CERTIFICATE OF COMPLIANCE FCC PART 22 MEASUREMENTS

Test Lab:

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Applicant Information:

SIERRA WIRELESS INC. 13575 Commerce Parkway, Suite 150 Richmond, B.C. Canada V6V 2L1 Attn: Trent McKeen, Senior RF Engineer

FCC Classification:	Licensed Non-Broadcast Station Transmitter (TNB)
FCC Rule Part(s):	§22.901(d), §2
FCC ID:	N7NACRD2
Model(s):	AirCard 300/350
Equipment Type:	PCMCIA CDPD Modem Card installed in Itronix IX250
	Rugged Laptop PC with Itronix Dipole Antenna
Tx Frequency Range:	824-849 MHz
Rx Frequency Range:	869-894 MHz
Max. RF Output Power:	0.336 Watts (ERP)
Frequency Tolerance:	2.5 PPM
Emission Designator:	31K5FXW
Class II Change(s):	Add Itronix IX250 Laptop PC & Itronix Dipole Antenna

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Celltech Research Inc. certifies that no party to this application has been denied FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).

Ma

Shawn McMillen General Manager Celltech Research Inc.



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MEASUREMENT REPORT - FCC PART 22

<u>1.1 SCOPE</u>

Measurement and determination of electromagnetic emissions (EME) from radio frequency devices for compliance with the technical rules and regulations of the Federal Communications Commission.

§2.1033(a) General Information

APPLICANT:

SIERRA WIRELESS INC. 13575 Commerce Parkway, Suite 150 Richmond, B.C. Canada V6V 2LI Attn: Trent McKeen, Senior RF Engineer

FCC ID	N7NACRD2
Model(s)	AirCard 300/350
EUT Type	PCMCIA CDPD Modem Card installed in Itronix IX250 Laptop PC with Itronix Dipole Antenna
Classification	Licensed Non-Broadcast Station Transmitter (TNB)
Rule Part(s)	§22.901(d), §2
Max. RF Output Power	0.336 Watts (ERP)
Tx Freq. Range	824-849 MHz
Rx Freq. Range	869-894 MHz
Emission Designator	31K5FXW
Signal Modulation	GMSK
Mode(s) Tested	Unmodulated Carrier
Class II Change(s)	Add Itronix IX250 Laptop PC & Dipole Antenna

2.1 MEASUREMENT PROCEDURES

2.2 SPURIOUS EMISSIONS AT ANTENNA TERMINAL - §2.1051

The level of the carrier and the various conducted spurious and harmonic frequencies were measured by means of a calibrated spectrum analyzer. The spectrum was scanned from 10MHz to 20GHz. The antenna output terminal of the EUT was connected to the input of a 50 Ω spectrum analyzer through a matched 40dB attenuator and coaxial cable. The transmitter was operating at maximum power with internal data modulation.

2.3 RADIATED SPURIOUS AND HARMONIC EMISSIONS - §2.1053

Radiated and harmonic emissions above 1 GHz were measured at our 3-meter outdoor site. The EUT was placed on the turntable with the transmitter transmitting into a non-radiating load. A receiving antenna located 3 meters from the turntable received any signal radiated from the transmitter and its operating accessories. The receiving antenna was varied from 1 to 4 meters and the polarization was varied (horizontal and vertical) to determine the worst-case emission level.

3.1 TEST DATA

3.2 EFFECTIVE RADIATED POWER OUTPUT - §2.1046

Freq. Tuned	EUT Conducted Power	Max. Field Strength of EUT (dBm)	Dipole Gain	Dipole Forward Conducted Power	ERP o Dipole H Dipole F Conducte	f EUT e Gain - Forward ed Power
(MHz)	(dBm)	Vertical Pol.	(dBd)	(dBm)	(dBm)	(Watts)
824.04	25.84	- 12.31	- 1.44	26.70	25.26	0.336
836.49	26.83	- 11.77	- 1.34	26.57	25.23	0.333
848.97	26.01	- 14.37	- 1.24	24.45	23.21	0.209

Notes:

ERP Measurements by Substitution Method:

The EUT was placed on a turntable 3-meters from the receive antenna. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A half-wave dipole was substituted in place of the EUT. The dipole was fed through a directional coupler and the power at the coupler port was monitored. A signal generator and power amplifier controlled the dipole, and the input level of the dipole was adjusted to the same field strength level as the EUT. The feed point for the dipole was then connected to a calibrated power meter and the power adjusted to read the same as the coupler port previously recorded, this is to account for any mismatch in impedance, which may occur at the dipole was then determined and the ERP level was determined by adding the forward dipole power and the dipole gain in dB. For readings above 1GHz the above method is repeated using standard gain horn antennas.

3.3 FIELD STRENGTH OF SPURIOUS RADIATION - 2.1053

Operating Frequency (MHz):	824.04
Channel:	991 (Low)
Measured Cond. Pwr. (dBm):	25.84
Measured ERP (dBm):	25.26
Modulation:	Unmodulated Carrier
Distance:	3 Meters
Limit:	$43 + 10 \log (W) = 40.31 dBc$

Frequency	Field Strength of Spurious Radiation	Horn Forward Cond. Pwr.	Standard Gain Horn Antenna Gain	POL (H/V)	EIRP (dBm)	ERP (dBm)	dBc
(MHz)	(dBm)	(dBm)	(dBi)				
1648.08	-67.11	-41.93	6.6	V	-35.33	-37.47	62.73
2472.12	-73.20	-46.00	7.8	V	-38.20	-40.34	65.60
3296.16	-79.31	-44.65	7.8	V	-36.90	-39.04	64.30
4120.20	-96.63	-67.61	7.6	V	-60.01	-62.15	87.41
4944.24	-95.00	-68.64	8.5	V	-60.14	-62.28	87.54
5768.28	-97.81	-70.93	8.8	V	-62.13	-64.27	89.53
6592.32	< -104						
7416.36	< -104						
8240.40	< -104						

Notes:

Radiated Measurements by Substitution Method:

The EUT was placed on a turntable 3-meters from the receive antenna. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A standard gain horn antenna was substituted in place of the EUT. The antenna was fed through a directional coupler and the power at the coupler port was monitored. A signal generator and power amplifier controlled the antenna, and the input level of the antenna was adjusted to the same field strength level as the EUT. The feed point for the antenna was then connected to a calibrated power meter and the power adjusted to read the same as the coupler port previously recorded, this is to account for any mismatch in impedance, which may occur at the horn antenna. The conducted power at the antenna feed point was recorded. The forward power for the antenna was then determined and the EIRP level was determined by adding the forward power and the antenna gain in dB.

FIELD STRENGTH OF SPURIOUS RADIATION - 2.1053

Operating Frequency (MHz):	836.49
Channel:	383 (Mid)
Measured Cond. Pwr. (dBm):	26.83
Measured ERP (dBm):	25.23
Modulation:	Unmodulated Carrier
Distance:	3 Meters
Limit:	$43 + 10 \log (W) = 40.31 \text{ dBc}$

Frequency	Field Strength of Spurious Radiation	Horn Forward Cond. Pwr.	Standard Gain Horn Antenna Gain	POL (H/V)	EIRP (dBm)	ERP (dBm)	dBc
(MHz)	(dBm)	(dBm)	(dBi)				
1672.98	-72.19	-49.30	6.6	V	-42.70	-44.84	70.07
2509.47	-68.69	-38.89	7.8	V	-31.09	-33.23	58.46
3345.96	-74.56	-47.98	7.8	V	-40.23	-42.37	67.60
4182.45	-89.06	-61.04	7.6	V	-53.44	-55.58	80.81
5018.94	-89.57	-63.21	8.5	V	-54.71	-56.85	82.08
5855.43	-92.65	-71.77	8.8	V	-62.97	-65.11	90.34
6691.92	< -104						
7528.41	< -104						
8364.90	< -104						

Notes:

Radiated Measurements by Substitution Method:

The EUT was placed on a turntable 3-meters from the receive antenna. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A standard gain horn antenna was substituted in place of the EUT. The antenna was fed through a directional coupler and the power at the coupler port was monitored. A signal generator and power amplifier controlled the antenna, and the input level of the antenna was adjusted to the same field strength level as the EUT. The feed point for the antenna was then connected to a calibrated power meter and the power adjusted to read the same as the coupler port previously recorded, this is to account for any mismatch in impedance, which may occur at the horn antenna. The conducted power at the antenna feed point was recorded. The forward power for the antenna was then determined and the EIRP level was determined by adding the forward power and the antenna gain in dB.

FIELD STRENGTH OF SPURIOUS RADIATION - 2.1053

Operating Frequency (MHz):	848.97
Channel:	799 (High)
Measured Cond. Pwr. (dBm):	26.01
Measured ERP (dBm):	23.21
Modulation:	Unmodulated Carrier
Distance:	3 Meters
Limit:	$43 + 10 \log (W) = 40.31 dBc$

Frequency	Field Strength of Spurious Radiation	Horn Forward Cond. Pwr.	Standard Gain Horn Antenna Gain	POL (H/V)	EIRP (dBm)	ERP (dBm)	dBc
(MHz)	(dBm)	(dBm)	(dBi)				
1697.94	-72.69	-47.11	6.6	V	-40.51	-42.65	65.86
2546.91	-72.12	-44.52	7.8	V	-36.72	-38.86	62.07
3395.88	-85.89	-48.00	7.8	V	-40.25	-42.39	65.60
4244.85	-89.12	-60.10	7.6	V	-52.50	-54.64	77.85
5093.82	-94.48	-68.12	8.5	V	-59.62	-61.76	84.97
5942.79	-91.40	-70.52	8.8	V	-61.72	-63.86	87.07
6791.76	-91.71	-72.43	9.6	V	-62.83	-64.97	88.18
7640.73	< -104						
8489.70	< -104						

Notes:

Radiated Measurements by Substitution Method:

The EUT was placed on a turntable 3-meters from the receive antenna. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A standard gain horn antenna was substituted in place of the EUT. The antenna was fed through a directional coupler and the power at the coupler port was monitored. A signal generator and power amplifier controlled the antenna, and the input level of the antenna was adjusted to the same field strength level as the EUT. The feed point for the antenna was then connected to a calibrated power meter and the power adjusted to read the same as the coupler port previously recorded, this is to account for any mismatch in impedance, which may occur at the horn antenna. The conducted power at the antenna feed point was recorded. The forward power for the antenna was then determined and the EIRP level was determined by adding the forward power and the antenna gain in dB.

4.1 TEST EQUIPMENT

Type	<u>Model</u>	<u>Calib. Date</u>	<u>Serial No.</u>
Signal Generator	HP 8648D (9kHz-4.0GHz)	Nov 1999	3847A00611
Gigatronics Power Meter	8652A	Oct 1999	1835272
Gigatronics Power Sensor (2)	80701A (0.05-18GHz)	Oct 1999	1833535, 1833542
Amplifier Research Power Amp.	5S1G4 (5W, 800MHz-4.2GHz)	N/A	26235
Microwave System Amplifier	HP 83017A (0.5-26.5GHz)	N/A	3123A00587
Network Analyzer	HP 8753E (30kHz-3GHz)	Nov 1999	US38433013
Audio Analyzer	HP 8903B	March 1999	3729A18691
Modulation Analyzer	HP 8901A	March 1999	3749A07154
Frequency Counter	HP 53181A (3GHz)	May 1999	3736A05175
CDMA Base Station Test Set	Agilent E8285A	N/A	US40332926
DC Power Supply	HP E3611A	N/A	KR83015294
Multi-Device Controller	EMCO 2090	N/A	9912-1484
Mini Mast	EMCO 2075	N/A	0001-2277
Turntable	EMCO 2080-1.2/1.5	N/A	0002-1002
Double Ridged Horn Antenna	ETS 3115 (1-18GHz)	Oct. 2000	6267
Double Ridged Horn Antenna	ETS 3115 (1-18GHz)	Oct. 2000	6276
Horn Antenna	Chase BBHA 9120-A (0.7-4.8GHz)	Sept 1998	9120A-239
Horn Antenna	Chase BBHA 9120-A (0.7-4.8GHz)	Sept 1998	9120A-240
Roberts Dipoles	Compliance Design (2 sets) 3121C	June 2000	
Spectrum Analyzer	HP 8594E	March 2000	3543A02721
Spectrum Analyzer	HP E4408B	Nov 1999	US39240170
Shielded Screen Room	Lindgren R.F. 18W-2/2-0	N/A	16297
Environmental Chamber	ESPEC ECT-2 (Temperature/Humidity)	Feb 2000	0510154-B

5.1 CONCLUSION

The data collected shows that the SIERRA WIRELESS PCMCIA CDPD Modem Card FCC ID: N7NACRD2 (installed in ITRONIX IX250 Rugged Laptop PC with ITRONIX dipole antenna) complies with all the requirements of Parts 2 and 22.901(d) of the FCC rules.

ATTACHMENT A – TEST PLOTS

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ATTACHMENT B – TEST SETUP PHOTOGRAPHS

RADIATED TEST SETUP PHOTOGRAPHS



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RADIATED TEST SETUP PHOTOGRAPHS



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RADIATED TEST SETUP PHOTOGRAPHS



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ATTACHMENT C – EUT PHOTOGRAPHS

Test Report S/N: 052301-116N7N Dates of Tests: May 23-24, 2001 FCC Part 22 Class II Change

EUT PHOTOGRAPHS PCMCIA CDPD Modem Card Front View



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EUT PHOTOGRAPHS PCMCIA CDPD Modem Card Rear View



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Test Report S/N: 052301-116N7N Dates of Tests: May 23-24, 2001 FCC Part 22 Class II Change

EUT PHOTOGRAPHS Itronix IX250 Laptop PC



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Test Report S/N: 052301-116N7N Dates of Tests: May 23-24, 2001 FCC Part 22 Class II Change

EUT PHOTOGRAPHS Itronix IX250 Laptop PC



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Test Report S/N: 052301-116N7N Dates of Tests: May 23-24, 2001 FCC Part 22 Class II Change

EUT PHOTOGRAPHS Itronix Dipole Antenna



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EUT PHOTOGRAPHS CDPD Card installed in PC



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Test Report S/N: 052301-116N7N Dates of Tests: May 23-24, 2001 FCC Part 22 Class II Change

EUT PHOTOGRAPHS CDPD Card installed in PC



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Test Report S/N: 052301-116N7N Dates of Tests: May 23-24, 2001 FCC Part 22 Class II Change

EUT PHOTOGRAPHS CDPD Card installed in PC





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Test Report S/N: 052301-116N7N Dates of Tests: May 23-24, 2001 FCC Part 22 Class II Change

EUT PHOTOGRAPHS CDPD Card installed in PC





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ATTACHMENT D – ANTENNA SPECIFICATIONS







ATTACHMENT E – SAR MEASUREMENT REPORT