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AirCard 880E HSPA Test Report

(RF Power Output)

FCC ID: N7NAC880E

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September 25, 2007

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1 Introduction and Purpose

The AirCard 880E (FCC ID: N7NAC880E) wireless modem was originally certified by FCC as an HSDPA device. This document provides additional RF output power data in Release 6 HSDPA/HSUPA mode per FCC's latest guidance on certification of HSPA devices in support of a Class II Permissive Change application for the AirCard 880E wireless modem.

2 Test Summary

FCC RULE	TEST Item	RESULT
2.1046	RF Power Output	Output power in Rel 6 HSPA mode is not higher than in Rel 99 WCDMA mode or Rel 5 HSDPA mode, therefore additional SAR testing in Rel 6 HSPA mode is not required.

The tests described in this report were performed by Mr. Philip Wright at:

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3 Description of DUT (Device Under Test)

AirCard 880E is a 3G multi-band wireless modem supporting HSDPA Category 8 with downlink data rate up to 7.2Mbps and HSUPA Category 5 with uplink data rate up to 2 Mbps. In the US, only Cellular and PCS bands are operational, so this test report only contains data for these two bands (850MHz and 1900MHz).

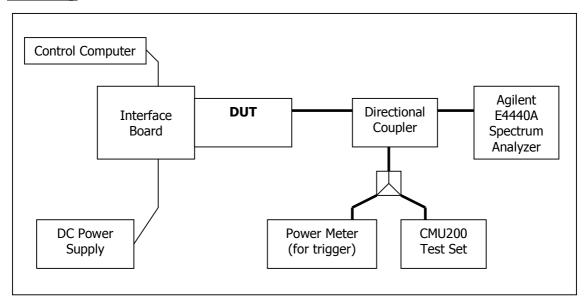## 4 RF Power Output
FCC 2.1046

4.1 Test Procedure
The transmitter output was connected to a Rohde & Schwarz CMU200 Test Set and configured to operate at maximum power according to each test. The power was measured using the spectrum analyzer at three equally spaced operating frequencies for each band. The RBW was set to 5MHz for the WCDMA measurements. The spectrum

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analyzer was set to measure the RF output power with the cable and coupler losses accounted for.

Test Setup

4.2 Test Equipment

Instrument List

EQUIPMENT	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE
Control Computer	TC	Generic PC	100488	N/A
Wireless Test Set	Rohde & Schwarz	CMU200	836766/030	N/A
Spectrum Analyzer	Agilent	PSA E4440A	US41421268	Mar. 1, 2007
DC Power Supply	HP	6632A	3530A	N/A
Interface Board	Shop built	Minnow	N/A	N/A
Directional Coupler	Mini-Circuits	ZA3PD-2	N/A	N/A

4.3 RF Output Power Results for HSDPA Rel6

The AirCard 880E supports Category 8 FDD HS-DSCH physical layer. As stated in the 3GPP TS25.306 V7.3.0 Table 5.1a, the details of Category 8 are as follows:

- Maximum of 10 E-DSCH received codes
- Minimum 1 inter-TTI interval
- Maximum 14411bits in an E-DSCH transport block received within an E-DSCH TTI
- Total number of soft channel bits is 134400
- Support of QPSK and 16QAM

A detailed list of all settings used is included at the end of this report in section 6.0

The following Sub-Tests were completed according to the test requirements outlined in section 5.2A of the 3GPP TS34.121-1 V7.5.0 specification. All TX RMS and Peak power requirements for Power Class 3 were met according to table 5.2AA.5 and achieved through the outlined test procedure in section 5.2AA.4.2. All UE channels and power ratio's are set according to table C10.1.4 in the 3GPP TS34.121-1 V7.5.0 specification. A summary of these settings are illustrated below:

Subtest	Mode	Call Type	RMC (kbps)	HSDPA FRC	Power Class 3 Max Limit dBm	$\beta c/\beta d$	βhs	CM (db)	MPR (db)
1	HSDPA	PS	12.2	H-Set 1 QPSK	24 (+1.7/-3.7 db)	2 /15	4/15	0.0	0.0
2	HSDPA	PS	12.2	H-Set 1 QPSK	24 (+1.7/-3.7 db)	12 /15	24/15	1.0	0.0
3	HSDPA	PS	12.2	H-Set 1 QPSK	23.5 (+2.2/-3.7 db)	15 /8	30/15	1.5	0.5
4	HSDPA	PS	12.2	H-Set 1 QPSK	23.5 (+2.2/-3.7 db)	15 /4	30/15	1.5	0.5

4.3.1 Sub-Test 1

$\beta c=2/15$, $\beta d=15/15$, $\beta hs=4/15$

Frequency (MHz)	Channel	Power (dBm)	
		RMS	Peak
826.4	4132	22.14	25.7
836.4	4182	22.13	25.8
846.6	4233	22.27	25.8
1852.4	9262	22.19	25.6
1880.0	9400	22.20	25.7
1907.6	9538	22.23	25.8

4.3.2 Sub-Test 2

$\beta c=12/15$, $\beta d=15/15$, $\beta hs=24/15$

Frequency (MHz)	Channel	Power (dBm)	
		RMS	Peak
826.4	4132	22.09	25.4
836.4	4182	22.06	25.6
846.6	4233	22.11	25.1
1852.4	9262	22.14	25.2
1880.0	9400	22.18	25.6
1907.6	9538	21.95	25.5

4.3.3 Sub-Test 3

$\beta c=15/15$, $\beta d=15/8$, $\beta hs=30/15$

Frequency (MHz)	Channel	Power (dBm)	
		RMS	Peak
826.4	4132	22.04	25.6
836.4	4182	22.10	25.3
846.6	4233	22.03	25.2
1852.4	9262	22.11	25.7
1880.0	9400	22.15	25.4
1907.6	9538	22.03	25.5

4.3.4 Sub-Test 4

$\beta c=15/15$, $\beta d=4/15$, $\beta hs=30/15$

Frequency (MHz)	Channel	Power (dBm)	
		RMS	Peak
826.4	4132	22.11	25.5
836.4	4182	22.04	25.3
846.6	4233	21.96	25.4
1852.4	9262	21.97	25.6
1880.0	9400	21.93	25.3
1907.6	9538	21.95	25.4

4.4 RF Output Power Results for HSPA (HSDPA & HSUPA) Rel6

The AirCard 880E supports Category 5 FDD E-DCH physical layer. As stated in the 3GPP TS25.306 V7.3.0 Table 5.1g, the details of Category 5 are as follows:
- Maximum of 2 E-DCH transmitted codes
- Minimum spreading factor of SF2
- Support for only 10ms TTI E-DCH
- Maximum 20000bits in an E-DCH transport block within a 10ms E-DCH TTI
- Data rate of 2 Mbps
- Support of QPSK only

A detailed list of all settings used is included at the end of this report in section 6.0

The following 5 Sub-Tests were completed according to the test requirements outlined in section 5.2B of the 3GPP TS34.121-1 V7.5.0 specification. All TX RMS and Peak power requirements were met according to table 5.2B.5 and achieved through the outlined test procedure in section 5.2B.4.2. All UE channels and power ratio's are set according to table C11.1.3 in the 3GPP TS34.121-1 V7.5.0 specification. A summary of these settings are illustrated below:

Subtest	Mode	Call Type	RMC (kbps)	HSDPA FRC	Power Class 3 Max Limit dBm	$\beta c/\beta d$	βhs	βed	CM (db)	MPR (db)
1	HSPA	PS	12.2	H-Set 1 QPSK	24 (+1.7/-5.2 db)	11 /15	22/15	209/225	1.0	0.0
2	HSPA	PS	12.2	H-Set 1 QPSK	22 (+3.7/-5.2 db)	6 /15	12/15	12/15	3.0	2.0
3	HSPA	PS	12.2	H-Set 1 QPSK	23 (+2.7/-5.2 db)	15 /15	30/15	30/15	2.0	1.0
4	HSPA	PS	12.2	H-Set 1 QPSK	22 (+1.7/-5.2 db)	15 /9	4/15	2/15	3.0	2.0
5	HSPA	PS	12.2	H-Set 1 QPSK	24 (+1.7/-5.2 db)	15/15	30/15	24/15	1.0	0.0

4.4.1 Sub-Test 1:

$\beta c=11/15$, $\beta d=15/15$, $\beta hs=22/15$, $\beta ec=209/225$, $\beta ed=1039/225$, AG=20, 1xSF4, E-TFCI=75.

Frequency (MHz)	Channel	Power (dBm)	
		RMS	Peak
826.4	4132	22.07	25.6
836.4	4182	22.11	25.9
846.6	4233	21.97	25.8
1852.4	9262	22.13	25.9
1880.0	9400	22.02	25.9
1907.6	9538	22.19	25.8

4.4.2 Sub-Test 2:

βc=6/15, βd=15/15, βhs=12/15, βec=12/15, βed=94/75, AG=12, 1xSF4, E-TFCI=67.

Frequency (MHz)	Channel	Power (dBm)	
		RMS	Peak
826.4	4132	21.89	25.9
836.4	4182	21.94	25.8
846.6	4233	21.86	25.9
1852.4	9262	21.99	25.9
1880.0	9400	22.02	26.0
1907.6	9538	21.96	25.8

4.4.3 Sub-Test 3:

βc=15/15, βd=15/15, βhs=30/15, βec=30/15, βed=47/15, AG=15, 2xSF4. E-TFCI=92, Note: # of Reference E-TFCI=2.

Frequency (MHz)	Channel	Power (dBm)	
		RMS	Peak
826.4	4132	21.81	25.8
836.4	4182	21.87	25.7
846.6	4233	21.89	26.0
1852.4	9262	21.95	25.8
1880.0	9400	21.83	25.8
1907.6	9538	21.79	25.9

4.4.4 Sub-Test 4:

βc=2/15, βd=15/15, βhs=4/15, βec=2/15, βed=56/75, AG=17, 1xSF4, E-TFCI=71.

Frequency (MHz)	Channel	Power (dBm)	
		RMS	Peak
826.4	4132	21.89	25.9
836.4	4182	22.05	25.9
846.6	4233	21.99	25.8
1852.4	9262	22.01	25.7
1880.0	9400	21.92	25.7
1907.6	9538	22.21	25.7

4.4.5 Sub-Test 5:

βc=15/15, βd=15/15, βhs=30/15, βec=24/15, βed=134/15, AG=21, 1xSF4, E-TFCI=81.

Frequency (MHz)	Channel	Power (dBm)	
		RMS	Peak
826.4	4132	22.03	25.7
836.4	4182	21.97	25.9
846.6	4233	22.11	25.9
1852.4	9262	22.04	25.7
1880.0	9400	22.12	26.0
1907.6	9538	21.95	25.9

5   CMU200 Settings for all Tests Completed

UE Power Control Settings
Maximum allowable UE-Power = 24.0 dBm
UL Target Power = 24.0 dBm

Node B Settings
Primary Scrambling Code = 9
Output Channel Power = -51.7 dBm
OCNS = Off
Total Output Power (Ior+Ioc) = -51.7 dBm

RMC Settings
Reference Channel Type: 12.2 kbps Downlink/Uplink DL DTCH Transport Format: 12.2
kbps DL Resources in Use: 100 % UL CRC (Sym. Loop Mode 2): Off
Test Mode: Loop Mode 2 Channel Data Source DTCH: PRBS9

Voice Settings
Voice Source: Echo
Loopback Type: Off

Adaptive Multirate Settings
Active Code Set: Selection A
Codec Mode: 12.2 kbps

Signaling RAB Settings
SRB Cell DCH: 3.4 kbps

BS Down Link Physical Channels Settings
Ior   = -51.7 dBm
P-CPICH = -3.3 dB
P-SCH   = -8.3 dB
S-SCH   = -8.3 dB
P-CCPCH = -5.3 dB
S-CCPCH = -5.3 dB
S-CCPCH Channel Code = 2
PICH   = -8.3 dB
PICH Channel Code = 3
AICH   = -8.3 dB
AICH Channel Code = 6
DPDCH   = -10.3 dB
DPDCH Channel Code = 96

Power Offset (DPCCH/DPDCH) = 0.0 dB
DL DPCH Timing Offset = 0
Secondary Scrambling Code = 0
Secondary Scrambling Code (HSDPA) = 0
HSDPA Channels = On

TPC Settings
Algorithm = 2
TPC Step Size = 1dB
TPC Pattern Setup = Set 1 (All 1, after linked to get maximum power)

HSDPA Mode Settings:
Node B Settings
Primary Scrambling Code = 9
Output Channel Power = -86 dBm
OCNS = Off
Total Output Power (Ior+Ioc) = -86 dBm

Network Settings
Packet Switched Domain = ON

HSDPA Test Mode Settings
Radiobearer Setup = RMC 12.2 kbps + HSPDA
RMC Test Loop = Loop Mode 1 RLC TM

HSDPA HS-DSCH
CQI Feedback Cycle = 4ms
CQI Repetition Factor = 2
ACK/NACK Repetition Factor = 3
UE Category = 8
Channel Configuration Type = FRC
H-Set Selection = H-Set 1 QPSK
RV Coding Sequence {0,2,5,6}

HSDPA Gain Factors are set according to each specific sub-test in table C.10.1.4 of
3GPP TS 34.121.

HSPA Mode Settings:
UE Power Control Settings
Maximum allowable UE-Power = 24.0 dBm
UL Target Power: Set according to each specific sub-test in table 5.2B.5 of 3GPP TS
34.121 less 5db for starting point.

UE Packet Data Gain Factors
Bc and Bd: *
ΔACK, ΔNACK,ΔCQI=8

HSUPA
E-DCH Physical Layer Category = 5
E-TFCI Table Index = 1
Minimum Set E-TFCI = 1*
Maximum Channelisation Code: 1xSF4 or 2xSF4*
Initial Service Grant: *

UE Gain Factors
ΔE-DPCCH: *
Number of Reference E-TFCIs: **
Reference E-TFCI's: **
E-TFCI Power offsets: **

Node B Settings
Primary Scrambling Code = 9
Output Channel Power = -86 dBm
OCNS = Off
Total Output Power (Ior+Ioc) = -86 dBm
Paket Switched
DCH Type: HSUPA Test Mode
Data Rate: HSDPA/HSUPA
HSDPA Test Mode Settings
Radiobearer Setup = RMC 12.2kbps + HSDPA
RMC Test Loop = Loop Mode 1 RLC TM

HSDPA HS-DSCH
CQI Feedback Cycle = 4ms
CQI Repetition Factor = 2
ACK/NACK Repetition Factor = 3
UE Category = 8
Channel Configuration Type = FRC
H-Set Selection = H-Set 1 QPSK
RV Coding Sequence {0,2,5,6}

HSUPA Test Mode Settings
Radiobearer Setup = SRB 3.4 + HSPA
HSUPA Settings
TTI mode: 10ms
E-AGCH
Pattern Length: 1
AG Value: *

Downlink Physical Channels
HSUPA Channels: On
E-AGCH: -6.0db
E-AGCH Chan. Code: 6
E-RGCH/E-HICH: -5.0db
E-RGCH Active: Off
E-RGCH/E-HICH Chan. Code: 6

*Set according to each specific sub-test in table C.11.1.3 of 3GPP TS 34.121.
** Set according to each specific sub-test in table 5.2B.2/3 of 3GPP TS 34.121.

6   Conclusion

The test results shown above demonstrate that the output power in Rel 6 HSPA mode is not higher than in Rel 99 WCDMA mode or Rel 5 HSDPA mode, therefore SAR testing in Rel 6 HSPA mode is not required.