

FCC CFR47 PART 27 SUBPART M CERTIFICATION TEST REPORT

FOR

USB MODEM

MODEL NUMBER: AC250U

FCC ID: N7NAC250U

REPORT NUMBER: 09U12929-3 Revision A2

ISSUE DATE: May 5, 2010

Prepared for

SIERRA WIRELESS INC. 2200 FARADAY AVENUE, SUITE 150 CALIFORNIA 92008, USA

Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
	12/15/2009	Initial Issue	T. Chan
A	03/08/2010	Verified Output Power At Antenna 2 Port	T. Chan
A1	05/03/2010	Revised section 5.3 and section 8.1.1 based upon FCC comments	T. Chan
A2	05/05/2010	Revised section 5.3 and section 8.1.1	T. Chan

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SIERRA WIRELESS INC.

2200 FARADAY AVENUE, SUITE 150.

CARLSBAD, CA 92008, U.S.A.

EUT DESCRIPTION: USB MODEM

MODEL: AC250U

SERIAL NUMBER: 3

DATE TESTED: NOVEMBER 19-DECEMBER 07, 2009 and MARCH 08, 2010

APPLICABLE STANDARDS

STANDARD TEST RESULTS

FCC PART 27 SUBPART M 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:

THU CHAN EMC MANAGER

COMPLIANCE CERTIFICATION SERVICES

CHIN PANG EMC ENGINEER

Chin Pany

COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA/EIA 603C (2004), FCC CFR 47 Part 2, FCC CFR 47 Part 27M.

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 Multi band wireless modem operating on CDMA2000 1xRTT, EVDO and WiMax networks. The USB modem is manufactured by Sierra Wireless.

5.2. **MAXIMUM OUTPUT POWER**

The transmitter has a maximum EIRP as follows:

Mode	Channel	Frequency	EIRP	EIRP
	Chamilei	(MHz)	(dBm)	(mW)
5MHz QPSK	Mid	2498.5	25.70	371.54
5MHz 16QAM	Low	2498.5	25.10	323.59
10MHz QPSK	Low	2501	24.50	281.84
10MHz 16QAM	Mid	2501	24.50	281.84

Only the highest EIRP for each channel BW and modulation is listed above. Measured EIRP for L/M/H channel for each channel BW and modulation is documented in section 8.1.1 of test report.

5.3. **DESCRIPTION OF AVAILABLE ANTENNAS**

The radio is equipped with ANT#1 (Printed PIFA) and ANT#2 (Reciprocal Notch) integrated monopole antennas, with the maximum peak gain of 2.12dBi. ANT#1 and ANT#2 are TX/RX diversity antenna. ANT#1 and ANT#2 cannot transmit simultaneously.

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was 4.0 Beceem Diagnostic Control Panel Version 3.4.0.

5.5. **WORST-CASE CONFIGURATION AND MODE**

The worst-case channel is determined as the channel with the highest output power.

There are two ports as indicated antenna1 and antenna2, based on the RF conducted output power test results, the antenna 1 has the higher output power than antenna 2; therefore all tests were performed at antenna 1 port.

To determine the worst-case, the EUT was investigated at X, Y and Z Positions, and the worst position is at Y position for 5MHZ and 10MHz Band.

REPORT NO: 09U12929-3A2 DATE: May 05, 2010 FCC ID: N7NAC250U **EUT: USB MODEM**

DESCRIPTION OF TEST SETUP 5.6.

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST						
Description Manufacturer Model Serial Number FCC ID						
Laptop	ZZ89085	DoC				
AC Adapter IBM 92P1158 570002150B DoC						

I/O CABLES (RF CONDUCTED TEST)

	I/O CABLE LIST						
Cable No.	Port	# of Identica Ports			Cable Length	Remarks	
1	AC	3	US 115V	Un-shielded	1m	NA	
2	DC	1	DC	Un-shielded	2m	NA	
3	USB	1	EUT	Un-shielded	0.2m	NA	
4	Antenna Port	1	Spectrum Analyzer	Un-shielded	0.1m	NA	
5	RF In/Out	1	Antenna	Un-shielded	None	NA	

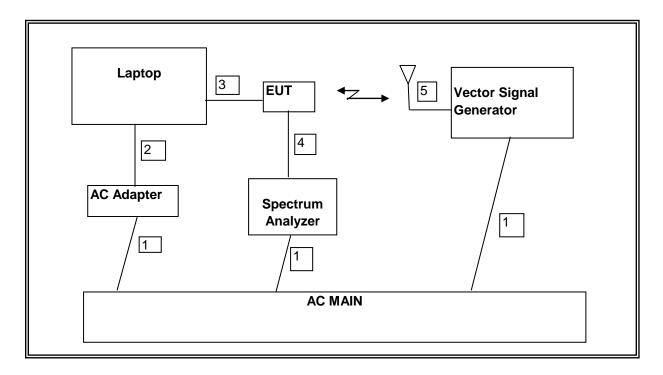
I/O CABLES (RF RADIATED TEST)

	I/O CABLE LIST					
Cable No.						Remarks
1	AC	1	US 115V	Un-shielded	1.2m	NA
2	DC	1	DC	Un-shielded	2m	NA
3	USB	1	EUT	Un-shielded	None	NA
4	RF In/Out	1	Antenna	Un-shielded	None	NA

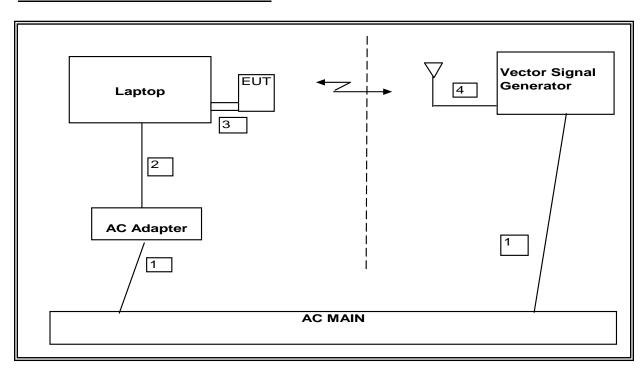
TEST SETUP

The EUT is connected to the host laptop computer via USB cable during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR RF CONDUCTED TESTS



SETUP DIAGRAM FOR RDIATED TESTS



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	C01052	07/06/10		
Antenna, Horn, 18 GHz	EMCO	3115	C00945	08/04/10		
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	07/29/10		
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01179	08/24/10		
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		
Power Meter	Agilent / HP	437B	N02778	08/04/10		
Power Sensor, 18 GHz	Agilent / HP	8481A	N02782	07/28/11		
Highpass Filter, 4.0 GHz	Micro-Tronics	HPM13351	N02708	N/A		
Vector Signal Generator	Agilent / HP	E4438C	None	09/28/11		

7. LIMITS AND RESULTS

7.1. ANTENNA PORT TEST RESULTS

7.1.1. 26 dB and 99% BANDWIDTH

LIMITS

§2.1049 & §27.53 (m)(6)

TEST PROCEDURE

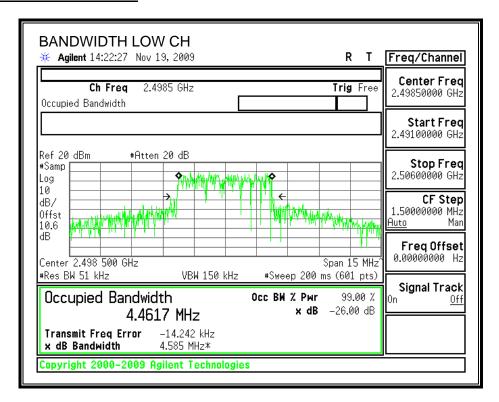
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

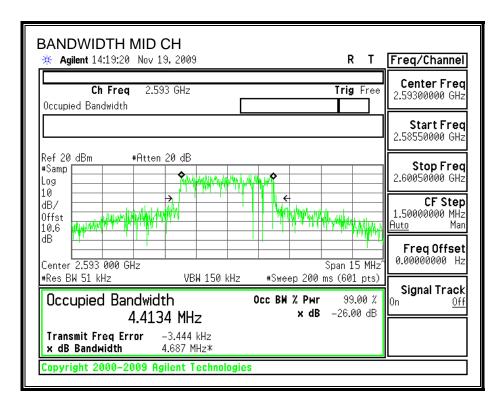
RESULTS

Mode	Channel	Frequency	26 dB Bandwidth	99% Bandwidth
Wiode	Chamilei	(MHz)	(MHz)	(MHz)
	Low	2498.5	4.585	4.4617
5MHz QPSK	Middle	2593	4.687	4.4134
	High	2687.5	4.734	4.3989
	Low	2498.5	4.600	4.3831
5MHz 16QAM	Middle	2593	4.852	4.4469
	High	2687.5	4.796	4.4050
	Low	2501	9.513	9.1018
10MHz QPSK	Middle	2593	9.625	9.0713
	High	2685	9.603	9.0754
	Low	2501	9.359	9.1003
10MHz 16QAM	Middle	2593	9.366	9.0494
	High	2685	9.608	9.0872

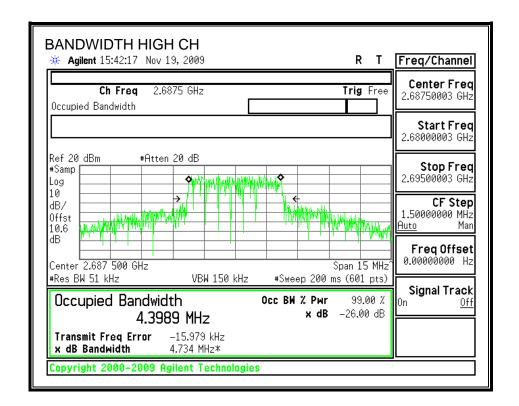
5MHz_QPSK

26 dB and 99% BANDWIDTH



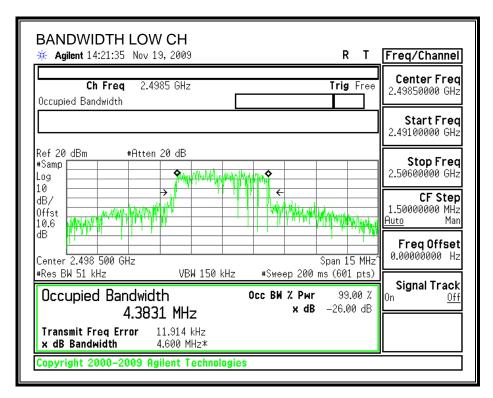


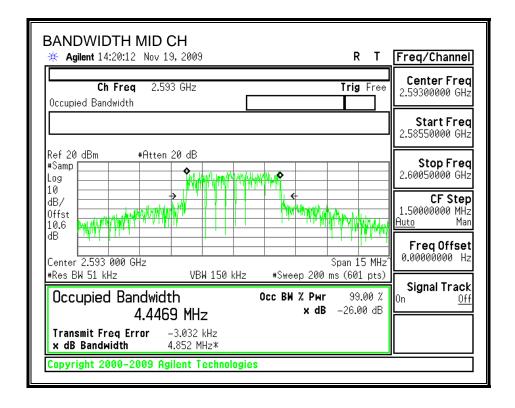
REPORT NO: 09U12929-3A2 EUT: USB MODEM



5MHz_16QAM

26 dB and 99% BANDWIDTH





REPORT NO: 09U12929-3A2 EUT: USB MODEM

Occupied Bandwidth

Transmit Freq Error x dB Bandwidth

4.4045 MHz

Copyright 2000-2009 Agilent Technologies

-17.327 kHz

4.796 MHz*

Occ BW % Pwr

x dB

99.00 %

-26.00 dB

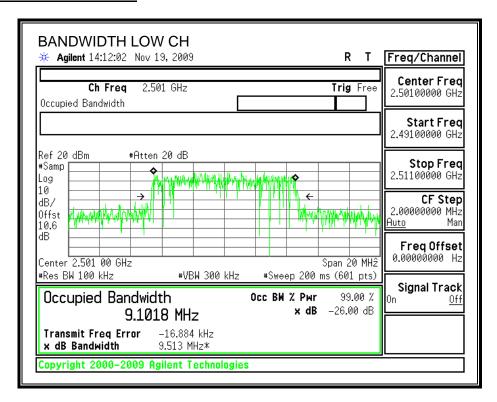
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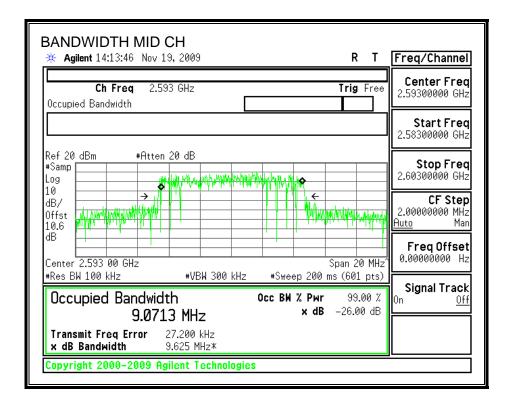
DATE: May 05, 2010

FCC ID: N7NAC250U

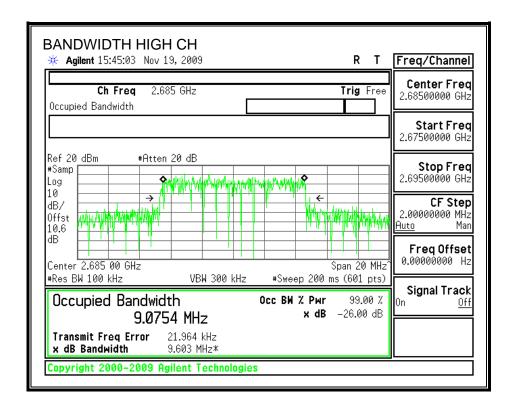
10MHz_QPSK

26 dB and 99% BANDWIDTH



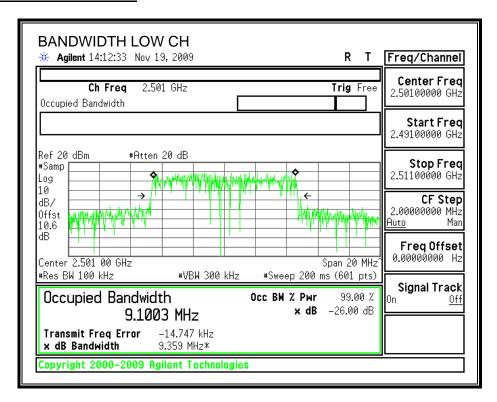


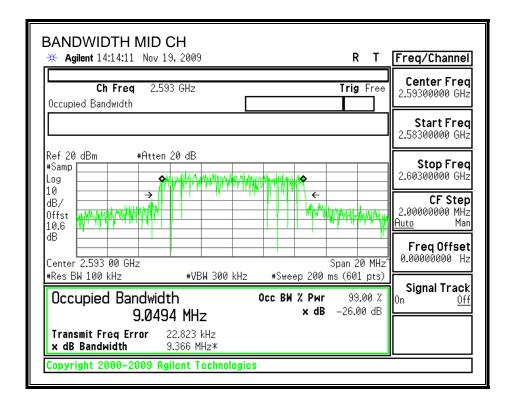
REPORT NO: 09U12929-3A2 EUT: USB MODEM

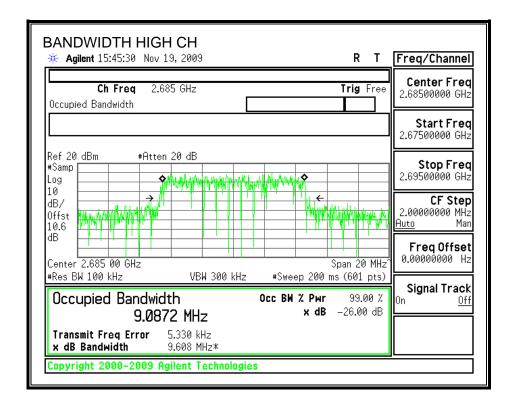


10MHz_16QAM

26 dB and 99% BANDWIDTH







7.1.2. RF POWER OUTPUT AT THE ANTENNA TERMINALS

LIMITS

§2.1046 & §27.50 (h)(2) Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 2.2.17 and §27.50 (i)

RESULTS

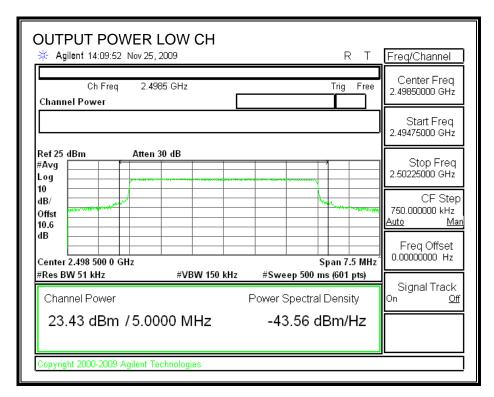
RF Conducted @ Antenna 1Port :

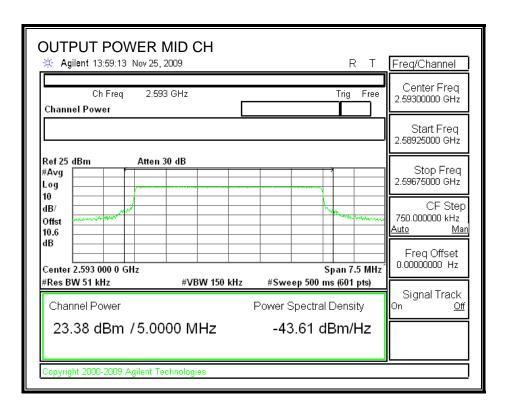
Mode	Test Vector file name	Channel	Frequency (MHz)	Output powe (dBm)	Output powe (mW)
		Low	2498.5	23.43	220.29
5MHz QPSK	T5D29U184Q12S85	Middle	2593	23.38	217.77
		High	2687.5	23.40	218.78
	T5D29U1816Q34S85	Low	2498.5	23.40	218.78
5MHz 16QAM		Middle	2593	23.21	209.41
		High	2687.5	23.37	217.27
		Low	2501	23.29	213.30
10MHz QPSK	T10D29U184Q12S175	Middle	2593	22.93	196.34
		High	2685	23.20	208.93
		Low	2501	23.24	210.86
10MHz 16QAM	T10D29U1816Q12S175	Middle	2593	22.91	195.43
		High	2685	23.10	204.17

RF Conducted @ Antenna 2 Port :

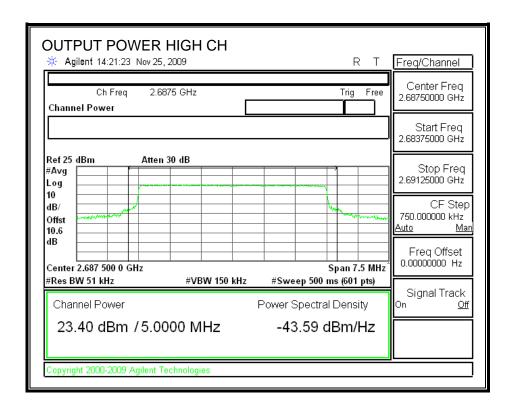
Mode	Test Vector file name	Channel	Frequency (MHz)	Output powe (dBm)	Output powe (mW)
		Low	2498.5	22.84	192.31
5MHz QPSK	T5D29U184Q12S85	Middle	2593	22.57	180.72
		High	2687.5	23.25	211.35
5MHz 16QAM	T5D29U1816Q34S85	Low	2498.5	22.81	190.99
		Middle	2593	22.49	177.42
		High	2687.5	23.17	207.49
		Low	2501	22.52	178.65
10MHz QPSK	T10D29U184Q12S175	Middle	2593	22.15	164.06
		High	2685	22.90	194.98
		Low	2501	22.46	176.20
10MHz 16QAM	T10D29U1816Q12S175	Middle	2593	22.11	162.55
		High	2685	22.96	197.70

5MHz_QPSK (Antenna 1)

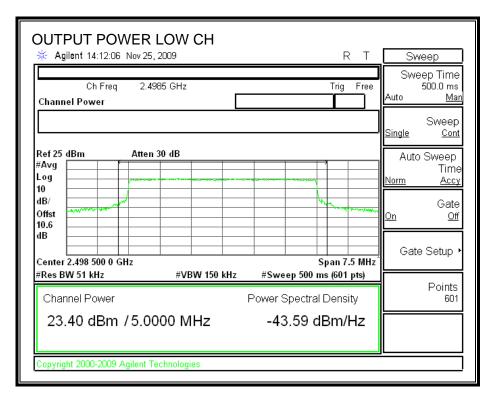


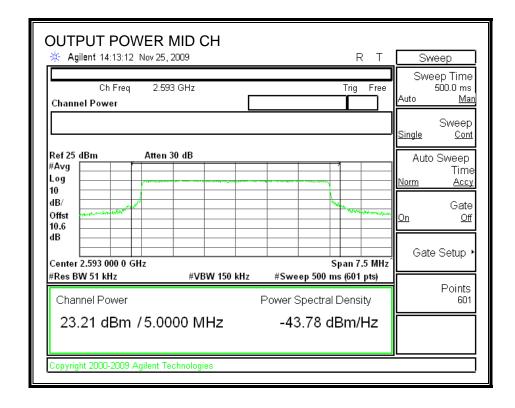


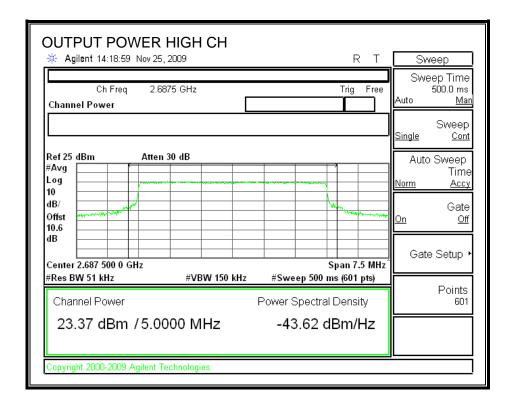
DATE: May 05, 2010 **EUT: USB MODEM** FCC ID: N7NAC250U



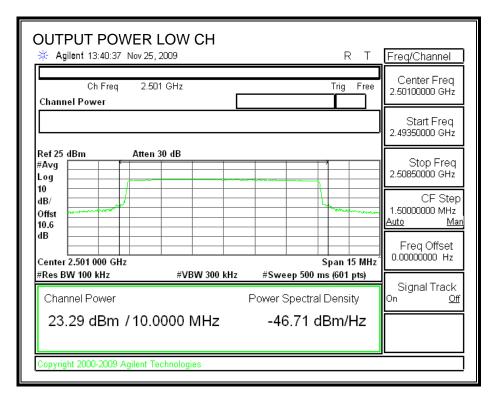
5MHz_16QAM

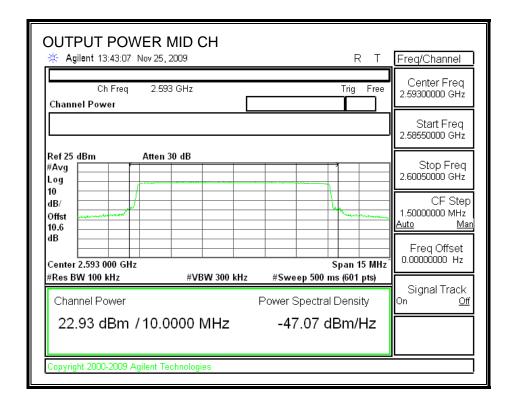


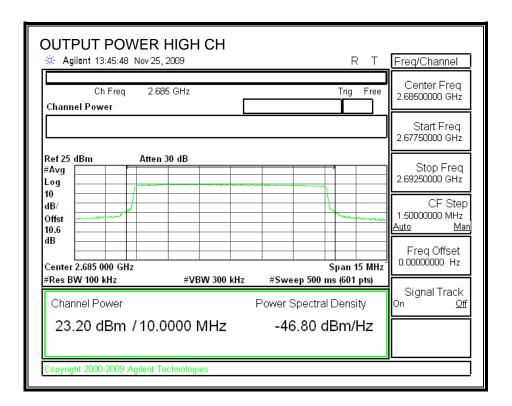




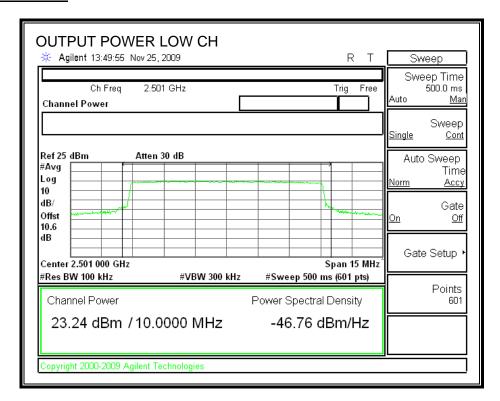
10MHz_QPSK

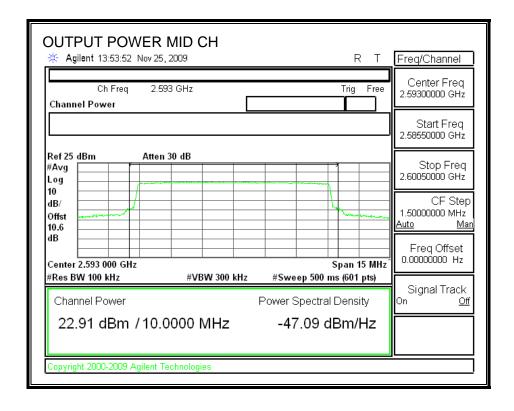




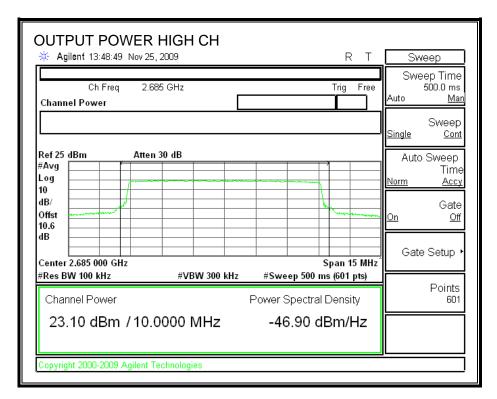


10MHz_16QAM

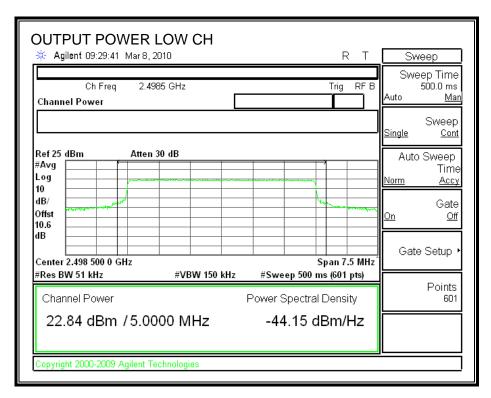


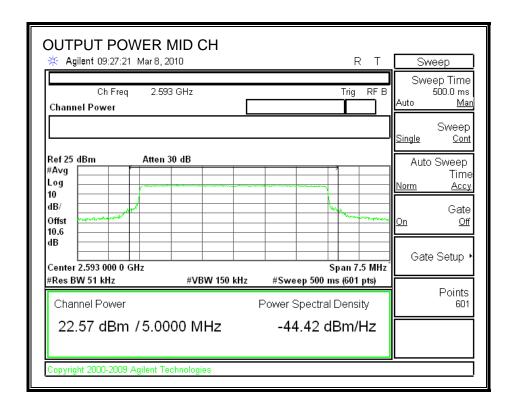


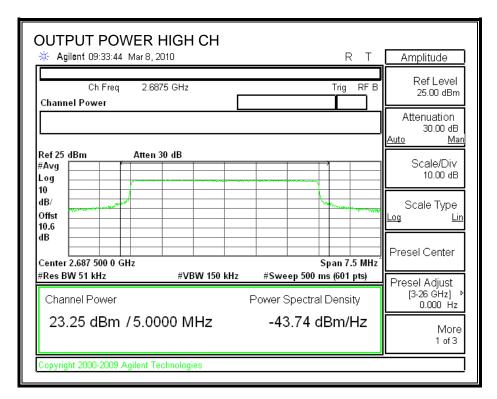
DATE: May 05, 2010 FCC ID: N7NAC250U **EUT: USB MODEM**



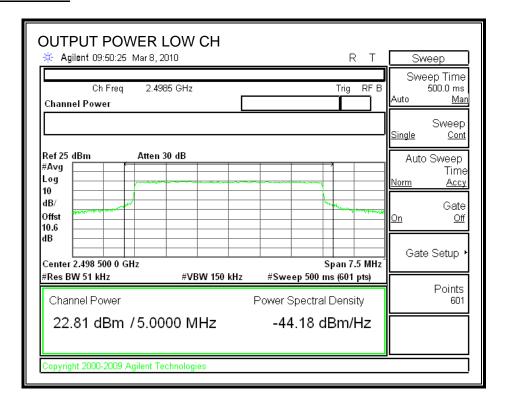
5MHz_QPSK (Antenna 2)

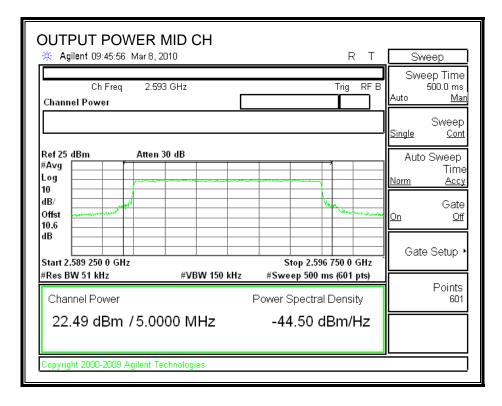


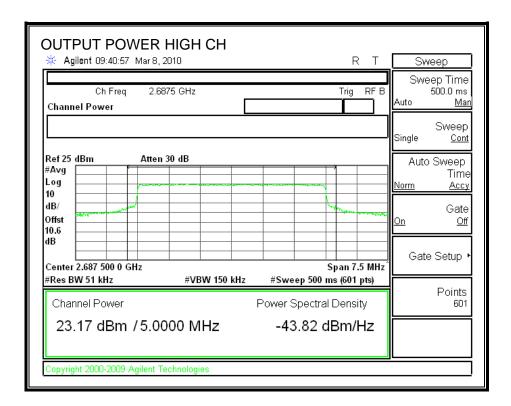




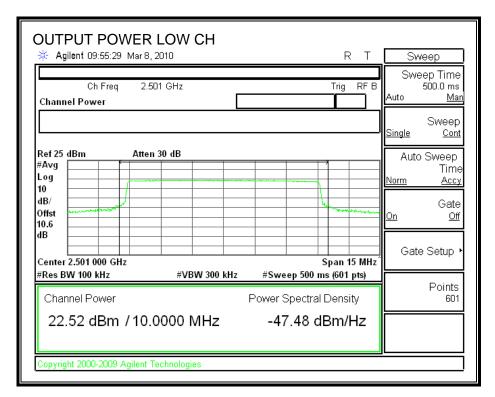
5MHz_16QAM

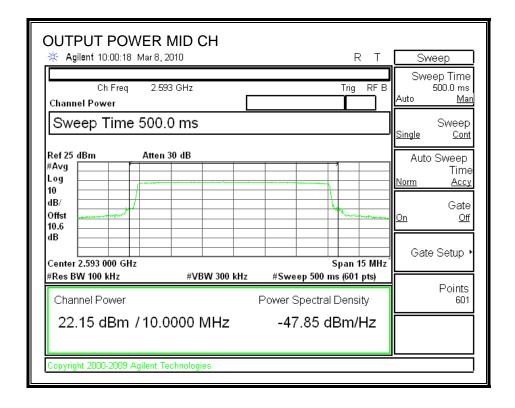


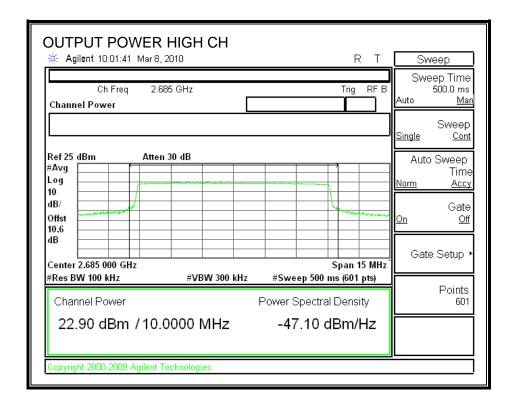




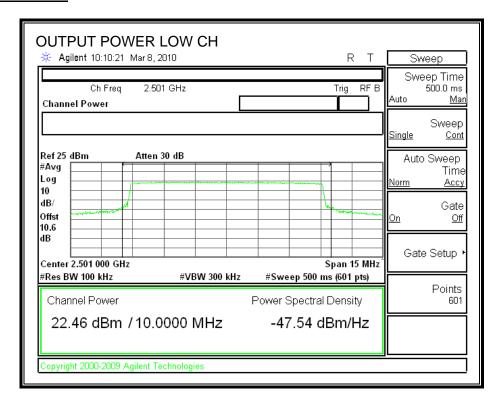
10MHz_QPSK

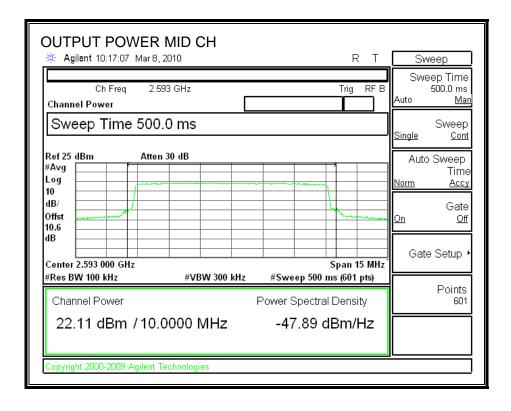


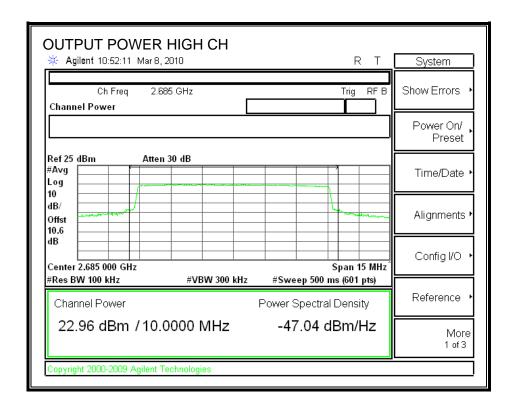




10MHz_16QAM







7.1.3. LIMITS OF CHANNEL EDGE

LIMITs

§2.1051

 $\S27.53$ (m)(4)(6) For mobile digital stations, the attenuation factor shall be not less than 43 + 10 log (P) dB at the channel edge, the limit of emission equal to -13dBm, and 55 + 10 log (P) dB at 5.5 megahertz from the channel edges, the limit of emission equal to -25dBm.

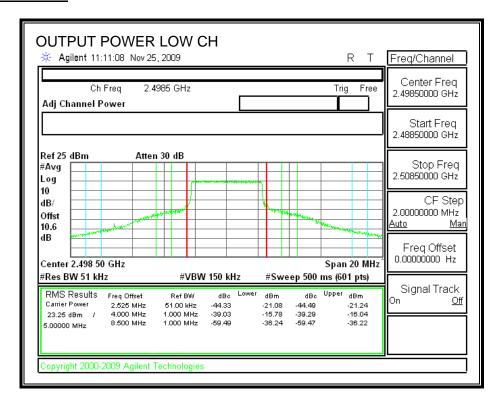
TEST PROCEDURE

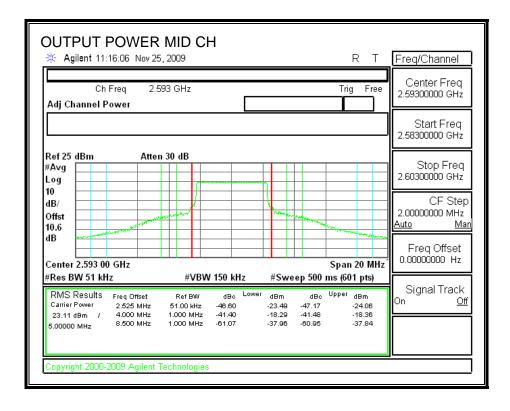
ANSI / TIA / EIA 603 Clause 3.2.12

RESULTS

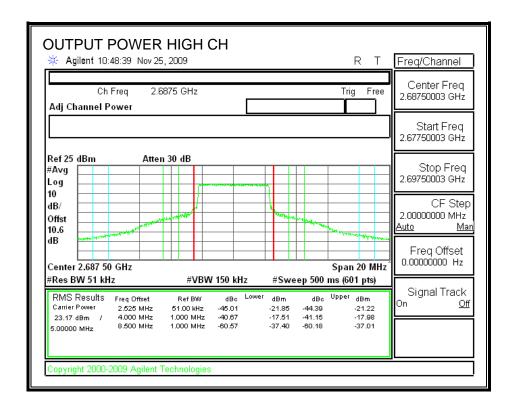
5MHz_QPSK

OUTPUT POWER



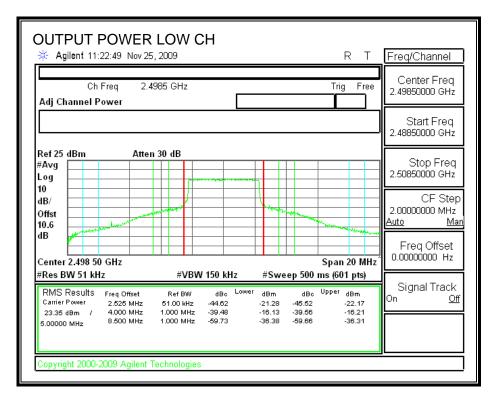


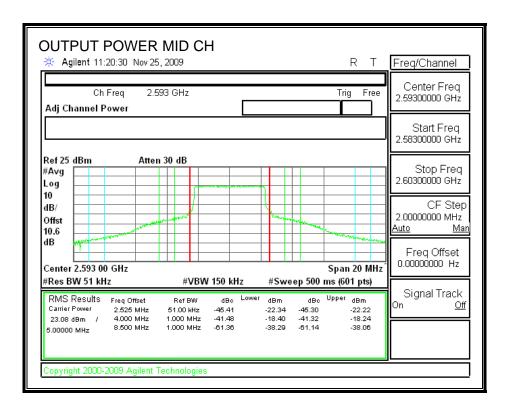
REPORT NO: 09U12929-3A2

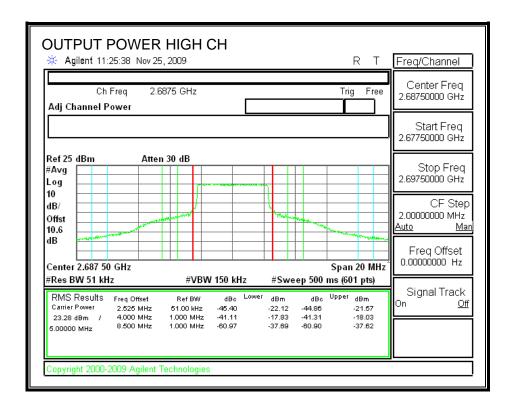


5MHz_16QAM

OUTPUT POWER

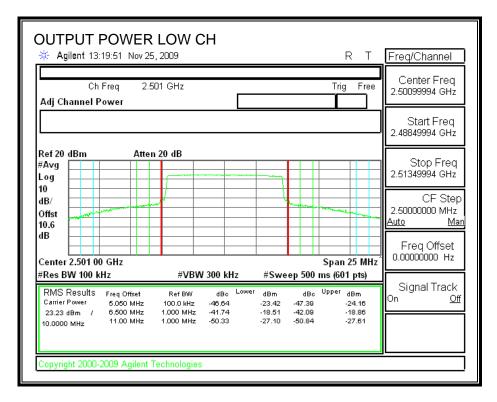


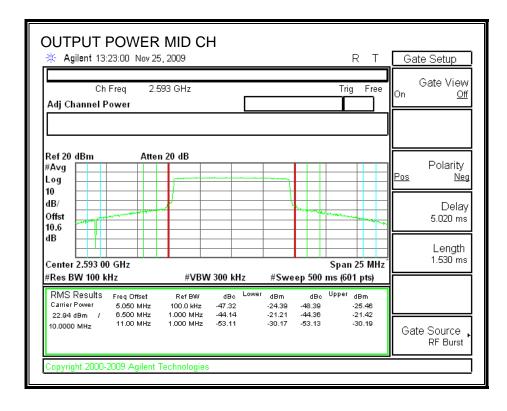




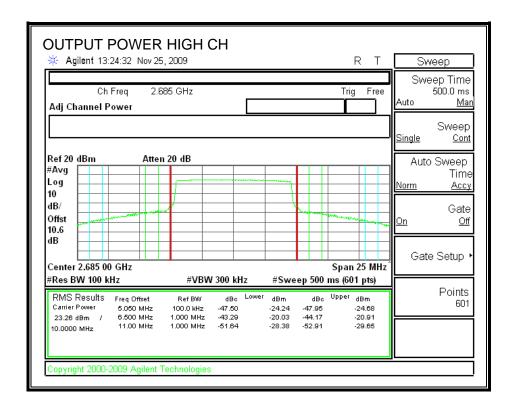
10MHz_QPSK

OUTPUT POWER



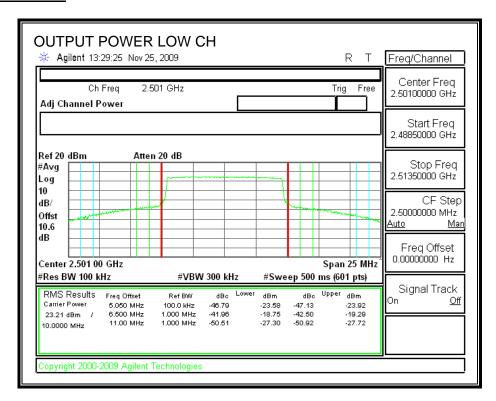


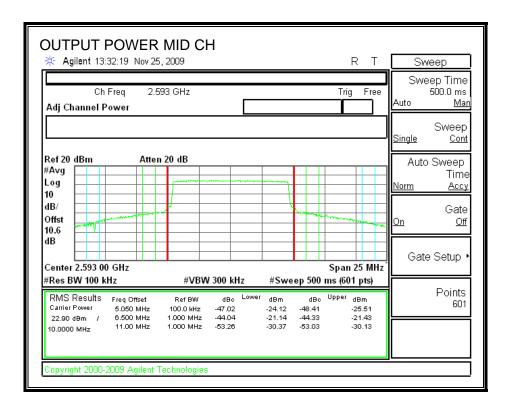
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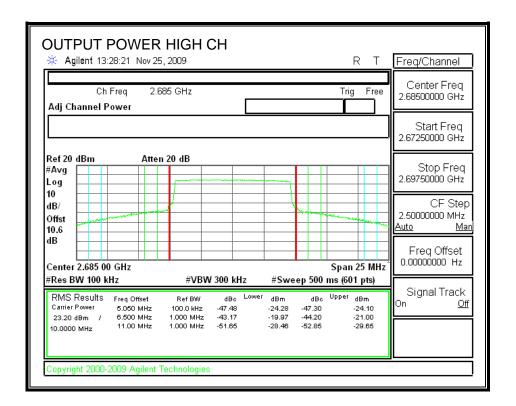
10MHz_16QAM

OUTPUT POWER





REPORT NO: 09U12929-3A2



7.1.4. CONDUCTED SPURIOUS EMISSIONS

LIMIT

§2.1051

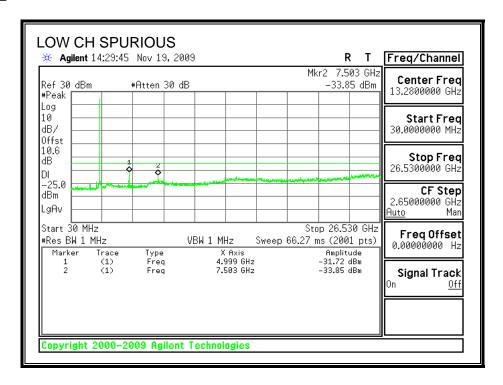
 $\S27.53$ (m)(4)(6) For mobile digital stations, the attenuation factor shall be not less than 43 + 10 log (P) dB at the channel edge and 55 + 10 log (P) dB at 5.5 megahertz from the channel edges.

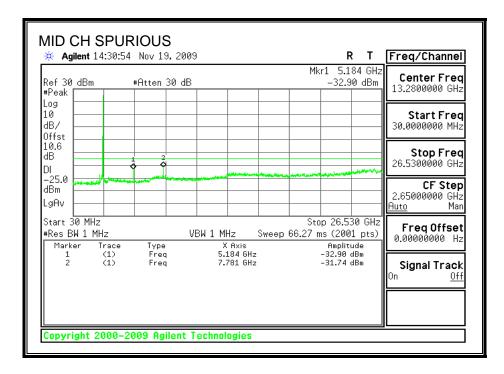
TEST PROCEDURE

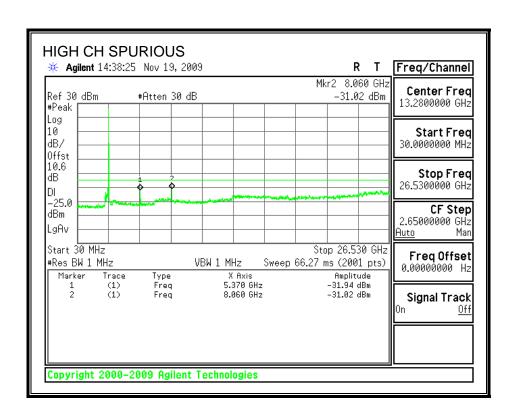
ANSI / TIA / EIA 603 Clause 3.2.12 & FCC 27

RESULTS

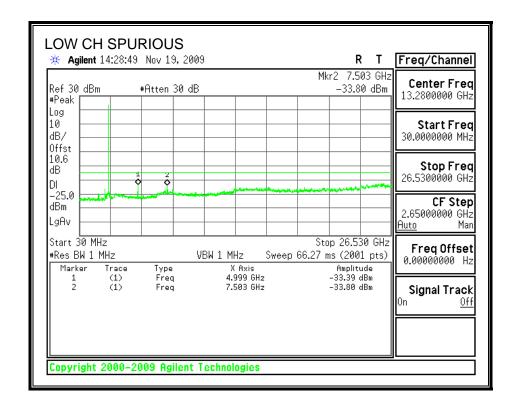
5MHz QPSK

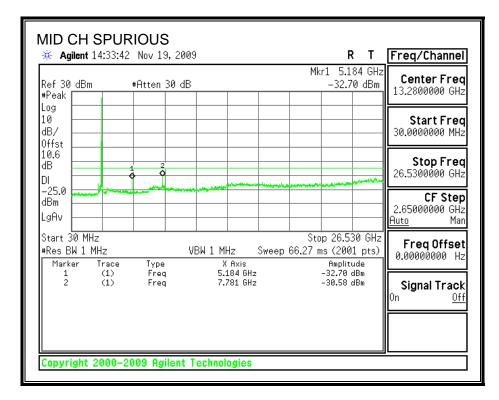


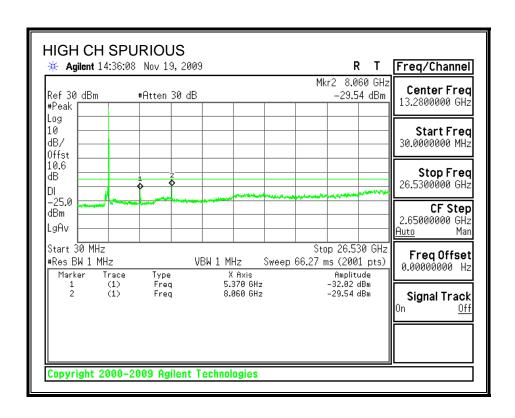




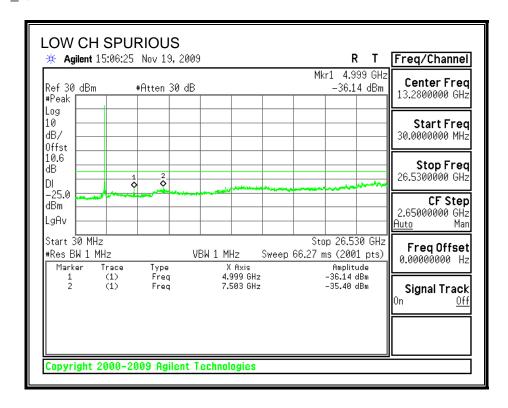
5MHz_16QAM

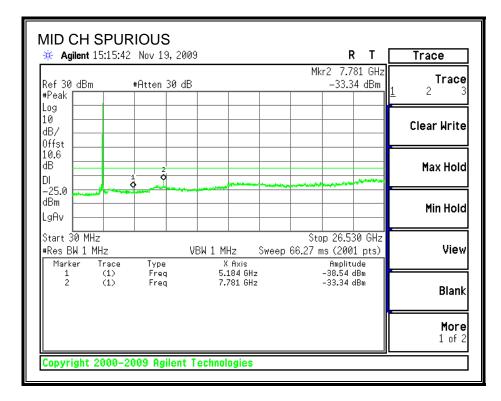


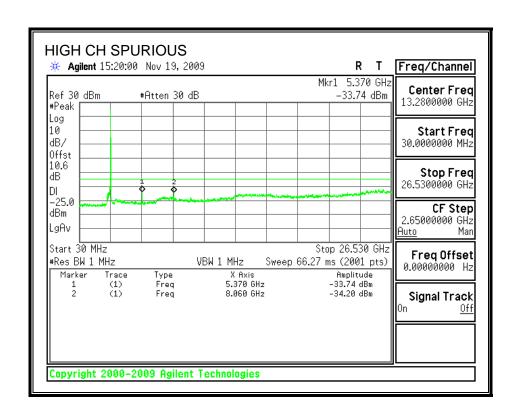




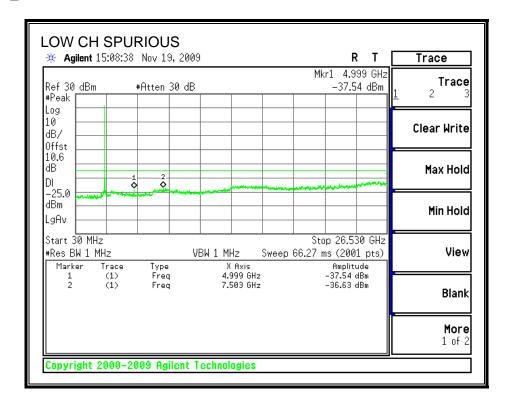
10MHz_QPSK

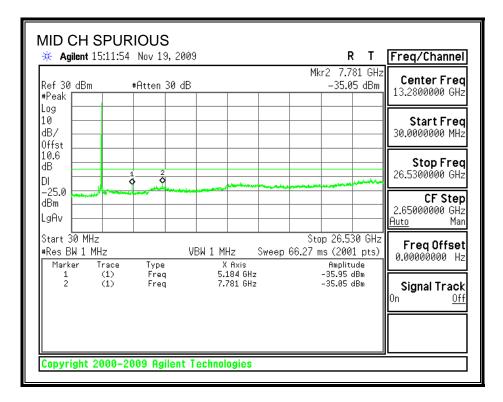


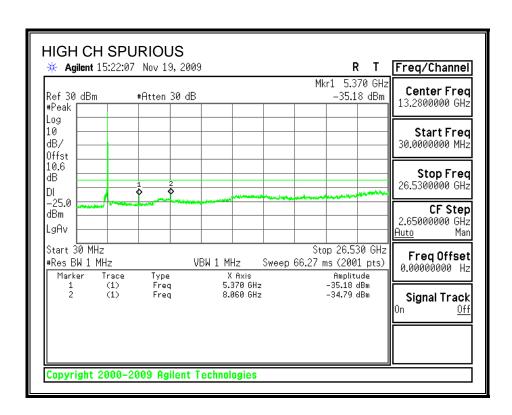




10MHz_16QAM







7.1.5. FREQUENCY STABILITY MEASUREMENT

<u>LIMIT</u>

§27.54 & 2.1055 Frequency stability.

Manufacturers of wireless medical telemetry devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all of the manufacturer's specified conditions.

TEST PROCEDURE

ANSI / TIA / EIA 603C Clause 2.3.1 and 2.3.2

TEST RESULTS

	Refe	rence Frequency:	2593.0203	MHz @ 20°C
	L	.imit: ± 20 ppm =	51860	Hz
Power Supply	Environment	Frequency Deviation Measureed wit		ith Time Elapse
(VAC)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)
115.00	50	2593.057337	-14.291	
115.00	40	2593.051566	-12.065	
115.00	30	2593.042851	-8.705	
115.00	20	2593.020280	0.000	Within the
115.00	10	2592.999518	8.007	authorized
115.00	0	2593.005958	5.523	frequency band
115.00	-10	2593.012353	3.057	
115.00	-20	2593.018769	0.583	
115.00	-30	2593.023614	-1.286	
97.75	20	2593.05273	-12.514	Within the authorized
132.25	20	2593.05159	-12.075	frequency band

8. RADIATED TEST RESULTS

8.1.1. RADIATED OUTPUT POWER (EIRP)

LIMITS

§2.1046 & §27.50 (h)(2) Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

TEST PROCEDURE

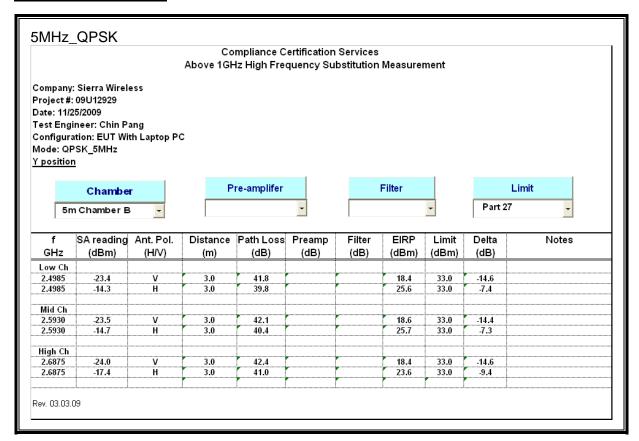
ANSI / TIA / EIA 603 Clause 2.2.17& FCC 27

RESULTS

Measurement was made with ANT#1(PIFA) transmitting.

Mode	Channel	Frequency	EIRP	EIRP	
WIOGE	Chamber	(MHz)	(dBm)	(mW)	
	Low	2498.5	25.60	363.08	
5MHz QPSK	Middle	2593	25.70	371.54	
	High	2687.5	23.60	229.09	
	Low	2498.5	25.10	323.59	
5MHz 16QAM	Middle	2593	24.80	302.00	
	High	2687.5	24.20	263.03	
	Low	2501	24.50	281.84	
10MHz QPSK	Middle	2593	24.20	263.03	
	High	2685	23.80	239.88	
	Low	2501	24.10	257.04	
10MHz 16QAM	Middle	2593	24.50	281.84	
	High	2685	23.30	213.80	

OUTPUT POWER (EIRP)

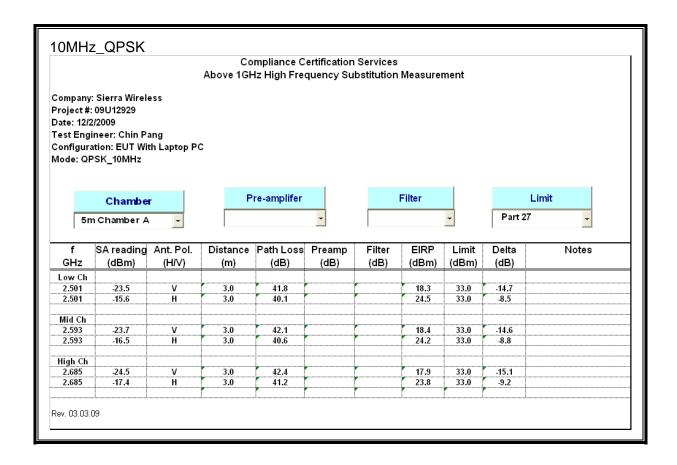


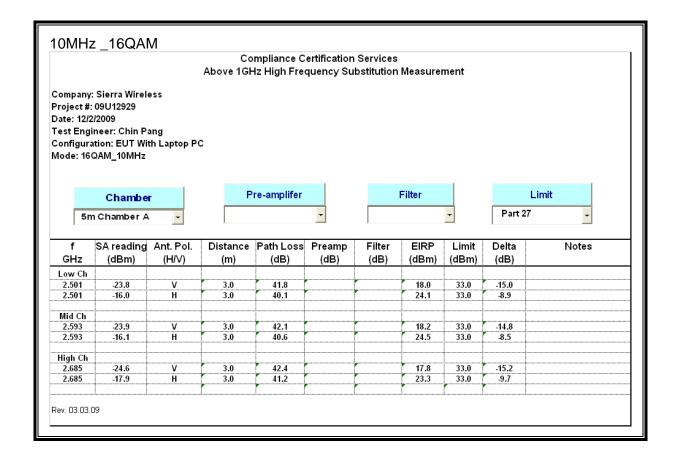
REPORT NO: 09U12929-3A2 EUT: USB MODEM

5MHz _16QAM **Compliance Certification Services** Above 1GHz High Frequency Substitution Measurement Company: Sierra Wireless Project #: 09U12929 Date: 12/2/2009 Test Engineer: Chin Pang Configuration: EUT With Laptop PC Mode: 16QAM_5MHz Y position Filter Limit Pre-amplifer Chamber Part 27 5m Chamber A f SA reading Ant. Pol. Distance Path Loss Preamp Filter EIRP Limit Delta Notes GHz (dBm) (H/V) (m) (dB) (dB) (dB) (dBm) (dBm) (dB) Low Ch 2.4985 23.7 41.8 18.1 33.0 -14.9 3.0 2.4985 -15.0 Н 3.0 40.1 25.1 33.0 -7.9 Mid Ch -23.8 3.0 42.1 18.3 33.0 -14.7 2.5930 Н 33.0 -15.8 3.0 40.6 24.8 -8.2 High Ch 42.4 33.0 -15.2 2.6875 Rev. 03.03.09

DATE: May 05, 2010

FCC ID: N7NAC250U





8.1.2. FIELD STRENGTH OF SPURIOUS RADIATION

LIMIT

§2.1053

§27.53 (m)(4) For mobile digital stations, the attenuation factor shall be not less than 43 + 10 log (P) dB at the channel edge and 55 + 10 log (P) dB at 5.5 megahertz from the channel edges.

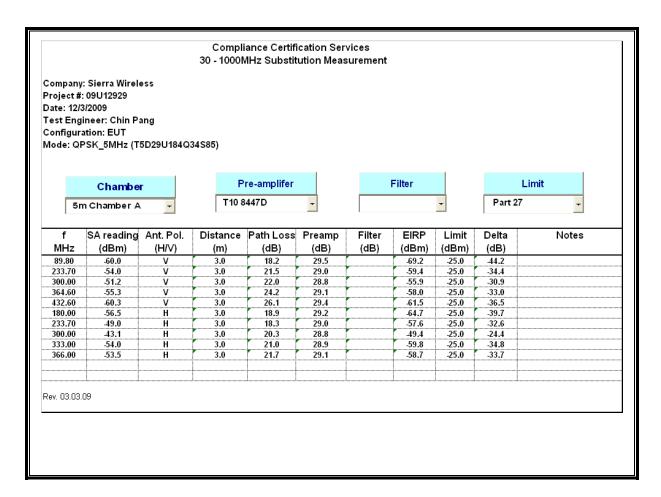
TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 3.2.12 & FCC 27

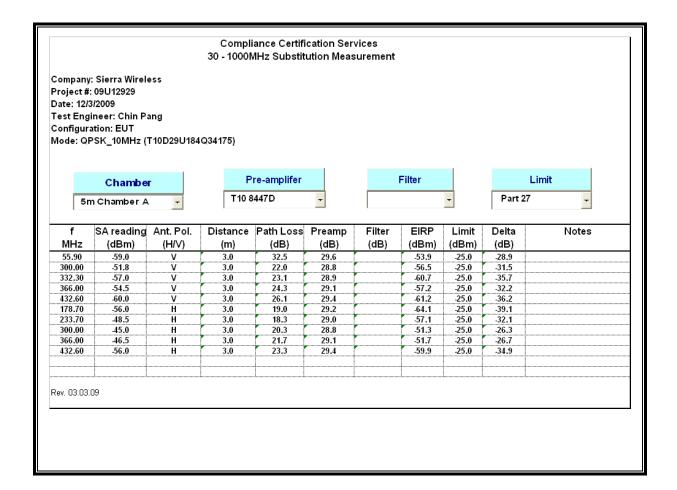
RESULTS

SPURIOUS & HARMONIC

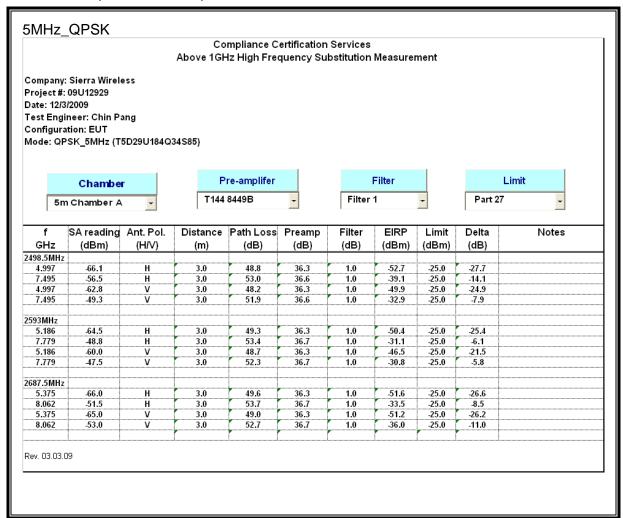
Below 1GHz at 5MHZ Bandwidth (Worst Case)

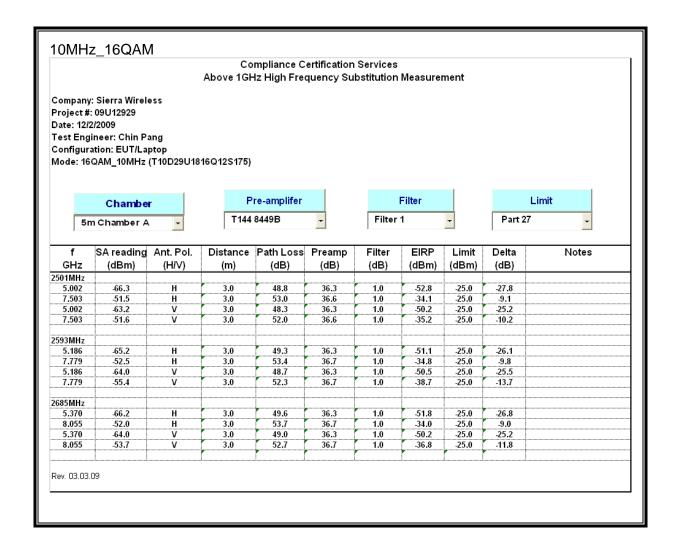


Below 1GHz at 10MHZ Bandwidth (Worst Case)



Above 1GHz (WORST CASE)





9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted I	imit (dBuV)
	Quasi-peak	Average
0.15-0.5	66 to 56 °	56 to 46 *
0.5-5	56	46
5-30	60	50

Decreases with the logarithm of the frequency.

TEST PROCEDURE

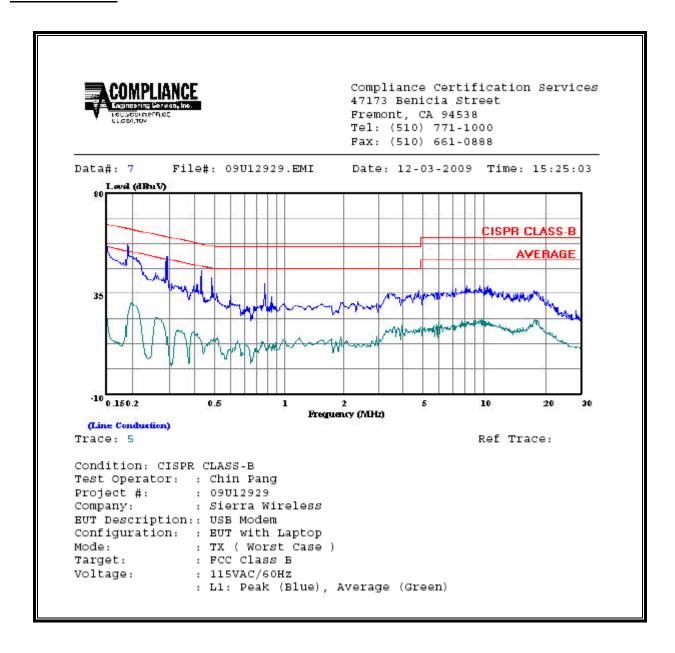
ANSI C63.4

RESULTS

6 WORST EMISSIONS

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	55.29		30.75	0.00	64.04	54.04	-8.75	-23.29	L1
0.29	51.61		24.14	0.00	60.41	50.41	-8.80	-26.27	L1
9.86	38.27		23.74	0.00	60.00	50.00	-21.73	-26.26	L1
0.20	51.33		30.78	0.00	63.61	53.61	-12.28	-22.83	L2
0.34	40.48		21.86	0.00	59.18	49.18	-18.70	-27.32	L2
18.52	36.77		23.27	0.00	60.00	50.00	-23.23	-26.73	L2
6 Worst Data									

LINE 1 RESULTS



LINE 2 RESULTS

