Novatel Wireless Inc Collocated MPE Report

For

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Accreditation Numbers:	FCC 101386 IC 3978A-1 **Accredited by Standards Council of Canada** Accredited Laboratory No. 440 Conforms with requirements of CAN−P−4D (ISO/IEC 17025) CLIENTS SERVED: All interested parties FIELDS OF TESTING: Electrical/Electronic, Mechanical/Physical ACCREDITATION DATE:: 2008−06−17 VALID TO: 2013−03−20
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Register of revisions

Revision	Date	Description of Revisions
0	December 18, 2009	Initial release
1	January 11, 2009	Modified for antenna gain

INTRODUCTION

1.1 PURPOSE

This Maximum Permissive Exposure report demonstrates compliance with FCC CFR 47 1.1310 and 2.1091 for collocated transmitters used in simultaneous conditions with the Model MiFi2352R 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

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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-1290-RA-1-3
2) For 802.11 b/g - NTS Report CG-1290-RA-2-2

2.2 ANTENNA SPECIFICATIONS

The Model MiFi 2352R has the following antenna gain specifications:

Cell mode	1.88 dbi
PCS mode	2.60 dbi
802.11 b/g mode	2.2 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/cm2)	Average Time (minutes)
(A) Limits for Occupational/Control Exposures (f=frequency)				
30-300	61.4	0.163	1	6
300-1500	…..	……	f/300	6
1500-100,000	…..	……	5.0	6
(B) Limits for General Population/Uncontrolled Exposure (f=frequency)				
30-300	27.5	0.073	0.2	30
300-1500	…..	….	f/1500	30
1500-100,000	…..	….	1.0	30

Friis Transmission Formula

Friis transmission formula:

$P_d = (P_{out} * G) / (4\pi R^2)$

Where,

P_d = power density (mW/cm^2)

P_{out} = 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:

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

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

MPE Limit = 824/1500 = 0.55 mw2

4.0 MPE FIGURES

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

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) / ($4\pi R^2$)
= (1896.71 mW * .5)/ (4π* 20 ^{2})

Maximum EIRP (Duty cycle corrected)	RF Exposure @ d= 20 cm mW/cm^2	Limit mW/cm^2	% of Total
948.355	0.1887	0.558	33.81

2. Operating Mode 2: PCS 1900

Maximum EIRP = 32.86 dBm or 1931.97 mW
Worst Case = 4 Up slots = 50% duty cycle
Power Density = (EIRP * DutyCycle) / ($4\pi R^2$)
= (1896.71 mW * .5)/ (4π* 20 ^{2})

Maximum EIRP (Duty cycle corrected)	RF Exposure @ d= 20 cm mW/cm^2	Limit mW/cm^2	% of Total
965.99	0.1922	1.00	19.22

3. Operating Mode 3: 802.11 b/g

Maximum EIRP = 17.9 dBm or 61.7 mW
Worst Case = 100% duty cycle
Power Density = (EIRP * DutyCycle) / ($4\pi R^2$)
= (61.7 mW *1.0)/ (4π* 20 ^{2})

Maximum EIRP (mW) (Duty cycle corrected)	RF Exposure @ d= 20 cm mW/cm^2	Limit mW/cm^2	% of Total
61.7	0.0123	1.00	.012

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.