NOVATEL WIRELESS TEST REPORT

FOR THE

NOVATEL EU850D PCI EXPRESS MINI-CARD, EU850D

FCC PART 15 SUBPART B SECTION 15.109

TESTING

DATE OF ISSUE: OCTOBER 16, 2007

PREPARED FOR:

Novatel Wireless
325 - 6715-8th St. N.E., Suite 200
Calgary, Alberta T2E 7H7 Canada

PREPARED BY:

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P.O. No.: 1000796
W.O. No.: 86985

Date of test: September 19 - October 11, 2007

Report No: FC07-087

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ADMINISTRATIVE INFORMATION

DATE OF TEST: September 19 – October 11, 2007

DATE OF RECEIPT: September 19, 2007

REPRESENTATIVE: Jim Turner

MANUFACTURER:
Novatel Wireless
325 - 6715-8th St. N.E., Suite 200
Calgary, Alberta T2E 7H7 Canada

TEST LOCATION:
CKC Laboratories, Inc.
22116 23rd Drive S.E., Suite A
Bothell, WA 98021-4413

TEST METHOD*: ANSI C63.4 (2003)

PURPOSE OF TEST: To perform the testing of the Novatel EU850D PCI Express Mini-Card, EU850D with the requirements for FCC Part 15 Subpart B Section 15.109 devices.

APPROVALS

QUALITY ASSURANCE:

Steve Behm, Director of Engineering Services

Joyce Walker, Quality Assurance Administrative Manager

Katie Molina, Senior EMC Engineer/Lab Manager

TEST PERSONNEL:

Ryan Rutledge, EMC Test Technologist

SUMMARY OF RESULTS

Test	Specification/Method	Results
Radiated Emissions	FCC Part 15 Subpart B Section 15.109	Pass

CONDITIONS DURING TESTING

No modifications to the EUT were necessary during testing. EUT is being retested to check for compliance after a modification was made to the metal shield over the RF section of the module. A sim card slot is now present in a hole that has been cut into the shield. Due to the nature of this change and the absence of any other changes, only spurious radiated emissions around the fundamental and the higher harmonics were tested. Testing was limited to above 30 MHz.

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

The customer declares the EUT tested by CKC Laboratories was representative of a production unit.

EQUIPMENT UNDER TEST

WWAN Module

Manuf: Novatel Wireless
Model: EU850D
Serial: 020207000160

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

RF Antenna (3 dBi)

Manuf: PCTEL
Model: ASPRDM1994S
Serial: NA

Module Developer Board

Manuf: Serac
Model: PCA-1017856 Rev B
Serial: 17017568

Laptop PC

Manuf: Dell
Model: Inspiron E1720
Serial: CN-0Y2C2-48643-6C9-0280

Laptop Power Supply

Manuf: Dell
Model: PA-1131-02D
Serial: CN-09Y819-71615-459-0C22

REPORT OF EMISSIONS MEASUREMENTS

TESTING PARAMETERS

The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. The following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used. When conducted emissions testing was performed, a 10 dB external attenuator was used with internal offset correction in the analyzer.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the highest readings, this is indicated as a "QP" or an "Ave" on the appropriate rows of the data sheets. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer/receiver readings were recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the measuring device called "peak hold," the measuring device had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the quasi-peak detector.

Average

For certain frequencies, average measurements may be made using the spectrum analyzer/receiver. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.

RADIATED EMISSIONS

Test Setup Photos

Test Data Sheets

Test Location: CKC Laboratories •22116 23rd Dr SE • Bothell, WA 98021-4413 • 425-402-1717

Customer: **Novatel Wireless**
Specification: **15.109 CLASS B**
Work Order #: **86985** Date: 10/10/2007
Test Type: **Radiated Scan** Time: 13:31:52
Equipment: **WWAN Module** Sequence#: 33
Manufacturer: Novatel Wireless Tested By: Ryan Rutledge
Model: EU850D
S/N: 020207000160

***Test Equipment*:**

Function	S/N	Calibration Date	Cal Due Date	Asset #
Agilent E4440A	S/N: MY46186330	10/03/2007	10/03/2009	AN02872
Bothell 5m Cable Set	S/N: P05444	04/26/2007	04/26/2009	ANP05444
20' RG-214 Coax	S/N: 16	11/09/2006	11/09/2008	ANP05360
HP 8447D PreAmp	S/N: 2944A08601	07/10/2006	07/10/2008	AN01517
Chase BILOG	S/N: 2458	01/31/2007	01/31/2009	AN01993

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
WWAN Module*	Novatel Wireless	EU850D	020207000160

Support Devices:

Function	Manufacturer	Model #	S/N
RF Antenna (3 dBi)	PCTEL	ASPRDM1994S	n/a
Module Developer Board	Serac	PCA-1017856 Rev B	17017568
Laptop PC	Dell	Inspiron E1720	CN-0Y2C2-48643-6C9-0280
Laptop Power Supply	Dell	PA-1131-02D	CN-09Y819-71615-459-0C22

Test Conditions / Notes:

EUT resident in developer board. Evaluation of Radiated Emissions is performed in open-chassis configuration with a 3 dBi monopole antenna. EUT is being retested to check for compliance after a modification was made to the metal shield over the RF section of the module. A sim card slot is now present in a hole that has been cut into the shield.

Transducer Legend:

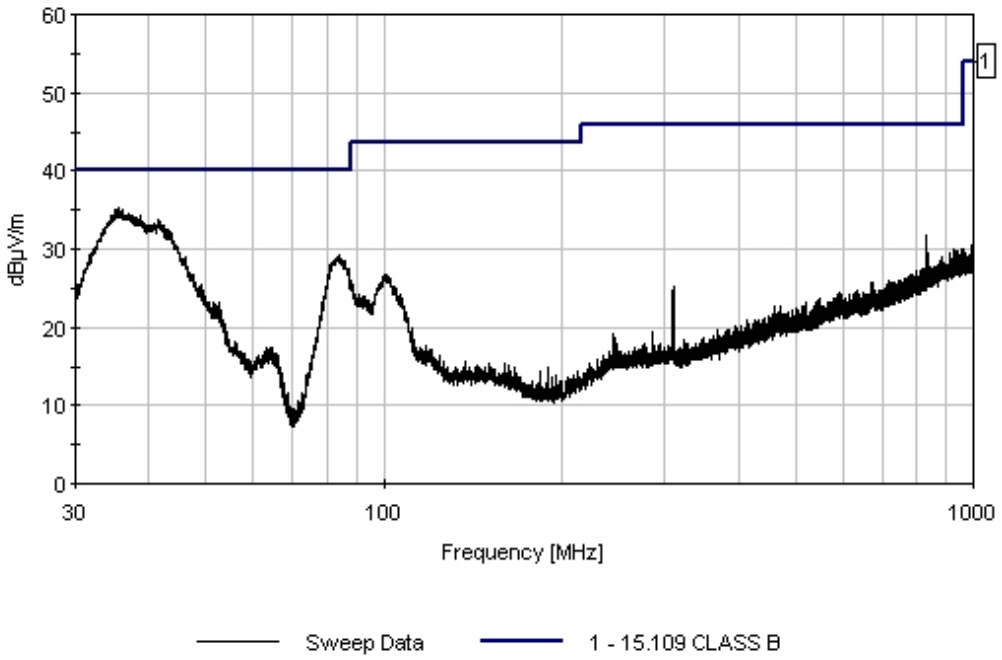
T1=ANT AN01993 25-1000MHz	T2=AMP-AN01517-071006
T3=CAB-ANP05444-042607 - CPC3 Cable Set	T4=CAB-ANP05360-110906

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	83.971M	47.0	+8.0	-27.5	+1.0	+0.7	+0.0	29.2	40.0	-10.8	Vert 100
2	35.700M QP	39.5	+16.3	-27.5	+0.6	+0.3	+0.0 45	29.2	40.0	-10.8	Vert 100
^	35.746M	45.8	+16.2	-27.5	+0.6	+0.3	+0.0 45	35.4	40.0	-4.6	Vert 100
4	833.607M	32.9	+22.7	-28.2	+2.6	+1.8	+0.0	31.8	46.0	-14.2	Vert 100

5	100.618M	42.6	+10.2	-27.6	+1.0	+0.6	+0.0	26.8	43.5	-16.7	Vert 100
6	52.860M	41.1	+7.6	-27.6	+0.8	+0.4	+0.0	22.3	40.0	-17.7	Vert 100
7	309.733M	36.8	+13.7	-27.0	+1.6	+0.9	+0.0	26.0	46.0	-20.0	Vert 100
8	108.436M	37.9	+10.8	-27.6	+1.1	+0.6	+0.0	22.8	43.5	-20.7	Vert 100

CKC Laboratories Date: 10/10/2007 Time: 13:31:52 Novatel Wireless WO#: 86985
15.109 CLASS B Test Distance: 3 Meters Sequence#: 33 Polarity: Vert
Notes: EUT resident in developer board, Evaluation of Radiated Emissions is performed in open-chassis configuration with



Test Location: CKC Laboratories •22116 23rd Dr SE • Bothell, WA 98021-4413 • 425-402-1717

Customer: **Novatel Wireless**
Specification: **15.109 CLASS B**
Work Order #: **86985** Date: 10/10/2007
Test Type: **Radiated Scan** Time: 13:33:36
Equipment: **WWAN Module** Sequence#: 34
Manufacturer: Novatel Wireless Tested By: Ryan Rutledge
Model: EU850D
S/N: 020207000160

***Test Equipment*:**

Function	S/N	Calibration Date	Cal Due Date	Asset #
Agilent E4440A	S/N: MY46186330	10/03/2007	10/03/2009	AN02872
Bothell 5m Cable Set	S/N: P05444	04/26/2007	04/26/2009	ANP05444
20' RG-214 Coax	S/N: 16	11/09/2006	11/09/2008	ANP05360
HP 8447D PreAmp	S/N: 2944A08601	07/10/2006	07/10/2008	AN01517
Chase BILOG	S/N: 2458	01/31/2007	01/31/2009	AN01993

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Laptop Power Supply	Dell	PA-1131-02D	CN-09Y819-71615-459-0C22

Test Conditions / Notes:

EUT resident in developer board. Evaluation of Radiated Emissions is performed in open-chassis configuration with a 3 dBi monopole antenna. EUT is being retested to check for compliance after a modification to the metal shield over the RF section of the module. A sim card slot is now present in a hole that has been cut into the shield.

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T3=CAB-ANP05444-042607 - CPC3 Cable Set	T4=CAB-ANP05360-110906

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	31.996M	37.4	+15.9	-27.5	+0.6	+0.3	+0.0 360	26.7	40.0	-13.3	Horiz 200
2	946.800M	29.1	+23.9	-27.6	+2.8	+2.0	+0.0 360	30.2	46.0	-15.8	Horiz 200
3	920.462M	28.8	+23.6	-27.8	+2.7	+2.0	+0.0 360	29.3	46.0	-16.7	Horiz 200
4	931.018M	28.2	+23.8	-27.7	+2.8	+2.0	+0.0 360	29.1	46.0	-16.9	Horiz 200
5	925.165M	28.2	+23.7	-27.7	+2.8	+2.0	+0.0 360	29.0	46.0	-17.0	Horiz 200

6	929.032M	28.0	+23.7	-27.7	+2.8	+2.0	+0.0 360	28.8	46.0	-17.2	Horiz 200
7	83.971M	39.9	+8.0	-27.5	+1.0	+0.7	+0.0 360	22.1	40.0	-17.9	Horiz 200
8	81.010M	40.3	+7.6	-27.6	+1.0	+0.6	+0.0 360	21.9	40.0	-18.1	Horiz 200
9	82.840M	39.9	+7.8	-27.5	+1.0	+0.7	+0.0 360	21.9	40.0	-18.1	Horiz 200
10	998.432M	28.1	+24.5	-27.8	+2.9	+2.0	+0.0 360	29.7	54.0	-24.3	Horiz 200
11	979.933M	28.1	+24.3	-27.7	+2.9	+2.0	+0.0 360	29.6	54.0	-24.4	Horiz 200
12	989.966M	28.0	+24.4	-27.8	+2.9	+2.0	+0.0 360	29.5	54.0	-24.5	Horiz 200
13	990.593M	28.0	+24.4	-27.8	+2.9	+2.0	+0.0 360	29.5	54.0	-24.5	Horiz 200
14	991.639M	28.0	+24.4	-27.8	+2.9	+2.0	+0.0 360	29.5	54.0	-24.5	Horiz 200
15	991.952M	27.9	+24.4	-27.8	+2.9	+2.0	+0.0 360	29.4	54.0	-24.6	Horiz 200
16	994.356M	27.9	+24.4	-27.8	+2.9	+2.0	+0.0 360	29.4	54.0	-24.6	Horiz 200
17	996.864M	27.8	+24.5	-27.8	+2.9	+2.0	+0.0 360	29.4	54.0	-24.6	Horiz 200
18	992.893M	27.8	+24.4	-27.8	+2.9	+2.0	+0.0 360	29.3	54.0	-24.7	Horiz 200
19	994.879M	27.5	+24.4	-27.8	+2.9	+2.0	+0.0 360	29.0	54.0	-25.0	Horiz 200

CKC Laboratories Date: 10/10/2007 Time: 13:33:36 Novatel Wireless WO#: 86985
15.109 CLASS B Test Distance: 3 Meters Sequence#: 34 Polarity: Horiz
Notes: EUT resident in developer board, Evaluation of Radiated Emissions is performed in open-chassis configuration with