

FCC CFR47 PART 15 SUBPART B CERTIFICATION TEST REPORT

FOR

WiMAX + WiFi Router

MODEL NUMBER: W801

REPORT NUMBER: 09U12839-2, Revision A

ISSUE DATE: NOVEMBER 24, 2009

Prepared for

SIERRA WIRELESS INC. 2290 COSMOS COURT, CARLSBAD CALIFORNIA 92011, USA

Prepared by

COMPLIANCE CERTIFICATION SERVICES 47173 BENICIA STREET FREMONT, CA 94538, U.S.A. TEL: (510) 771-1000

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Revision History

Rev.	Issue Date	Revisions	Revised By
	11/03/09	Initial Issue	T. Chan
	11/24/09	Revised model number	A. Zaffar

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SIERRA WIRELESS INC.

2290 COSMOS COURT, CARLSBAD

CALIFORNIA 92011, USA

EUT DESCRIPTION: WiMAX + WiFi Router

MODEL: W801

SERIAL NUMBER: H9H239901472014 AND H9H239901122014

DATE TESTED: OCTOBER 8 – 15, 2009

APPLICABLE STANDARDS

STANDARD TEST RESULTS

FCC PART 15 SUBPART B 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. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For CCS By:

Tested By:

SS - F

THU CHAN
EMC MANAGER
COMPLIANCE CERTIFICATION SERVICES

DEVIN CHANG
EMC ENGINEER

COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003.

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 EUT is a WiMAX + WiFi Router.

GENERAL INFORMATION

Power Requirements	5.2VDC from AC/DC Adapter	
List of frequencies generated or used by the EUT	40 MHz crystal on the WiMAX is the fastest clock crystal in the system	

5.2. PRELIMINARY TEST CONFIGURATIONS

The following configurations were investigated during preliminary testing:

EUT Configuration	Description
Typical Configuration	EUT connected via USB cable to laptop PC. Also laptop PC was connected to printer and mouse.

5.3. MODE(S) OF OPERATION

Mode	Description
Normal Mode	Laptop PC was pinging EUT with minimum configuration
Charging Mode	EUT was charging with AC/DC adapter at standby configuration
Standalone Mode	EUT was alone standby configuration

5.4. SOFTWARE AND FIRMWARE

The software/firmware installed in the EUT during testing was version 1.1.2.0, rev. 7-1-2009. Laptop PC was pinging EUT.

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 PC	DELL	PP18L	30216847141	DOC	
AC Adapter	DELL	HS65NS1-00	662-47890-86B-C06B	DOC	
AC/DC Adapter	AirLink	WRG10F-120A	None	DoC	
Printer	HP	Q6335A	MY56K1304B	DoC	
AC/DC Adapter	HP	0957-2084	5715480604	DoC	
Mouse	HP	M-U48a	LZE01650025	DoC	

I/O CABLES

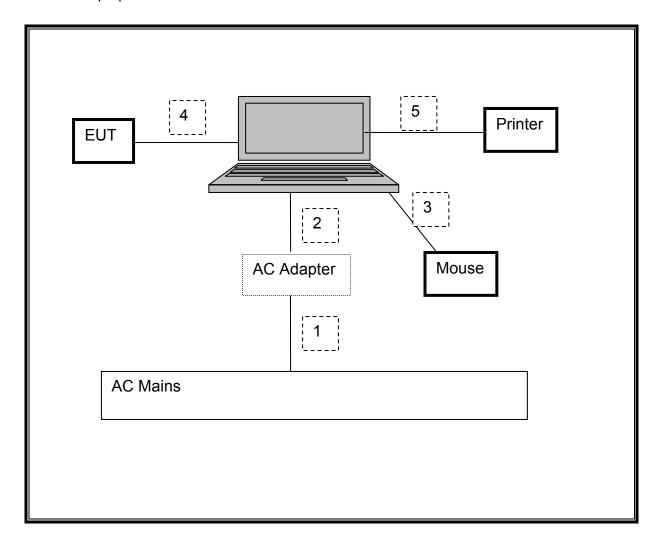
	I/O CABLE LIST						
Cable No.	Port	# of Identica Ports	Connector Type	Cable Type	Cable Length	Remarks	
1	AC	2	US 115V	Un-shielded	1.8m	N/A	
2	DC	3	DC Plug	Un-shielded	1.8m	N/A	
3	Mouse	1	USB	Un-shielded	1.0m	N/A	
4	USB	1	USB	Un-shielded	1.2m	N/A	
5	USB	1	USB	Un-shielded	1.8m	N/A	

TEST SETUP

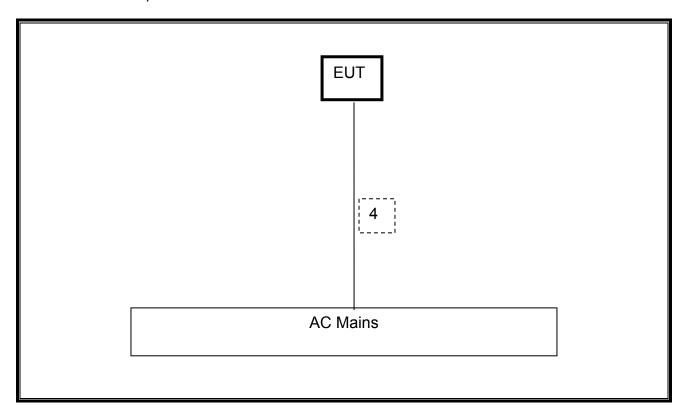
The EUT was connected via USB cable to laptop PC, and test software exercised the EUT.

TEST SETUP DIAGRAM

EUT with laptop via USB cable in Link Mode



EUT with AC Adapter Mode



REPORT NO: 09U12839-2A EUT: WiMAX + WiFi Router		DATE: NOVEMBER 24, 2009 MODEL: W801
EUT Standalone Mode		
	EUT	

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	Asset	Cal Due	
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	02/04/10	
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01171	01/14/10	
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	12/16/09	
Antenna, Horn, 18 GHz	EMCO	3115	C00872	04/22/10	
EMI Test Receiver, 30 MHz	R&S	ESHS 20	N02396	05/06/11	
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/06/10	
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	11/06/10	

7. APPLICABLE LIMITS AND TEST RESULTS

7.1. RADIATED EMISSIONS

TEST PROCEDURE

ANSI C63.4 and CAN/CSA-CEI/IEC CISPR 22:02 as referenced by ICES-003 Issue 4.

The highest clock frequency generated is 40 MHz in the EUT, but RX standby mode at PCS 1900MHz band; therefore the frequency range was investigated from 30 MHz to 2 GHz.

<u>LIMIT</u>

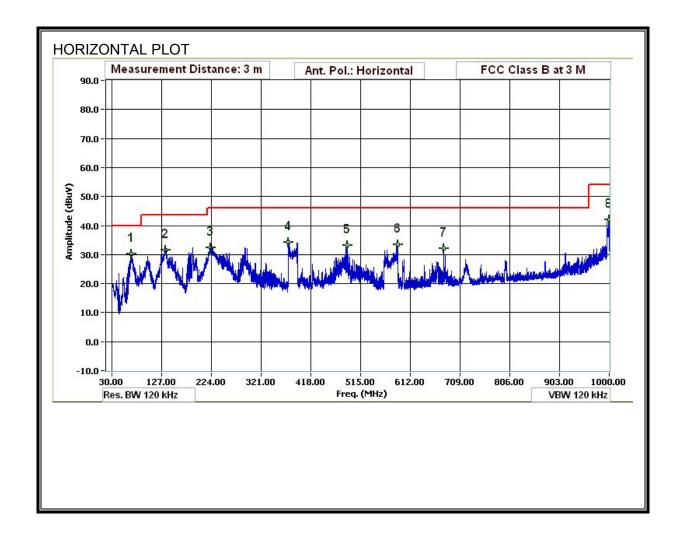
§15.109 (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Limits for radiated disturbance of Class B_ ITE at measuring distance of 3 m				
Frequency range	Quasi-peak limits			
(MHz)	(dBµV/m)			
30 to 88	40			
88 to 216	43.5			
216 to 960	46			
960 to 1000 54				
Note: The lower limit shall apply at the transition frequency.				

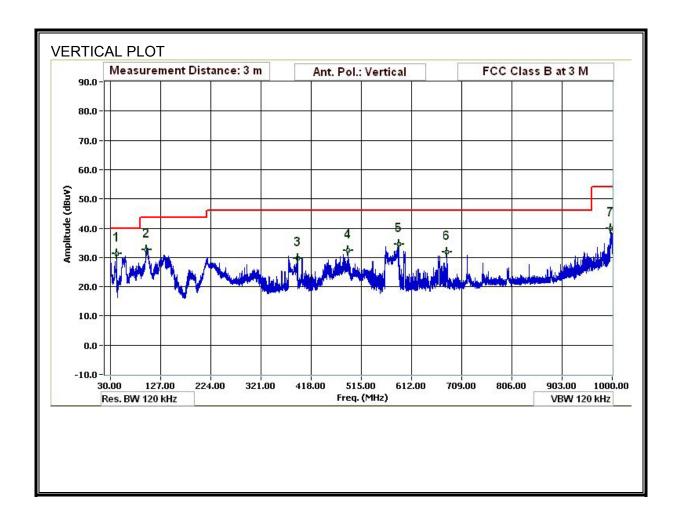
Limits for radiated disturbance of Class B_ ITE at measuring distance of 3 m					
Frequency range Peak limits Average limits					
(MHz) $(dB\mu V/m)$ $(dB\mu V/m)$					
1000 to 2000 74 54					
Note: The lower limit shall apply at the transition frequency.					

7.1.1. RADIATED EMISSIONS 30 to 1000 MHz

RADIATED EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION (USB LINK), HORIZONTAL)



RADIATED EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION (USB LINK), VERTICAL)



RADIATED EMISSION DATA

30-1000MHz Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Devin Chang
Date: 10/07/09
Project #: 09U12839
Company: Sierra Wireless
EUT Description: WiMAX + WiFi Router

EUT M/N: Eagle Mode Oper: Tx mode

f Measurement Frequency Amp Preamp Gain Margin Margin vs. Limit

f Measurement frequency Amp Freating Sain

Distance to Antenna D Corr Distance Correct to 3 meters

Read Analyzer Reading Filter Filter Insert Loss

AF Antenna Factor Corr. Calculated Field Strength

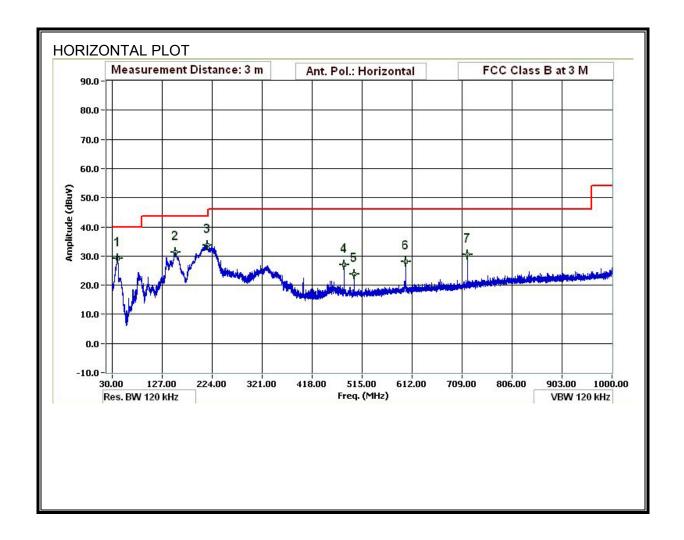
CL Cable Loss Limit Field Strength Limit

f	Dist	Read	AF	CL	Amp	D Corr	Filter	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
MHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	$dBuV/\mathbf{m}$	dB	V/H	P/A/QP	
42.000	3.0	47.4	12.9	0.6	29.6	0.0	0.0	31.2	40.0	-8.8	V	EP	
100.443	3.0	51.2	10.2	0.9	29.5	0.0	0.0	32.7	43.5	-10.8	V	EP	
391.575	3.0	42.1	14.9	1.9	29.3	0.0	0.0	29.6	46.0	-16.4	V	EP	
489.499	3.0	43.2	16.6	2.1	29.7	0.0	0.0	32.3	46.0	-13.7	V	EP	
587.423	3.0	43.9	18.1	2.4	29.6	0.0	0.0	34.6	46.0	-11.4	V	EP	
680.067	3.0	39.7	19.0	2.6	29.6	0.0	0.0	31.7	46.0	-14.3	V	EP	
996.520	3.0	42.6	22.6	3.2	28.4	0.0	0.0	39.9	54.0	-14.1	V	EP	
67.922	3.0	50.9	8.2	0.7	29.6	0.0	0.0	30.2	40.0	-9.8	H	EP	
135.004	3.0	46.4	13.4	1.0	29.4	0.0	0.0	31.5	43.5	-12.0	H	EP	
222.608	3.0	48.0	11.9	1.4	28.9	0.0	0.0	32.4	46.0	-13.6	H	EP	
374.654	3.0	47.0	14.6	1.8	29.2	0.0	0.0	34.3	46.0	-11.7	H	EP	
489.619	3.0	44.0	16.6	2.1	29.7	0.0	0.0	33.1	46.0	-12.9	H	EP	
587.423	3.0	42.6	18.1	2.4	29.6	0.0	0.0	33.4	46.0	-12.6	H	EP	
677.787	3.0	40.0	19.0	2.6	29.6	0.0	0.0	32.0	46.0	-14.0	H	EP	
999.400	3.0	44.7	22.6	3.2	28.4	0.0	0.0	42.1	54.0	-11.9	H	EP	

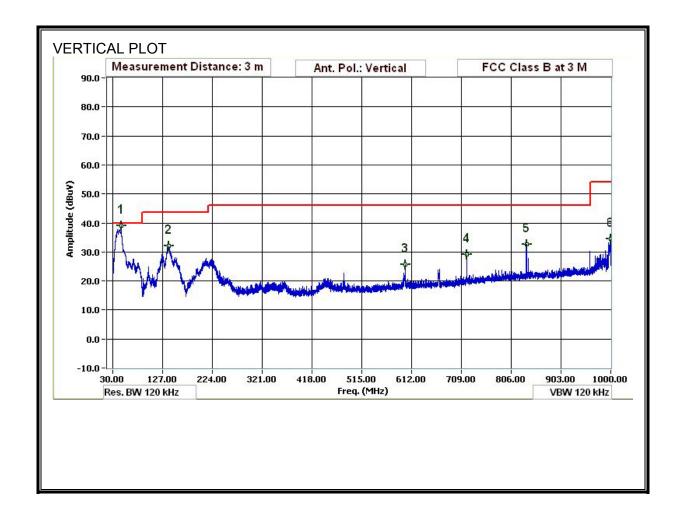
Rev. 1.27.09

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

RADIATED EMISSIONS 30 TO 1000 MHz (AC ADAPTOR CONFIGURATION, HORIZONTAL)



RADIATED EMISSIONS 30 TO 1000 MHz (AC ADAPTOR CONFIGURATION, VERTICAL)



RADIATED EMISSION DATA

30-1000MHz Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Devin Chang
Date: 10/07/09
Project #: 09U12839
Company: Sierra Wireless
EUT Description: WiMAX + WiFi Router

EUT M/N: Eagle

Mode Oper: EUT power by AC Adaptor

f Measurement Frequency Amp Preamp Gain Margin Margin vs. Limit

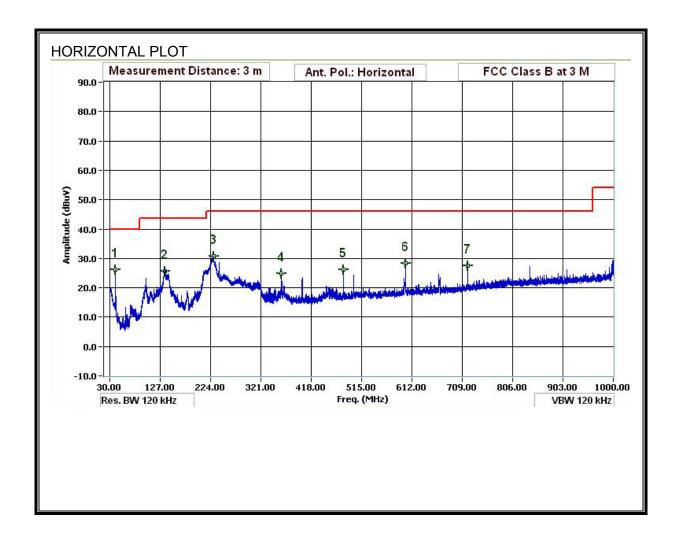
Dist Distance to Antenna D Corr Distance Correct to 3 meters
Read Analyzer Reading Filter Filter Insert Loss
AF Antenna Factor Corr. Calculated Field Strength
CL Cable Loss Limit Field Strength Limit

f	Dist	Read	AF	CL	Amp	D Corr	Filter	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
MHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
46.681	3.0	58.0	10.0	0.6	29.6	0.0	0.0	39.0	40.0	-1.0	V	EP	
46.681	3.0	56.0	10.0	0.6	29.6	0.0	0.0	37.0	40.0	-3.0	V	QP	
139.565	3.0	47.2	13.2	1.1	29.4	0.0	0.0	32.1	43.5	-11.4	V	EP	
600.024	3.0	34.6	18.3	2.4	29.6	0.0	0.0	25.6	46.0	-20.4	v	EP	
720.028	3.0	36.4	19.6	2.6	29.5	0.0	0.0	29.2	46.0	-16.8	V	EP	
835.593	3.0	37.5	21.2	2.9	28.9	0.0	0.0	32.6	46.0	-13.4	V	EP	
999.400	3.0	37.0	22.6	3.2	28.4	0.0	0.0	34.4	54.0	-19.6	V	EP	•
40.560	3.0	44.5	13.7	0.6	29.6	0.0	0.0	29.2	40.0	-10.8	H	EP	
152.285	3.0	47.3	12.2	1.1	29.3	0.0	0.0	31.3	43.5	-12.2	H	EP	
214.928	3.0	49.2	11.9	1.3	28.9	0.0	0.0	33.6	43.5	-9,9	H	EP	
480.019	3.0	38.1	16.4	2.1	29.6	0.0	0.0	27.0	46.0	-19.0	H	EP	
499.939	3.0	34.5	16.8	2.1	29.7	0.0	0.0	23.7	46.0	-22.3	H	EP	•
600.024	3.0	37.1	18.3	2.4	29.6	0.0	0.0	28.2	46.0	-17.8	H	EP	
720.028	3.0	37.6	19.6	2.6	29.5	0.0	0.0	30.4	46.0	-15.6	H	EP	
•		•				•							•

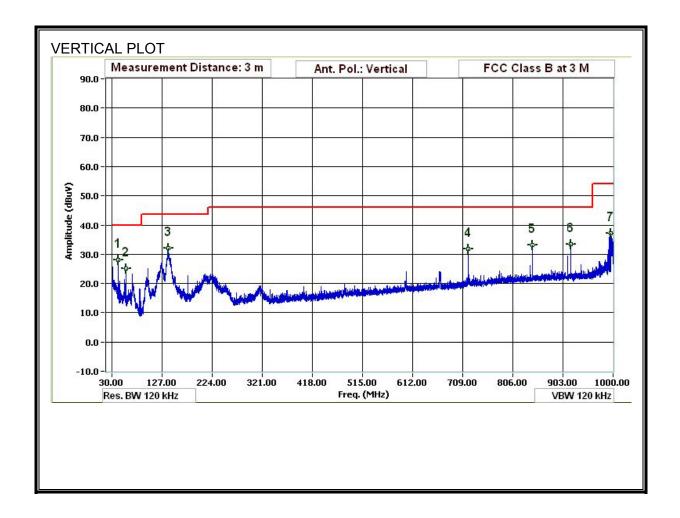
Rev. 1.27.09

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

RADIATED EMISSIONS 30 TO 1000 MHz (BATTERY CONFIGURATION, HORIZONTAL)



RADIATED EMISSIONS 30 TO 1000 MHz (BATTERY CONFIGURATION, VERTICAL)



RADIATED EMISSION DATA

30-1000MHz Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Devin Chang
Date: 10/07/09
Project #: 09U12839
Company: Sierra Wireless
EUT Description: WiMAX + WiFi Router

EUT M/N: Eagle

Mode Oper: EUT power by Battery

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	Dist	Read	AF	CL	Amp	D Corr	Filter	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
MHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
41.760	3.0	44.1	13.0	0.6	29.6	0.0	0.0	28.0	40.0	-12.0	V	EP	
56.881	3.0	46.1	7.9	0.7	29.6	0.0	0.0	25.0	40.0	-15.0	V	EP	
139.565	3.0	47.1	13.2	1.1	29.4	0.0	0.0	32.0	43.5	-11.5	V	EP	
720.028	3.0	39.0	19.6	2.6	29.5	0.0	0.0	31.7	46.0	-14.3	V	EP	
843.994	3.0	37.8	21.2	2.9	28.9	0.0	0.0	33.1	46.0	-12.9	V	EP	
918.517	3.0	37.2	21.7	3.0	28.5	0.0	0.0	33.4	46.0	-12.6	V	EP	
995.200	3.0	39.8	22.5	3.2	28.4	0.0	0.0	37.2	54.0	-16.8	V	EP	
41.160	3.0	41.9	13.4	0.6	29.6	0.0	0.0	26.2	40.0	-13.8	H	EP	
135.964	3.0	40.6	13.4	1.0	29.4	0.0	0.0	25.7	43.5	-17.8	H	EP	
229.688	3.0	46.4	11.9	1.4	28.8	0.0	0.0	30.8	46.0	-15.2	H	EP	
360.014	3.0	37.7	14.3	1.8	29.1	0.0	0.0	24.8	46.0	-21.2	H	EP	
480.019	3.0	37.2	16.4	2.1	29.6	0.0	0.0	26.1	46.0	-19.9	H	EP	
600.024	3.0	37.4	18.3	2.4	29.6	0.0	0.0	28.4	46.0	-17.6	H	EP	
719.908	3.0	34.8	19.6	2.6	29.5	0.0	0.0	27.5	46.0	-18.5	H	EP	
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Rev. 1.27.09

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

7.1.2. RADIATED EMISSIONS ABOVE 1GHz

SPURIOUS RADIATED EMISSIONS ABOVE 1000MHz (WORST-CASE CONFIGURATION)

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Devin Chang
Date: 10/09/09
Project #: 09U12839
Company: Sierra Wireless
EUT Description: WiMAX + WiFi Router

EUT M/N: Eagle

Mode Oper: above 1GHz spurious emission

 f
 Measurement Frequency Amp
 Preamp Gain
 Average Field Strength Limit

 Dist
 Distance to Antenna
 D Corr
 Distance Correct to 3 meters
 Peak Field Strength Limit

 Read
 Analyzer Reading
 Avg
 Average Field Strength @ 3 m
 Margin vs. Average Limit

 AF
 Antenna Factor
 Peak
 Calculated Peak Field Strength
 Margin vs. Peak Limit

 CL
 Cable Loss
 HPF
 High Pass Filter

f	Dist	Read	AF	CL	Amp	D Corr	Fltr	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
GHz	(m)	dBuV	dB/m	dB	dΒ	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
1.330	3.0	58.1	25.2	2.7	-35.9	0.0	0.0	50.1	74.0	-24.0	V	P	
1.330	3.0	38.3	25.2	2.7	-35.9	0.0	0.0	30.3	54.0	-23.7	V	A	
1.596	3.0	56.5	26.1	3.0	-35.7	0.0	0.0	49.9	74.0	-24.1	V	P	
1.596	3.0	36.2	26.1	3.0	-35.7	0.0	0.0	29.6	54.0	-24.4	V	A	
6.000	3.0	42.1	33.8	6.5	-34.9	0.0	0.0	47.6	74.0	-26.4	V	P	
6.000	3.0	37.4	33.8	6.5	-34.9	0.0	0.0	42.9	54.0	-11.1	V	A	
1.330	3.0	52.8	25.2	2.7	-35.9	0.0	0.0	44.8	74.0	-29.2	H	P	
1.330	3.0	35.4	25.2	2.7	-35.9	0.0	0.0	27.4	54.0	-26.6	H	A	
1.596	3.0	57.1	26.1	3.0	-35.7	0.0	0.0	50.6	74.0	-23.4	H	P	
1.596	3.0	34.0	26.1	3.0	-35.7	0.0	0.0	27.4	54.0	-26.6	H	A	
6.000	3.0	39.7	33.8	6.5	-34.9	0.0	0.0	45.2	74.0	-28.8	H	P	
6.000	3.0	31.9	33.8	6.5	-34.9	0.0	0.0	37.4	54.0	-16.6	H	A	
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Rev. 4.1.2.7

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

7.2. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.4 and CAN/CSA-CEI/IEC CISPR 22:02 as referenced by ICES-003 Issue 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 μ H/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	Limit	s (dBµV)
(MHz)	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.

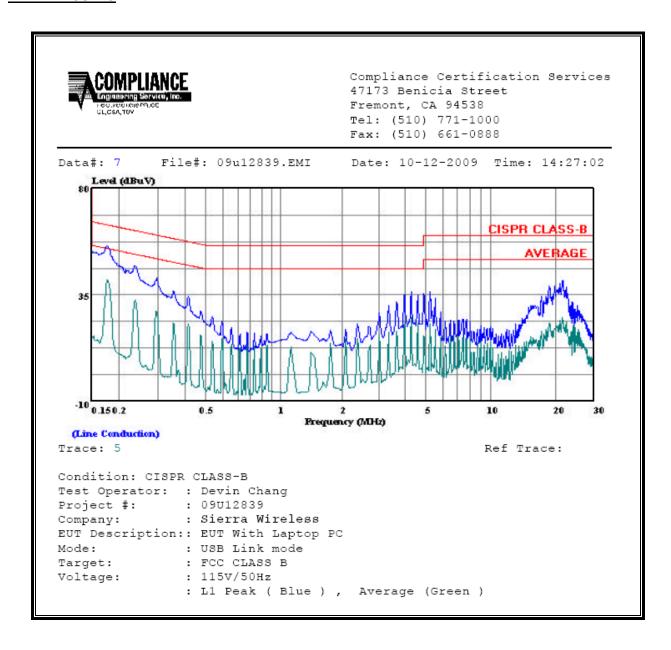
RESULTS

EUT With Laptop Via USB Cable Link Mode:

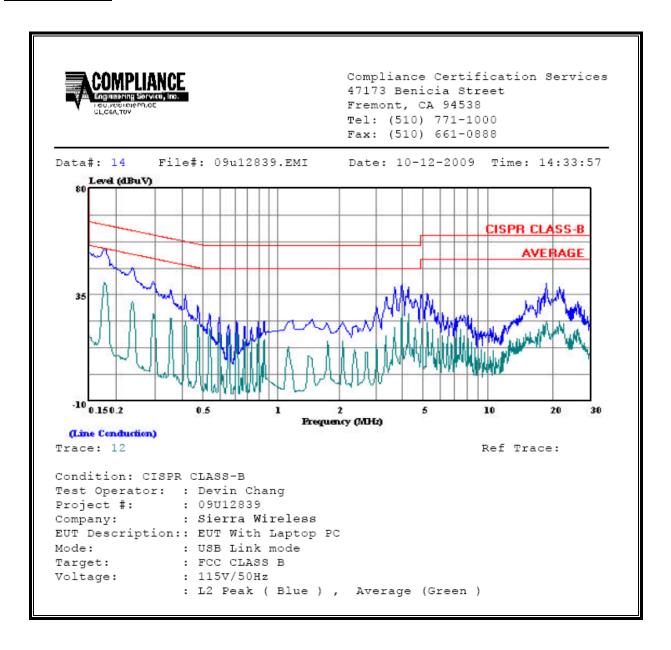
6 WORST EMISSIONS

	CONDUCTED EMISSIONS DATA (115VAC 60Hz)												
Freq.		Reading		Closs	Limit	FCC_B	Margin		Remark				
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1/L2				
0.18	55.75		41.05	0.00	64.63	54.63	-8.88	-13.58	L1				
4.38	36.25		25.54	0.00	56.00	46.00	-19.75	-20.46	L1				
21.49	41.04		25.40	0.00	60.00	50.00	-18.96	-24.60	L1				
0.18	54.23		40.35	0.00	64.63	54.63	-10.40	-14.28	L2				
0.24	45.94		32.15	0.00	62.17	52.17	-16.23	-20.02	L2				
4.38	39.49		27.20	0.00	56.00	46.00	-16.51	-18.80	L2				
6 Worst	Data												

LINE 1 RESULTS



LINE 2 RESULTS

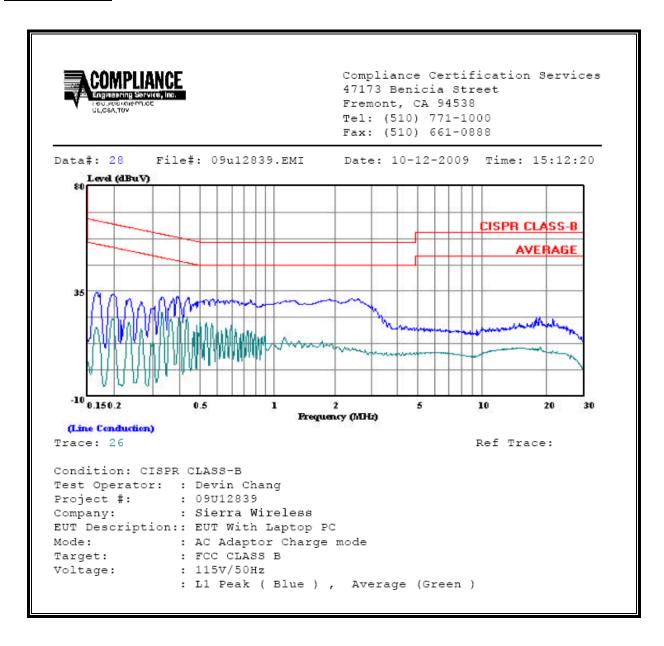


EUT With AC Adaptor Mode:

6 WORST EMISSIONS

	CONDUCTED EMISSIONS DATA (115VAC 60Hz)												
Freq.		Reading		Closs	Limit	FCC_B	Marg	Remark					
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1/L2				
0.20	33.69		23.00	0.00	63.74	53.74	-30.05	-30.74	L1				
0.23	31.55	_	21.64	0.00	62.31	52.31	-30.76	-30.67	L1				
0.33	32.60	_	25.82	0.00	59.35	49.35	-26.75	-23.53	L1				
0.16	44.30		29.26	0.00	65.62	55.62	-21.32	-26.36	L2				
0.19	40.18		28.00	0.00	64.08	54.08	-23.90	-26.08	L2				
0.64	37.97		27.68	0.00	56.00	46.00	-18.03	-18.32	L2				
6 Worst	Data												

LINE 1 RESULTS



LINE 2 RESULTS

