=frequency)				
30-300	27.5	0.1	0.2	30.0
300-1500	-	-	f/1500	30.0
1500-100,000	-	-	1.0	30.0

#### Friis Transmission Formula:

$$Pd = (Pout * G) / (4\pi R^2)$$

Where,

Pd = power density (mW/cm<sup>2</sup>)

Pout = output power to antenna (mW)

G = gain of antenna in linear scale

R = distance between observation point and center of the radiator (cm)

The resulted power density at a distance of 20cm can be calculated as follows:

$$\text{Power Density} = (\text{EIRP} * \text{DutyCycle}) / (4\pi R^2)$$

The MPE limit for General Population/Uncontrolled Exposure is shown in the table above and can be derived as follows:

$$\text{MPE Limit} = 824/1500 = 0.549 \text{ mw}^2$$

The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

## 4.0 MPE FIGURES

For the purposes of this report worst case MPE values are provided for each mode

### 4.1 OPERATING MODE 1: GSM 850

Maximum EIRP = 32.78 dBm or 1896.71 mW  
Worst Case = 4 Up slots = 50% duty cycle  
Power Density = (EIRP \* DutyCycle) / (4πR<sup>2</sup>)  
= (1896.71 mW \* .5) / (4π \* 20<sup>2</sup>)

Duty cycle corrected maximum EIRP mW	RF Exposure @ d= 20 cm mW/cm <sup>2</sup>	Limit mW/cm <sup>2</sup>	% of Total
948.355	0.1887	0.558	33.81

### 4.2 OPERATING MODE 2: PCS 1900

Maximum EIRP = 32.86 dBm or 1932 mW  
Worst Case = 4 Up slots = 50% duty cycle  
Power Density = (EIRP \* Duty Cycle) / (4πR<sup>2</sup>) = (1932 mW \* 0.5) / (4π \* 20<sup>2</sup>)

Duty cycle corrected maximum EIRP mW	RF Exposure @ d= 20 cm mW/cm <sup>2</sup>	Limit mW/cm <sup>2</sup>	% of Total
966	0.192	1.00	19.22

### 4.3 OPERATING MODE 3: 802.11B/G

Maximum EIRP = Conducted power + Antenna gain = 15.70 + 2.2 = 17.92 dBm or 61.9 mW  
Worst Case = 100% duty cycle  
Power Density = (EIRP \* Duty Cycle) / (4πR<sup>2</sup>) = (61.9 mW \* 1.0) / (4π \* 20<sup>2</sup>)

Duty cycle corrected maximum EIRP mW	RF Exposure @ d= 20 cm mW/cm <sup>2</sup>	Limit mW/cm <sup>2</sup>	% of Total
61.9	0.012	1.00	1.22

## Result

Compliant. The combined % total for the combinations of 802.11 mode and Cell mode or 802.11 mode and PCS mode are below both the required limits.

**END OF DOCUMENT**

---

The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

NTS Product Integrity Laboratory, 5151-47<sup>th</sup> Street N.E. Tel: 403-568-6605, Fax: 403-568-6970