Novatel Wireless Inc Collocated MPE Report for

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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

1.0 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 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/cm2)	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^2)
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:

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 = 0.549 mw^2

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) / (4πR²)
= (1896.71 mW * .5)/ (4π* 20²)

Duty cycle corrected maximum EIRP mW	RF Exposure @ d= 20 cm mW/cm²	Limit mW/cm²	% 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) / (4πR²) = (1932 mW *0.5)/ (4π* 20²)

Duty cycle corrected maximum EIRP mW	RF Exposure @ d= 20 cm mW/cm²	Limit mW/cm²	% 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) / (4πR²) = (61.9 mW *1.0)/ (4π* 20²)

Duty cycle corrected maximum EIRP mW	RF Exposure @ d= 20 cm mW/cm²	Limit mW/cm²	% 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