FCC CFR47 PART 15 SUBPART B
ICES-003 ISSUE 4, 2004-02

CERTIFICATION TEST REPORT
FOR

EXPRESSCARD WIRELESS MODEM

MODEL NUMBER: AirCard 504

FCC ID: N7NAC500
IC: 2417C-AC500

REPORT NUMBER: 09U12860-2

ISSUE DATE: NOVEMBER 11, 2009

Prepared for
SIERRA WIRELESS, INC.
13811 WIRELESS WAY
RICHMOND, BC V6V 3A4, CANADA

Prepared by
COMPLIANCE CERTIFICATION SERVICES
47173 BENICIA STREET
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
---	11/11/09	Initial Issue	T. Chan

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SIERRA WIRELESS, INC.
13811 WIRELESS WAY
RICHMOND, BC V6V 3A4, CANADA

EUT DESCRIPTION: ExpressCard Wireless Modem

MODEL: AirCard 504

SERIAL NUMBER: F9E2619006E2-OC

DATE TESTED: NOVEMBER 06-07, 2009

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART B	PASS
ICES-003 ISSUE 4, 2004-02	PASS

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

THU CHEN
EMC MANAGER
COMPLIANCE CERTIFICATION SERVICES

Tested By:

CHIN PANG
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003 and ICES-003 ISSUE 4, 2004-02.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The AC504 modem, referred to as "EUT" hereafter, is a multi-band wireless modem operating on the GSM/GPRS/EDGE/UMTS networks. In the US and Canada, only cellular and PCS bands are used for GSM/GPRS/UMTS operation, so this test report only contains data for these two bands (850MHz and 1900MHz).
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GENERAL INFORMATION

CHASSIS MATERIAL	PLASTIC
ENCLOSURE MATERIAL	PLASTIC
POWER REQUIREMENTS	3.3VDC from Host device
POWERLINE FILTER MANUFACTURER AND MODEL	N/A
LIST OF ALL OSCILLATOR FREQUENCIES GREATER THAN OR EQUAL TO 9 kHz	19.2MHz, 3.9796GHz

5.2. WORST CASE CONFIGURATIONS

Two configurations have been investigated on:

1. EUT directly plugged into the Laptop with a PC card adapter.
2. EUT directly plugged into the Laptop.without PC card adapter

5.3. MODE(S) OF OPERATION

Mode	Description
Normal	The EUT was in normal mode, while all the I/O ports active to transfer data between the laptop and other peripherals.

5.4. SOFTWARE AND FIRMWARE

The test software used during the test was EMCTest software.

5.5. MODIFICATIONS

No modifications were made during testing.

5.6. DETAILS OF TESTED SYSTEM

SUPPORT EQUIPMENT & PERIPHERALS

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	IBM	Lenovo T60	ZZBC354	DoC
AC Adapter	IBM	92P1160	11S92P1160Z1ZAW66C90MH	DoC
Mouse	HP	M-U48a	LZE01650032	DoC
Printer	Microline 186	D22300A	AE5A048148A0	DoC

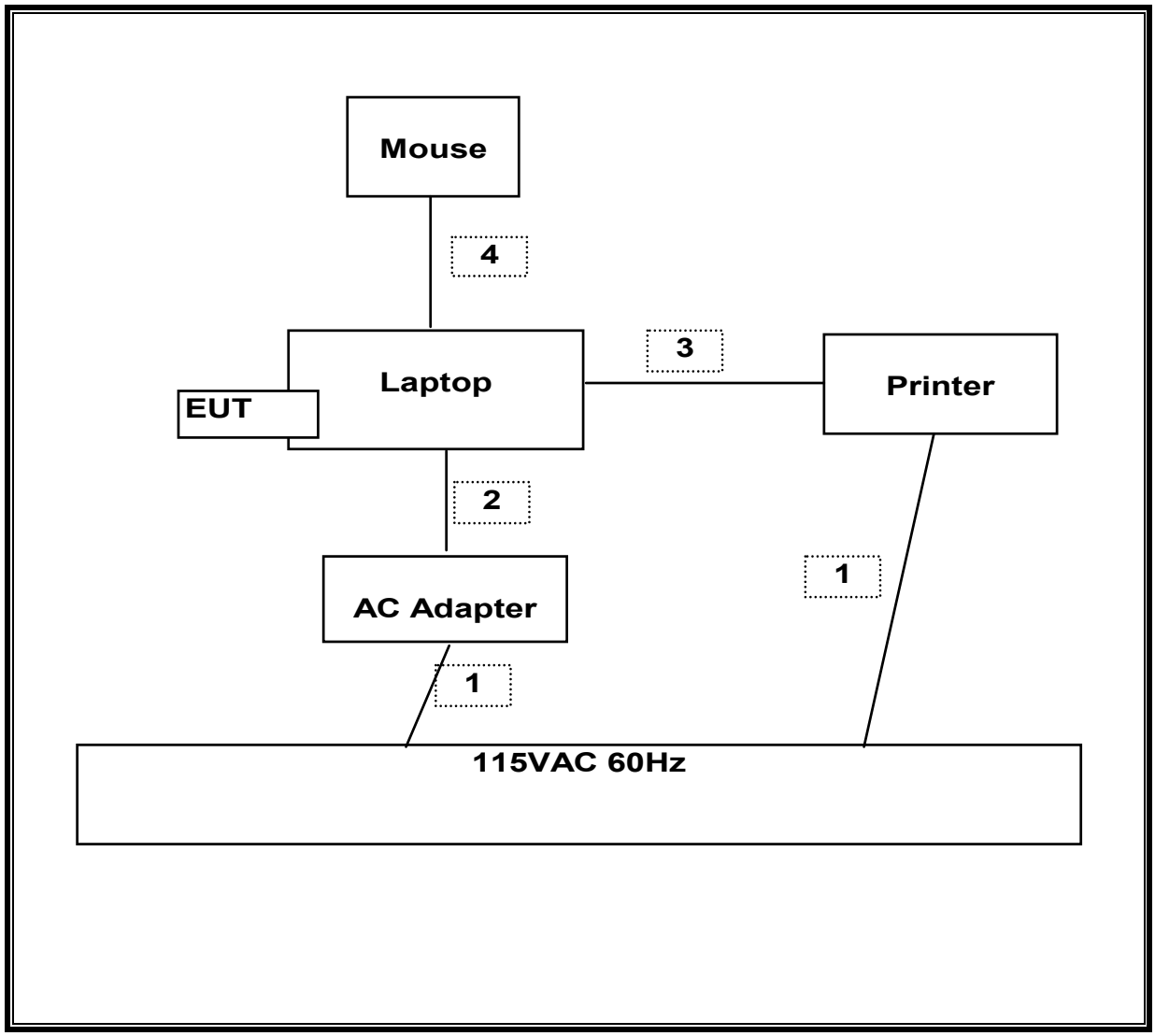
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identica Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	2	US 115V	Un-shielded	2m	N/A
2	DC	1	DC	Un-shielded	2m	N/A
3	USB	1	printer	Un-shielded	2m	N/A
4	USB	1	Mouse	Un-shielded	1.2m	N/A

TEST SETUP

The EUT is plugged into a laptop with and without a PC card adapter, test software exercised the EUT.

TEST SETUP DIAGRAM



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**Cal Due**
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	A121003	01/14/10
Preamplifier, 1300 MHz	Agilent / HP	8447D	1937A02062	03/31/10
Preamplifier, 26.5 GHz	Agilent / HP	8449B	3008A00561	02/04/10
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	08/31/10
LISN, 30 MHz	FCC	LISN-50/250-25-2	2023	11/06/10
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	11/06/10
EMI Test Receiver, 30 MHz	R & S	ESHS 20	827129/006	05/06/11

7. APPLICABLE LIMITS AND TEST RESULTS

7.1. RADIATED EMISSIONS

TEST PROCEDURE

ANSI C63.4

The highest clock frequency generated is 3.9796 GHz in the EUT. Therefore the frequency range was investigated from 30 MHz to 20 GHz.

LIMIT

§15.109 (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

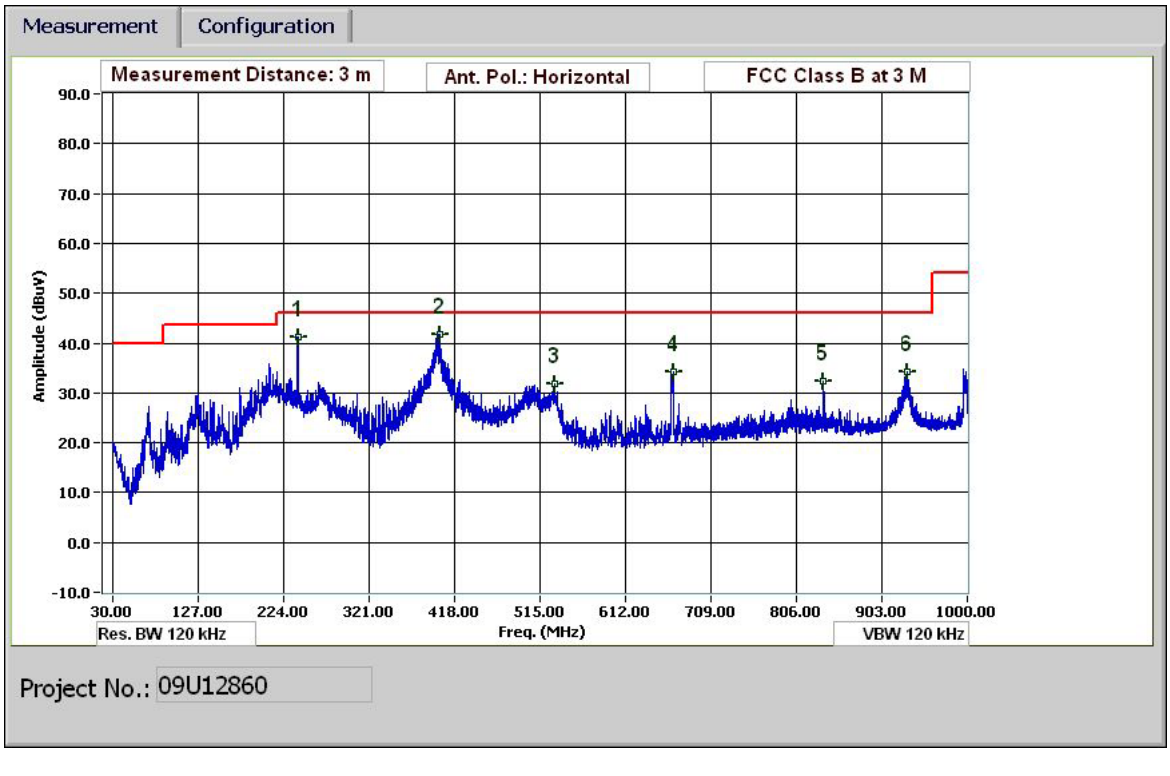
Limits for radiated disturbance of Class B ITE at measuring distance of 3 m	
Frequency range (MHz)	Quasi-peak limits (dBµV/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960 MHz	54
Note: The lower limit shall apply at the transition frequency.	

RESULTS

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

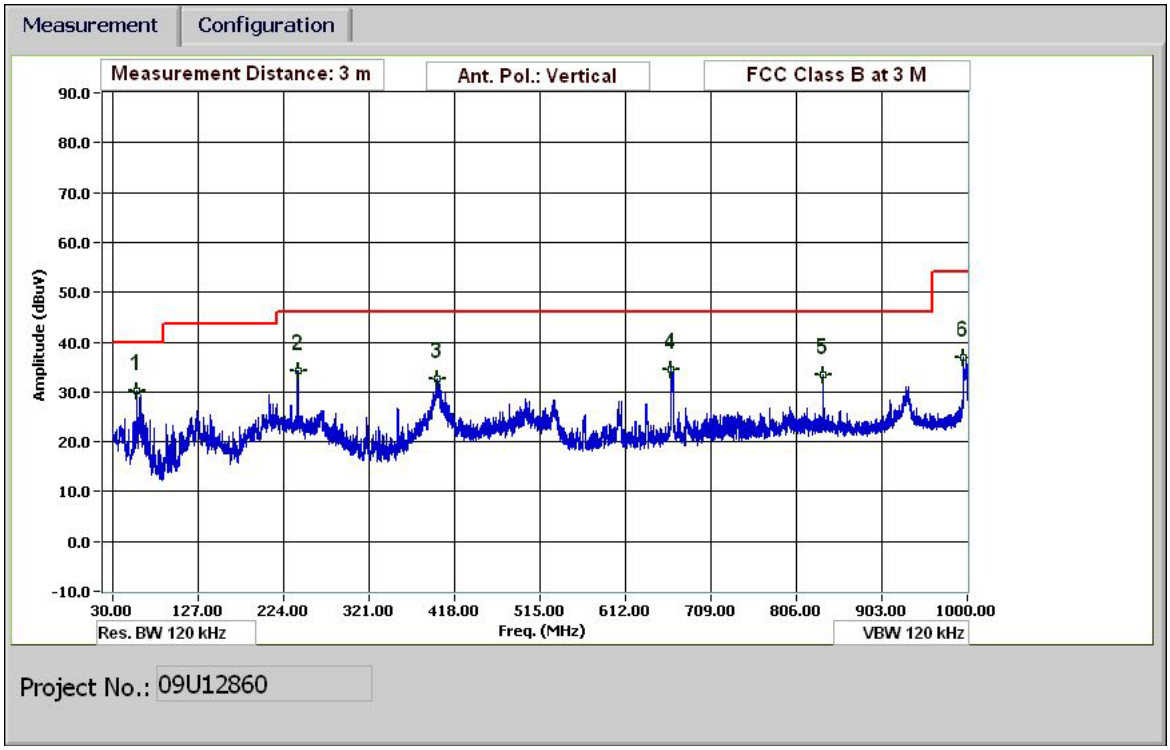
WITH PC CARD ADAPTER

HORIZONTAL PLOT



SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



EMISSIONS DATA

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Chin Pang
Date: 11/06/09
Project #: 09U12860
Company: Sierra Wireless
EUT Description: ExpressCard Wireless Modem
Configuration: EUT with PC card adapter and basic peripheral
EUT M/N: AirCard 504
Test Target: FCC Class B
Mode Oper: Normal

f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		
Read	Analyzer Reading	Filter	Filter Insert Loss		
AF	Antenna Factor	Corr.	Calculated Field Strength		
CL	Cable Loss	Limit	Field Strength Limit		

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filter dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
57.841	3.0	51.2	7.9	0.7	29.6	0.0	0.0	30.1	40.0	-9.9	V	P	
240.009	3.0	49.8	11.8	1.4	28.8	0.0	0.0	34.2	46.0	-11.8	V	P	
398.055	3.0	45.0	15.0	1.9	29.3	0.0	0.0	32.7	46.0	-13.3	V	P	
663.746	3.0	42.6	18.9	2.5	29.6	0.0	0.0	34.4	46.0	-11.6	V	P	
836.433	3.0	38.2	21.2	2.9	28.9	0.0	0.0	33.4	46.0	-12.7	V	P	
995.800	3.0	39.5	22.5	3.2	28.4	0.0	0.0	36.9	54.0	-17.1	V	P	
240.009	3.0	56.9	11.8	1.4	28.8	0.0	0.0	41.3	46.0	-4.7	H	P	
240.009	3.0	56.9	11.8	1.4	28.8	0.0	0.0	39.3	46.0	-6.7	H	QP	
400.575	3.0	54.0	15.0	1.9	29.3	0.0	0.0	41.6	46.0	-4.4	H	P	
400.575	3.0	54.0	15.0	1.9	29.3	0.0	0.0	37.6	46.0	-8.4	H	QP	
531.621	3.0	42.1	17.3	2.2	29.7	0.0	0.0	31.9	46.0	-14.1	H	P	
666.146	3.0	42.3	18.9	2.5	29.6	0.0	0.0	34.1	46.0	-11.9	H	P	
836.313	3.0	37.1	21.2	2.9	28.9	0.0	0.0	32.2	46.0	-13.8	H	P	
932.197	3.0	37.8	21.9	3.1	28.5	0.0	0.0	34.2	46.0	-11.8	H	P	

SPURIOUS EMISSIONS ABOVE 1000 MHz (WORST-CASE CONFIGURATION)

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Sierra Wireless
Project #: 09U12860
Date: 11/6/09
Test Engineer: Chin Pang
EUT Description: ExpressCard Wireless Modem
Model No: AirCard 504
Configuration: EUT (with PC Card adapter) and Basic peripheral
Mode: Normal

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T59; S/N: 3245 @3m	T145 Agilent 3008A0056			FCC 15.209

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.063	3.0	60.5	38.6	24.2	2.4	-36.1	0.0	0.0	51.0	29.1	74	54	-23.0	-24.9	V
1.330	3.0	55.7	37.8	25.2	2.7	-35.9	0.0	0.0	47.7	29.8	74	54	-26.3	-24.2	V
1.063	3.0	52.5	34.5	24.2	2.4	-36.1	0.0	0.0	43.0	25.0	74	54	-31.0	-29.0	H
1.463	3.0	52.0	34.3	25.6	2.9	-35.8	0.0	0.0	44.7	27.0	74	54	-29.3	-27.0	H

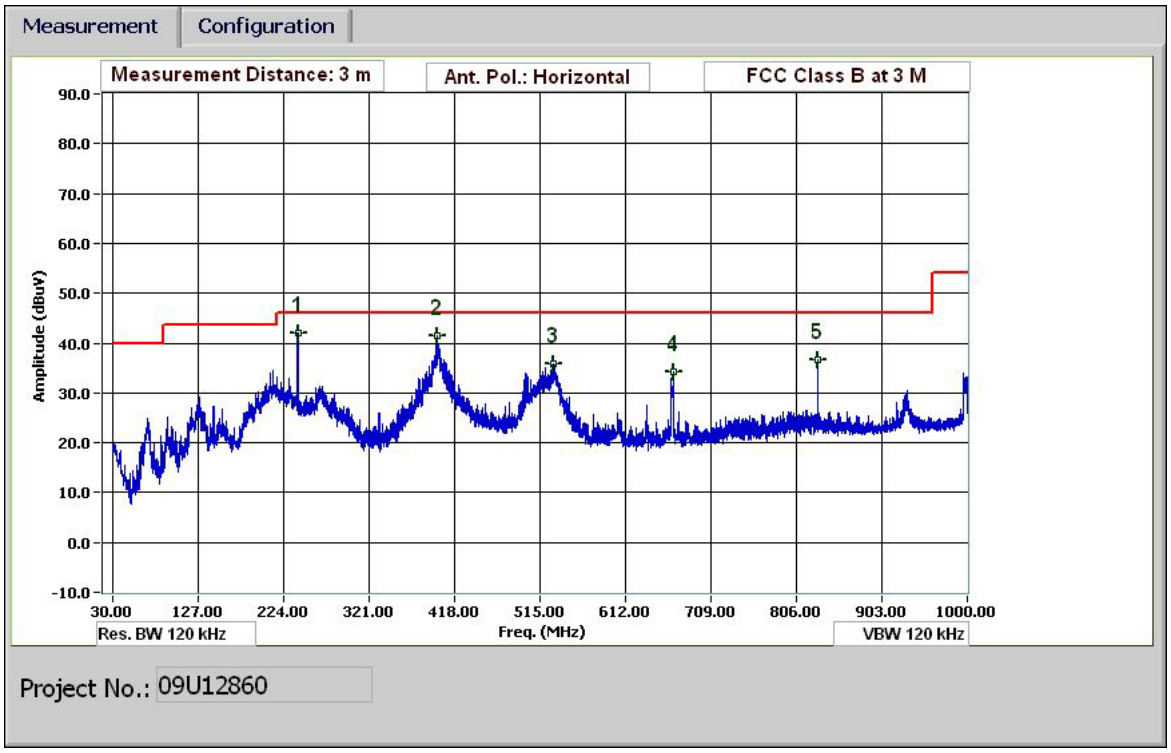
Rev. 11.10.08
Note: No other emissions were detected above the system noise floor.

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

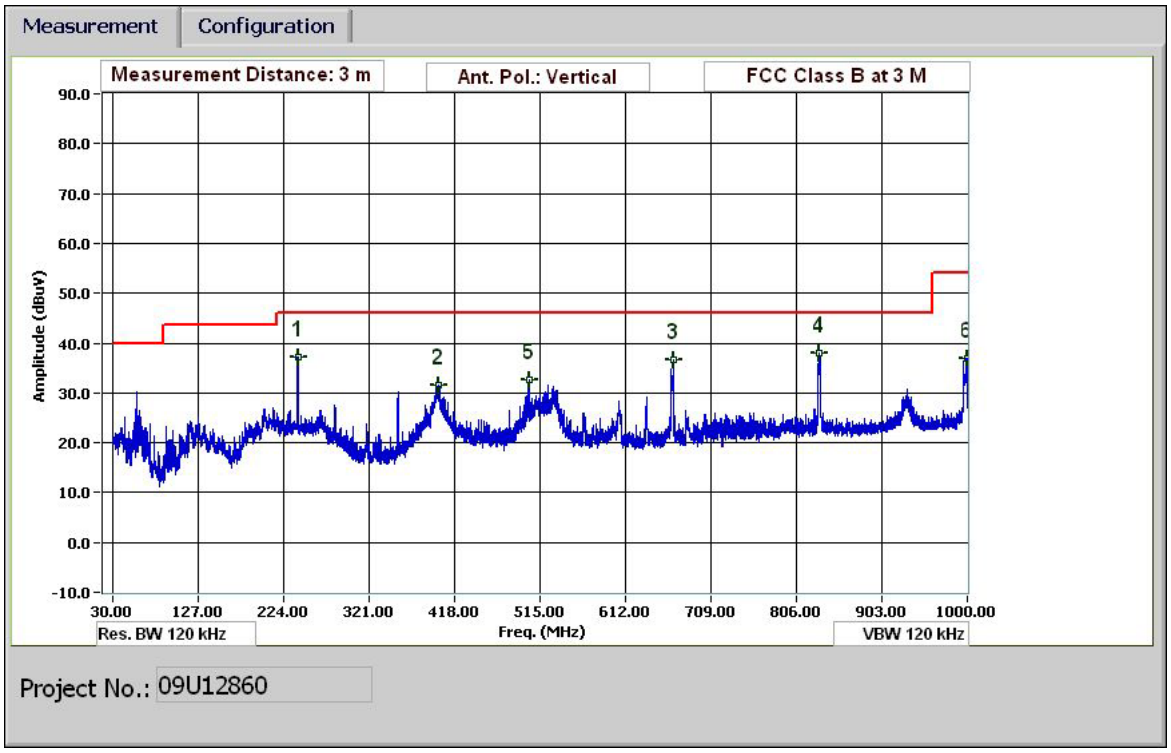
WITHOUT PC CARD ADAPTER

HORIZONTAL PLOT



SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



EMISSIONS DATA

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Chin Pang
Date: 11/06/09
Project #: 09U12860
Company: Sierra Wireless
EUT Description: ExpressCard Wireless Modem
Configuration: EUT (without PC Card adapter) and basic peripheral
EUT M/N: AirCard 504
Test Target: FCC Class B
Mode Oper: Normal

f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		
Read	Analyzer Reading	Filter	Filter Insert Loss		
AF	Antenna Factor	Corr.	Calculated Field Strength		
CL	Cable Loss	Limit	Field Strength Limit		

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filter dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
240.009	3.0	57.5	11.8	1.4	28.8	0.0	0.0	42.0	46.0	-4.0	H	P	
240.009	3.0	57.5	11.8	1.4	28.8	0.0	0.0	40.8	46.0	-5.2	H	QP	
397.695	3.0	53.9	15.0	1.9	29.3	0.0	0.0	41.5	46.0	-4.5	H	P	
397.695	3.0	53.9	15.0	1.9	29.3	0.0	0.0	37.3	46.0	-8.7	H	QP	
530.421	3.0	46.2	17.2	2.2	29.7	0.0	0.0	36.0	46.0	-10.0	H	P	
666.146	3.0	42.3	18.9	2.5	29.6	0.0	0.0	34.2	46.0	-11.8	H	P	
830.673	3.0	41.5	21.2	2.9	29.0	0.0	0.0	36.6	46.0	-9.4	H	P	
240.009	3.0	52.8	11.8	1.4	28.8	0.0	0.0	37.2	46.0	-8.8	V	P	
400.455	3.0	44.0	15.0	1.9	29.3	0.0	0.0	31.7	46.0	-14.3	V	P	
502.819	3.0	43.4	16.8	2.1	29.7	0.0	0.0	32.6	46.0	-13.4	V	P	
666.026	3.0	44.7	18.9	2.5	29.6	0.0	0.0	36.6	46.0	-9.4	V	P	
831.393	3.0	42.9	21.2	2.9	29.0	0.0	0.0	37.9	46.0	-8.1	V	P	
999.280	3.0	39.4	22.6	3.2	28.4	0.0	0.0	36.9	54.0	-17.1	V	P	

SPURIOUS EMISSIONS ABOVE 1000 MHz (WORST-CASE CONFIGURATION)

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Sierra Wireless
Project #: 09U12860
Date: 11/6/09
Test Engineer: Chin Pang
Configuration:EUT (without PC Card adapter) and Basic peripheral
EUT M/N:AirCard 504
Mode: Normal

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T59; S/N: 3245 @3m	T145 Agilent 3008A0056			FCC 15.209

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.063	3.0	62.0	40.8	24.2	2.4	-36.1	0.0	0.0	52.5	31.3	74	54	-21.5	-22.7	V
1.330	3.0	57.8	40.0	25.2	2.7	-35.9	0.0	0.0	49.8	32.0	74	54	-24.2	-22.0	V
1.065	3.0	55.0	35.8	24.2	2.4	-36.1	0.0	0.0	45.5	26.3	74	54	-28.5	-27.7	H
1.327	3.0	53.6	37.0	25.1	2.7	-35.9	0.0	0.0	45.6	29.0	74	54	-28.4	-25.0	H

Rev. 11.10.08
Note: No other emissions were detected above the system noise floor.

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

7.2. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.4

LIMIT

§15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Notes: 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

RESULTS

6 WORST EMISSIONS

WITH PC CARD ADAPTER

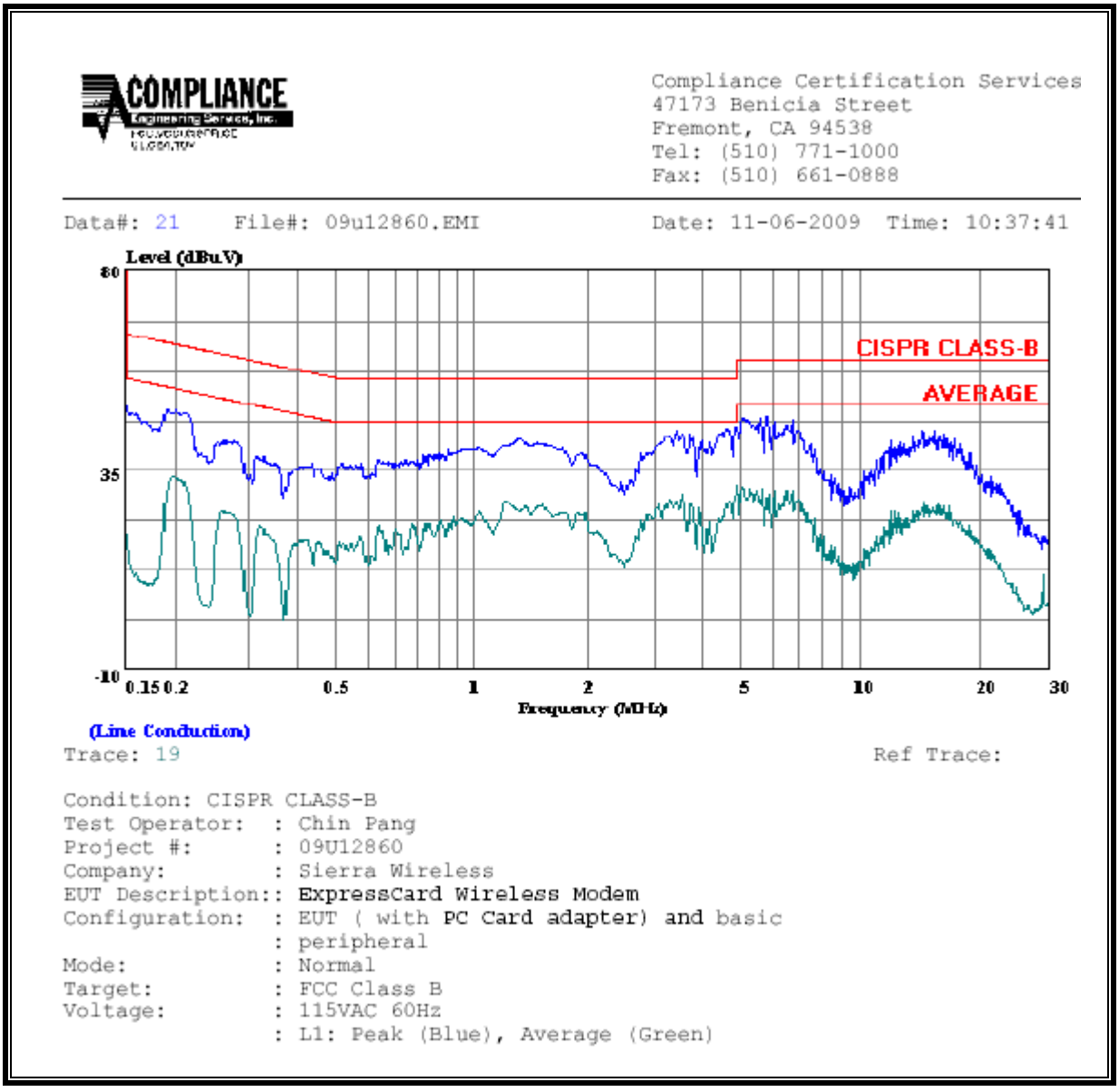
CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.20	49.00	--	33.61	0.00	63.82	53.82	-14.82	-20.21	L1
3.64	44.27	--	29.79	0.00	56.00	46.00	-11.73	-16.21	L1
6.84	47.12	--	30.62	0.00	60.00	50.00	-12.88	-19.38	L1
0.20	48.72	--	33.16	0.00	63.82	53.82	-15.10	-20.66	L2
3.64	44.49	--	30.57	0.00	56.00	46.00	-11.51	-15.43	L2
5.14	47.12	--	31.60	0.00	60.00	50.00	-12.88	-18.40	L2
6 Worst Data									

WITHOUT PC CARD ADAPTER

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.19	50.29	--	32.94	0.00	64.04	54.04	-13.75	-21.10	L1
3.64	45.30	--	30.11	0.00	56.00	46.00	-10.70	-15.89	L1
6.81	46.58	--	30.73	0.00	60.00	50.00	-13.42	-19.27	L1
0.20	49.28	--	33.15	0.00	63.82	53.82	-14.54	-20.67	L2
3.64	44.61	--	30.54	0.00	56.00	46.00	-11.39	-15.46	L2
5.14	47.32	--	32.02	0.00	60.00	50.00	-12.68	-17.98	L2
6 Worst Data									

WITH PC CARD ADAPTER

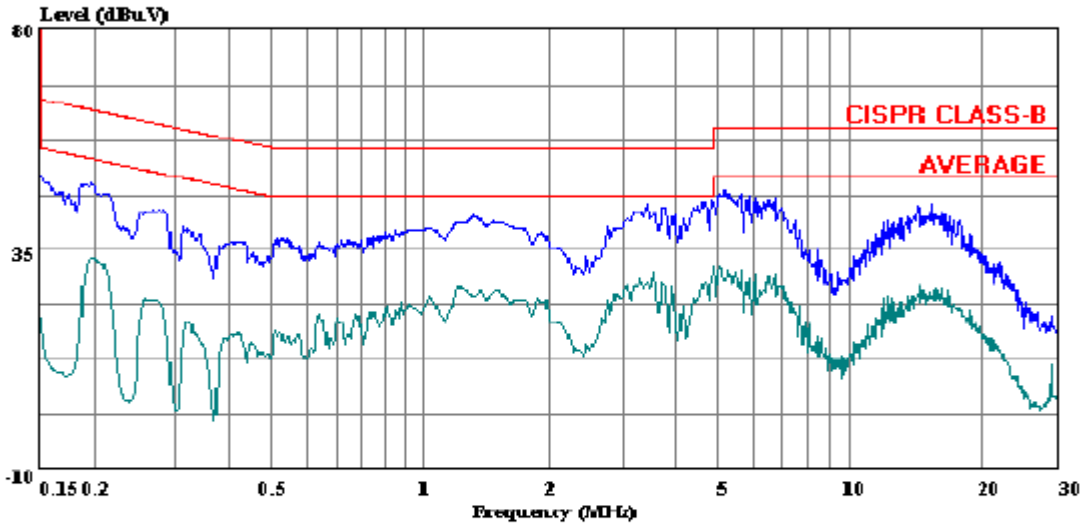
LINE 1 RESULTS



LINE 2 RESULTS

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 28 File#: 09u12860.EMI Date: 11-06-2009 Time: 10:41:49



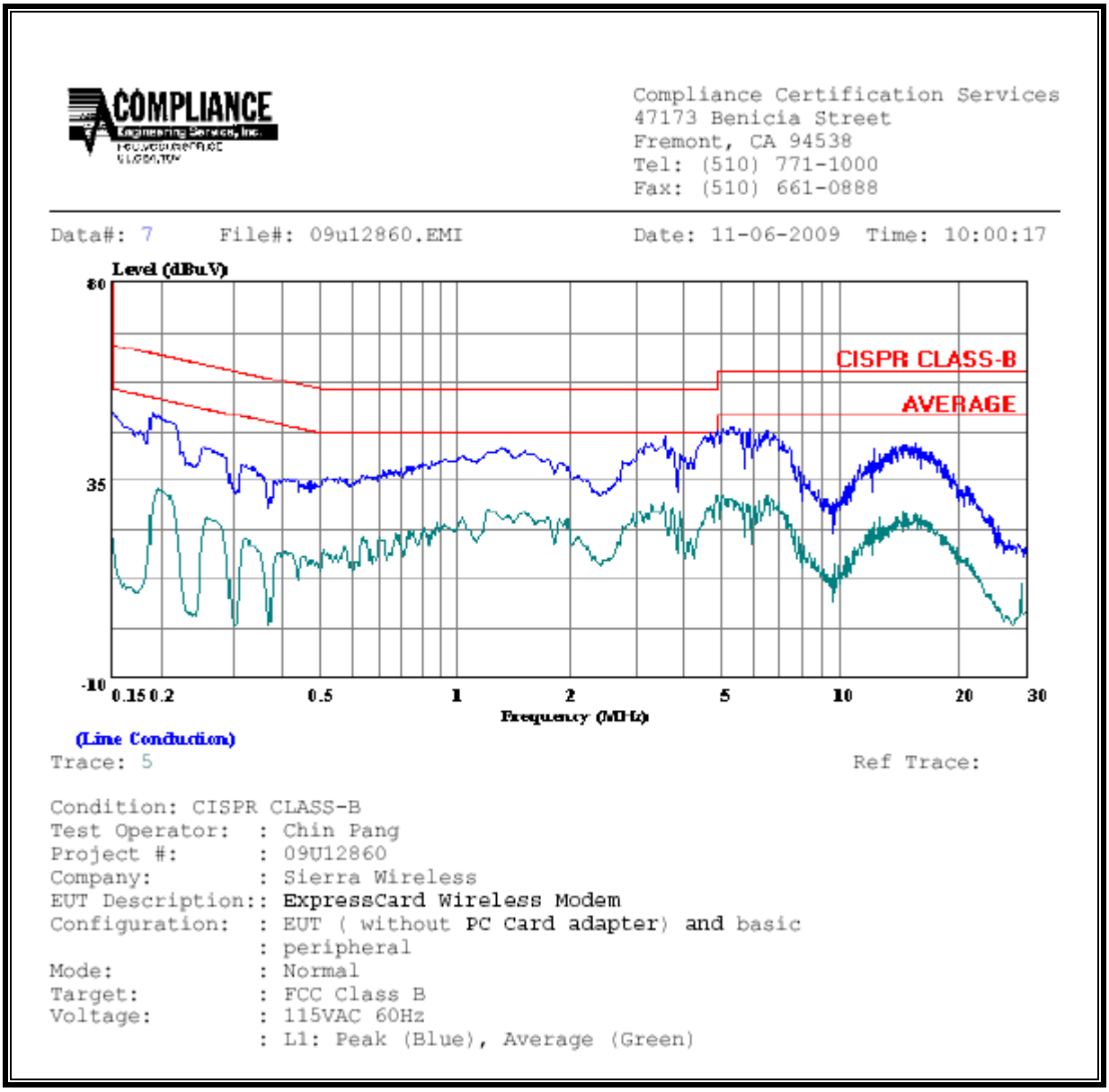
(Line Conduction)

Trace: 26 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Chin Pang
Project #: : 09U12860
Company: : Sierra Wireless
EUT Description:: ExpressCard Wireless Modem
Configuration: : EUT (with PC Card adapter) and basic
: peripheral
Mode: : Normal
Target: : FCC Class B
Voltage: : 115VAC 60Hz
: L2: Peak (Blue), Average (Green)

WITHOUT PC CARD ADAPTER

LINE 1 RESULTS



LINE 2 RESULTS

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
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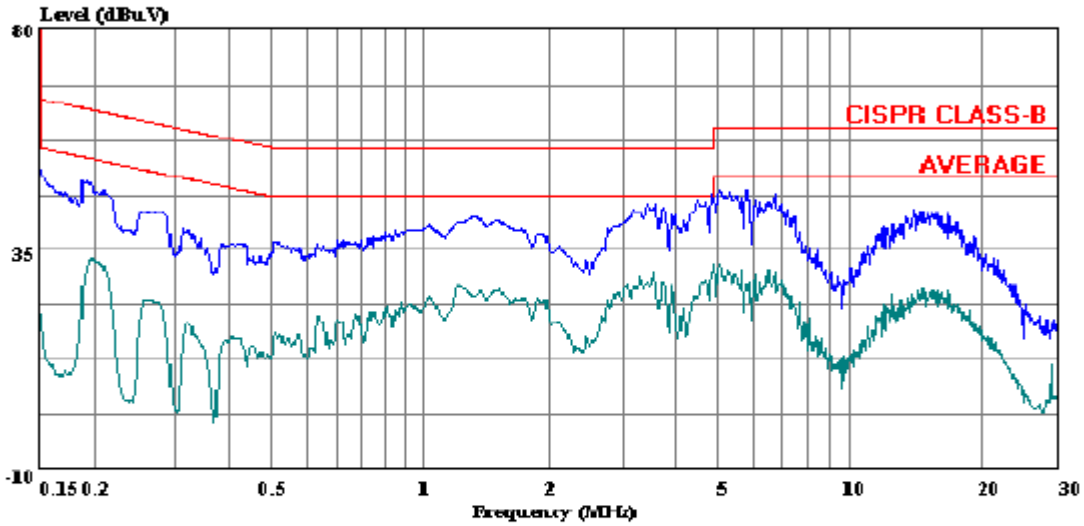
Data#: 14 File#: 09u12860.EMI Date: 11-06-2009 Time: 10:14:40



(Line Conduction)

Trace: 12 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Chin Pang
Project #: : 09U12860
Company: : Sierra Wireless
EUT Description:: ExpressCard Wireless Modem
Configuration: : EUT (without PC Card adapter) and basic
: peripheral
Mode: : Normal
Target: : FCC Class B
Voltage: : 115VAC 60Hz
: L2: Peak (Blue), Average (Green)