EMISSIONS TEST REPORT FOR A LOW POWER TRANSMITTER

I. GENERAL INFORMATION

Requirement: FCC, IC
Test Requirements: FCC Part 15
IC: RSS-Gen, RSS-210

Applicant: Novariant Inc.
5700 Northport Loop East
Fremont, CA 94538

FCC ID: TMN-WMIA-166AGI
IC: 8490A-WMIA166AGI
Model No.: WMIA-166AGI

II. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

The Novariant model WMIA-166AGI is an 802.11b/g radio module in a MiniPCI format. It will be used on Novariant manufactured mobile farm and mining machinery as part of a guidance and data communications system mounted.

III. TEST DATES AND TEST LOCATION

FCC/IC compliance testing was performed 14-15 July 2009 at

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538

T.N. Cokenias 15 August 2009
EMC Consultant/Agent for Novariant Inc.

15.203 Antenna connector requirement

The EUT was tested with two types of monopole antennas:

Antenna description	Mfr.	Model No.	Gain
Monopole (short)	Tranzeo	MA247-7	7 dBi
Monopole (long)	Comet	SF245 SPR-R	7.4 dBi

The antenna cable has a unique connector that attaches to the module.

TEST PROCEDURES

All tests were performed in accordance with the applicable procedures called out in the following documents, unless otherwise noted:

FCC 47CFR15

RSS-210 Issue 7: Low power license exempt radio frequency devices (July 2007)
RSS-Gen Issue 2; **General Requirements and Information for the Certification of Radiocommunication Equipment**

RSS-212: Test Facilities and Test Methods for Radio Equipment

ANSI C63.4 – 2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

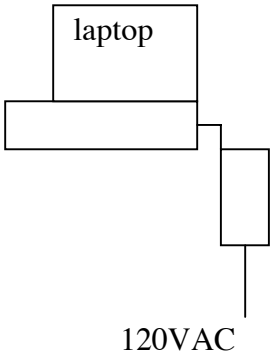
Tests were performed at three frequencies:

Channel 1(LOW) – 2412 MHz
Channel 6 (MID) – 2437 MHz
Channel 11 (HIGH) – 2462 MHz

Test Equipment

TEST EQUIPMENT LIST					
Description	Manufacturer	Model	Asset	Cal Date	Cal Due
Spectrum Analyzer, 44 GHz	*Agilent / HP*	*E4446A*	*C01159*	*11/07/08*	*02/07/10*
Peak Power Meter	*Boonton*	*4541*	*C01189*	*39828*	*40193*
Peak Power Sensor	*Boonton*	*57318*		*39846*	*40211*
Spectrum Analyzer, 44 GHz	*Agilent / HP*	*E4446A*	*C01159*	*11/07/08*	*02/07/10*
Antenna, Bilog, 2 GHz	*Sunol Sciences*	*JB1*	*C01011*	*01/14/09*	*01/14/10*
Preamplifier, 1300 MHz	*Agilent / HP*	*8447D*	*C00885*	*12/16/08*	*12/16/09*
Preamplifier, 26.5 GHz	*Agilent / HP*	*8449B*	*C01052*	*02/04/09*	*02/04/10*
Antenna, Horn, 18 GHz	*EMCO*	*3115*	*C00945*	*04/22/08*	*04/22/10*
EMI Test Receiver, 30 MHz	*R & S*	*ESHS 20*	*N02396*	*02/06/08*	*08/06/09*
LISN, 30 MHz	*FCC*	*LISN-50/250-25-2*	*N02625*	*10/29/08*	*10/29/09*

Test Set-up Diagram



Support Equipment

Equipment	Mfr	Model	Asset No.
Laptop PC	Dell	PP01L	TW-0791UH1280-OC9-6558
AC/DC adapter	CUI Inc.	DSA-60W-20	2607HB

TEST RESULTS
Radiated Test Set-up, 30-26 GHz

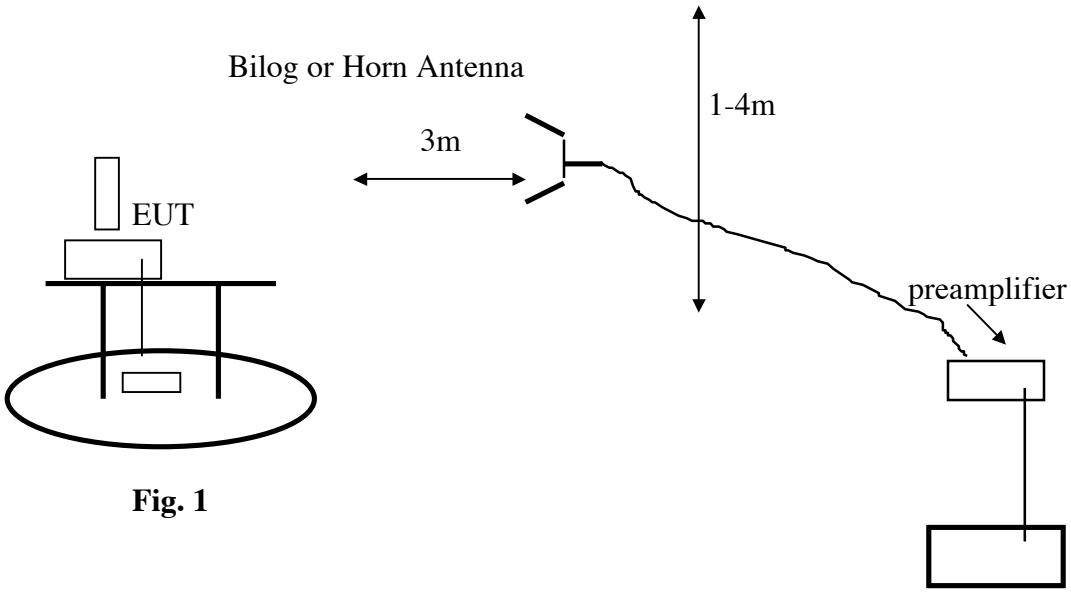


Fig. 1

Test Procedures

Radiated emissions generated by the transmitter portion of the EUT were measured.

1. The EUT was placed on a wooden table resting on a turntable on the test site.
The search antenna was placed 3m from the EUT. The EUT antenna was mounted in the with the EUT TX antenna pointed directly to the search antenna.

2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205.

3. Emissions were investigated to the 10^{th} harmonic of the fundamental.

4. Once maximum direction was determined, the search antenna was raised and lowered in both vertical and horizontal polarizations. The maximum readings so obtained are recorded in the data listed below.

Test Results: Worst-case results are presented. Refer to data sheets below. Restricted band emissions meet 54 dBuV/m. Other undesired emissions from the transmitter meet the -20 dBc requirement in 15.247(d).

15.205 Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505 (1)	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	
13.36 - 13.41	322 - 335.4		

15.209 General Field Strength Limits

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

Radiated Spurious Emissions Above 1 GHz: Large Antenna 802.11b

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: **Tom Chen**
Date: **07/13/09**
Project #: **09U12680**
Company: **Novariant**
EUT Description: **802.11b/g MiniPCI Radio Module**
FCC ID: TMN-WMIA-166AGI
Test Target:
Mode Oper: **Large Antenna**

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 GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Det. P/A/QP	Notes
b mode 2412												
4.824	3.0	37.4	32.7	5.8	-34.8	0.0	0.0	41.0	74.0	-33.0	P	Hori
4.824	3.0	28.8	32.7	5.8	-34.8	0.0	0.0	32.4	54.0	-21.6	A	Hori
b mode 2437												
4.874	3.0	36.9	32.7	5.8	-34.8	0.0	0.0	40.6	74.0	-33.4	P	Hori
4.874	3.0	28.2	32.7	5.8	-34.8	0.0	0.0	31.9	54.0	-22.1	A	Hori
b mode 2462												
4.924	3.0	37.0	32.7	5.9	-34.8	0.0	0.0	40.8	74.0	-33.2	P	Hori
4.924	3.0	29.2	32.7	5.9	-34.8	0.0	0.0	33.0	54.0	-21.0	A	Hori
b mode 2462												
4.924	3.0	44.2	32.7	5.9	-34.8	0.0	0.0	48.0	74.0	-26.0	P	Vert
4.924	3.0	41.4	32.7	5.9	-34.8	0.0	0.0	45.2	54.0	-8.8	A	Vert
b mode 2437												
4.874	3.0	43.8	32.7	5.8	-34.8	0.0	0.0	47.5	74.0	-26.5	P	Vert
4.874	3.0	41.2	32.7	5.8	-34.8	0.0	0.0	45.0	54.0	-9.0	A	Vert
b mode 2412												
4.824	3.0	43.4	32.7	5.8	-34.8	0.0	0.0	47.0	74.0	-27.0	P	Vert
4.824	3.0	40.1	32.7	5.8	-34.8	0.0	0.0	43.7	54.0	-10.3	A	Vert

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

Radiated Spurious Emissions Above 1 GHz: Large Antenna 802.11g

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: **Tom Chen**
Date: **07/13/09**
Project #: **09U12680**
Company: **Novariant**
EUT Description: **802.11 b/g MiniPCI Radio Module**
FCC ID: TMN-WMIA-166AGI
Test Target:
Mode Oper: **Large antenna**

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 GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Det. P/A/QP	Notes
g mode 2412												
4.824	3.0	38.6	32.7	5.8	-34.8	0.0	0.0	42.2	74.0	-31.8	P	Vert
4.824	3.0	25.8	32.7	5.8	-34.8	0.0	0.0	29.4	54.0	-24.6	A	Vert
g mode 2412												
4.824	3.0	35.7	32.7	5.8	-34.8	0.0	0.0	39.3	74.0	-34.7	P	Hori
4.824	3.0	23.4	32.7	5.8	-34.8	0.0	0.0	27.1	54.0	-26.9	A	Hori
g mode 2437												
4.874	3.0	36.9	32.7	5.8	-34.8	0.0	0.0	40.6	74.0	-33.4	P	Vert
4.874	3.0	24.7	32.7	5.8	-34.8	0.0	0.0	28.5	54.0	-25.5	A	Vert
g mode 2437												
4.874	3.0	35.0	32.7	5.8	-34.8	0.0	0.0	38.7	74.0	-35.3	P	Hori
4.874	3.0	22.6	32.7	5.8	-34.8	0.0	0.0	26.4	54.0	-27.6	A	Hori
g mode 2462												
4.924	3.0	35.4	32.7	5.9	-34.8	0.0	0.0	39.2	74.0	-34.8	P	Hori / 17dBm
4.924	3.0	23.3	32.7	5.9	-34.8	0.0	0.0	27.1	54.0	-26.9	A	Hori / 17dBm
g mode 2462												
4.924	3.0	38.3	32.7	5.9	-34.8	0.0	0.0	42.2	74.0	-31.8	P	Vert / 17dBm
4.924	3.0	26.3	32.7	5.9	-34.8	0.0	0.0	30.1	54.0	-23.9	A	Vert / 17dBm

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

Radiated Spurious Emissions Above 1 GHz: Small Antenna 802.11b

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: **Tom Chen**
Date: **07/13/09**
Project #: **09U12680**
Company: **Novariant**
EUT Description: **802.11b/g MiniPCI Radio Module**
FCC ID: TMN-WMIA-166AGI
Test Target:
Mode Oper: **Small Antenna**

	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 GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Det. P/A/QP	Notes
b mode 2412												
4.824	**3.0**	**42.3**	**32.7**	**5.8**	**-34.8**	**0.0**	**0.0**	**45.9**	**74.0**	**-28.1**	**P**	**Hori / 20dBm**
4.824	**3.0**	**38.4**	**32.7**	**5.8**	**-34.8**	**0.0**	**0.0**	**42.0**	**54.0**	**-12.0**	**A**	**Hori / 20dBm**
b mode 2412												
4.824	**3.0**	**46.6**	**32.7**	**5.8**	**-34.8**	**0.0**	**0.0**	**50.3**	**74.0**	**-23.7**	**P**	**Vert / 20dBm**
4.824	**3.0**	**44.5**	**32.7**	**5.8**	**-34.8**	**0.0**	**0.0**	**48.2**	**54.0**	**-5.8**	**A**	**Vert / 20dBm**
b mode 2437												
4.874	**3.0**	**45.1**	**32.7**	**5.8**	**-34.8**	**0.0**	**0.0**	**48.8**	**74.0**	**-25.2**	**P**	**Vert / 20dBm**
4.874	**3.0**	**43.0**	**32.7**	**5.8**	**-34.8**	**0.0**	**0.0**	**46.7**	**54.0**	**-7.3**	**A**	**Vert / 20dBm**
b mode 2437												
4.874	**3.0**	**39.2**	**32.7**	**5.8**	**-34.8**	**0.0**	**0.0**	**42.9**	**74.0**	**-31.1**	**P**	**Hori / 20dBm**
4.874	**3.0**	**30.8**	**32.7**	**5.8**	**-34.8**	**0.0**	**0.0**	**34.6**	**54.0**	**-19.4**	**A**	**Hori / 20dBm**
b mode 2462												
4.924	**3.0**	**37.7**	**32.7**	**5.9**	**-34.8**	**0.0**	**0.0**	**41.5**	**74.0**	**-32.5**	**P**	**Hori / 20dBm**
4.924	**3.0**	**30.5**	**32.7**	**5.9**	**-34.8**	**0.0**	**0.0**	**34.3**	**54.0**	**-19.7**	**A**	**Hori / 20dBm**
b mode 2462												
4.924	**3.0**	**41.5**	**32.7**	**5.9**	**-34.8**	**0.0**	**0.0**	**45.4**	**74.0**	**-28.6**	**P**	**Vert / 20dBm**
4.924	**3.0**	**37.3**	**32.7**	**5.9**	**-34.8**	**0.0**	**0.0**	**41.1**	**54.0**	**-12.9**	**A**	**Vert / 20dBm**

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

Radiated Spurious Emissions Above 1 GHz: Small Antenna 802.11g

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: **Tom Chen**
Date: **07/13/09**
Project #: **09U12680**
Company: **Novariant**
EUT Description: **802.11b/g MiniPCI Radio Module**
FCC ID: TMN-WMIA-166AGI
Test Target:
Mode Oper: **Small Antenna**

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 GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Det. P/A/QP	Notes
g mode 2462												
4.924	3.0	36.0	32.7	5.9	-34.8	0.0	0.0	39.8	74.0	-34.2	P	Vert / 17dBm
4.924	3.0	23.7	32.7	5.9	-34.8	0.0	0.0	27.5	54.0	-26.5	A	Vert / 17dBm
g mode 2462												
4.924	3.0	35.1	32.7	5.9	-34.8	0.0	0.0	38.9	74.0	-35.1	P	Hori / 17dBm
4.924	3.0	23.1	32.7	5.9	-34.8	0.0	0.0	26.9	54.0	-27.1	A	Hori / 17dBm
g mode 2437												
4.874	3.0	36.2	32.7	5.8	-34.8	0.0	0.0	39.9	74.0	-34.1	P	Hori / 17dBm
4.874	3.0	22.6	32.7	5.8	-34.8	0.0	0.0	26.3	54.0	-27.7	A	Hori / 17dBm
g mode 2437												
4.874	3.0	39.4	32.7	5.8	-34.8	0.0	0.0	43.2	74.0	-30.9	P	Vert / 17dBm
4.874	3.0	27.0	32.7	5.8	-34.8	0.0	0.0	30.7	54.0	-23.3	A	Vert / 17dBm
g mode 2412												
4.824	3.0	40.6	32.7	5.8	-34.8	0.0	0.0	44.3	74.0	-29.7	P	Vert / 17dBm
4.824	3.0	28.3	32.7	5.8	-34.8	0.0	0.0	31.9	54.0	-22.1	A	Vert / 17dBm
g mode 2412												
4.824	3.0	38.1	32.7	5.8	-34.8	0.0	0.0	41.7	74.0	-32.3	P	Hori / 17dBm
4.824	3.0	24.9	32.7	5.8	-34.8	0.0	0.0	28.6	54.0	-25.4	A	Hori / 17dBm

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

Radiated Emissions 30-1000 MHz, Horizontal Polarity Emissions

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

Test Engr: **Tom Chen**
Date: **07/13/09**
Project #: **09U12680**
Company: **Novariant, Inc.**
EUT Description: **802.11b/g MiniPCI Radio Module**
FCC ID: TMN-WMIA-166AGI
Test Target: **FCC Class B**
Mode Oper:

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
Hori													
99.963	3.0	56.1	9.3	0.8	28.2	0.0	0.0	38.0	43.5	-5.5	H	EP	Prescan
126.124	3.0	51.9	14.1	0.9	28.0	0.0	0.0	38.9	43.5	-4.6	H	EP	Prescan
192.127	3.0	52.9	11.4	1.1	27.4	0.0	0.0	38.0	43.5	-5.5	H	QP	Prescan
204.607	3.0	52.9	11.9	1.2	27.4	0.0	0.0	38.6	43.5	-4.9	H	QP	Prescan
215.288	3.0	54.9	11.9	1.2	27.4	0.0	0.0	40.6	43.5	-2.9	H	QP	Prescan
248.049	3.0	56.0	11.8	1.3	27.4	0.0	0.0	41.7	46.0	-4.3	H	EP	Prescan
398.295	3.0	53.7	15.0	1.7	28.0	0.0	0.0	42.5	46.0	-3.5	H	EP	Prescan
531.741	3.0	51.3	17.4	2.0	28.6	0.0	0.0	42.1	46.0	-3.9	H	EP	Prescan

Rev. 1.27.09
Note: No other emissions were detected above the system noise floor.

Radiated Emissions 30-1000 MHz, Vertical Polarity Emissions

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

Test Engr: **Tom Chen**
Date: **07/13/09**
Project #: **09U12680**
Company: **Novariant, Inc.**
EUT Description: **802.11b/g MiniPCI Radio Module**
FCC ID: TMN-WMIA-166AGI
Test Target: **FCC Class B**
Mode Oper:

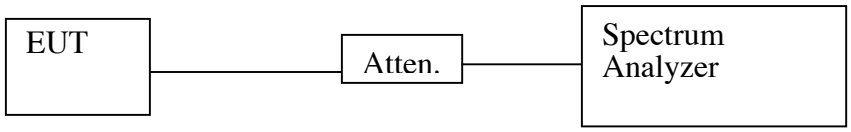
f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		
Read	Analyzer Reading	Filter	Filter Insert Loss		
AF	Antenna Factor	Corr.	Calculated Field Strength		
CL	Cable Loss	Limit	Field Strength Limit		

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
Vert													
168.246	3.0	56.8	11.6	1.1	27.6	0.0	0.0	41.8	43.5	-1.7	V	EP	Prescan
176.646	3.0	55.5	10.5	1.1	27.6	0.0	0.0	39.5	43.5	-4.0	V	EP	Prescan
181.806	3.0	56.7	10.9	1.1	27.5	0.0	0.0	41.2	43.5	-2.3	V	EP	Prescan
187.326	3.0	55.9	11.1	1.1	27.4	0.0	0.0	40.7	43.5	-2.8	V	EP	Prescan
299.771	3.0	51.0	13.5	1.5	27.4	0.0	0.0	38.5	46.0	-7.5	V	EP	Prescan
432.977	3.0	53.6	15.6	1.8	28.2	0.0	0.0	42.8	46.0	-3.2	V	EP	Prescan
564.262	3.0	48.1	17.9	2.1	28.6	0.0	0.0	39.5	46.0	-6.5	V	EP	Prescan

Rev. 1.27.09
Note: No other emissions were detected above the system noise floor.

6dB Bandwidth for DTS
Test Requirement: FCC: 15.247 (a)2
IC: RSS-210 Sec. 6.2.2(o)(iv)

Test Set-up



Test Procedures

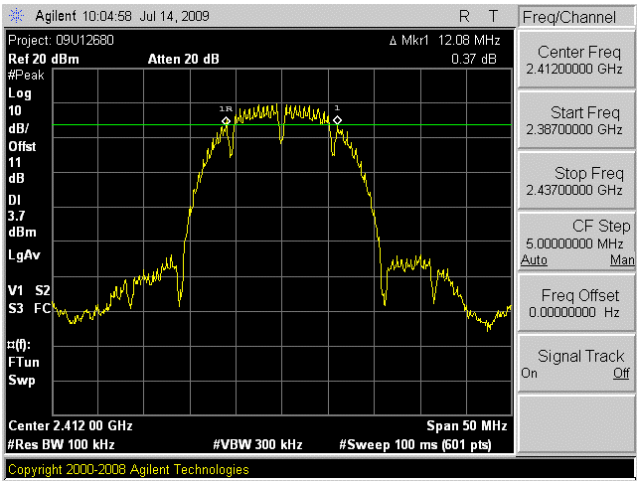
A modified EUT with a coaxial cable attached to the radio antenna port was configured on a test bench. The cable's SMA connector was connected to the spectrum analyzer. The EUT transmission was continuous at the LOW channel. While the transmitter broadcast a steady stream of digital data, the analyzer OCCUPIED BW function was activated to measure 6 dB BW and 99% BW.

Test was repeated for MID and HIGH channels.

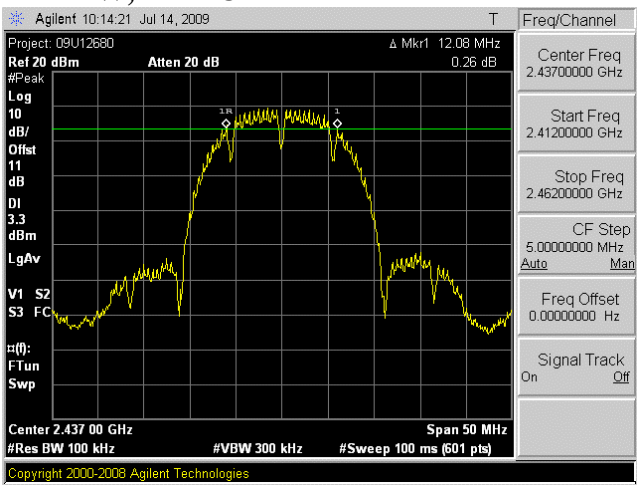
Test Results. No non-compliance noted. Refer to data sheets below.

Minimum 6 dB BW, 802.11b: 12.08 MHz
Minimum 6 dB BW, 802.11g: 16.42
Minimum Required: 500 kHz

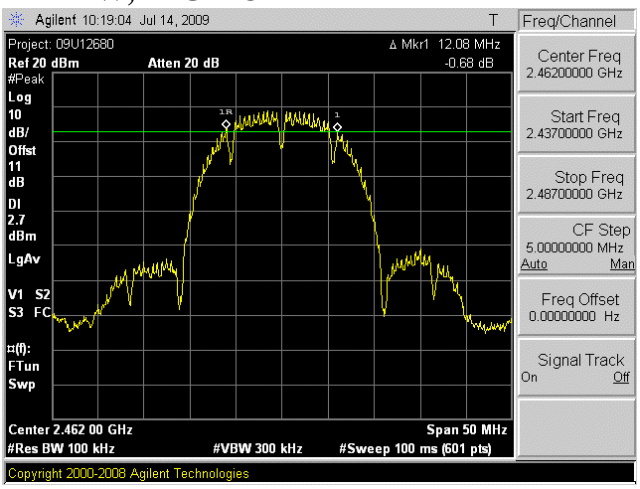
6dB Bandwidth LOW Channel 802.11b



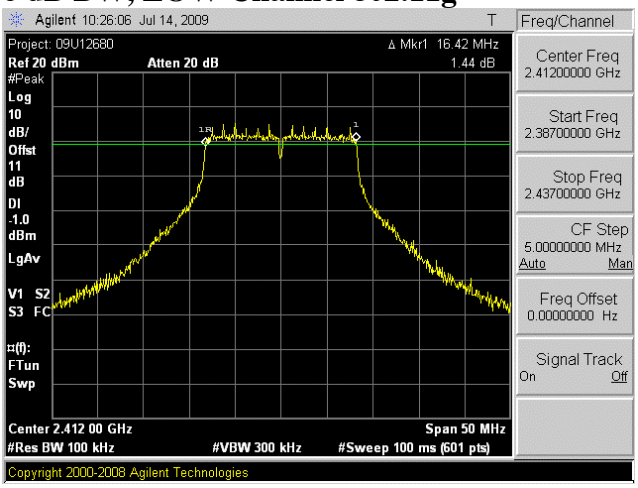
6 dB BW, MID Channel 802.11b



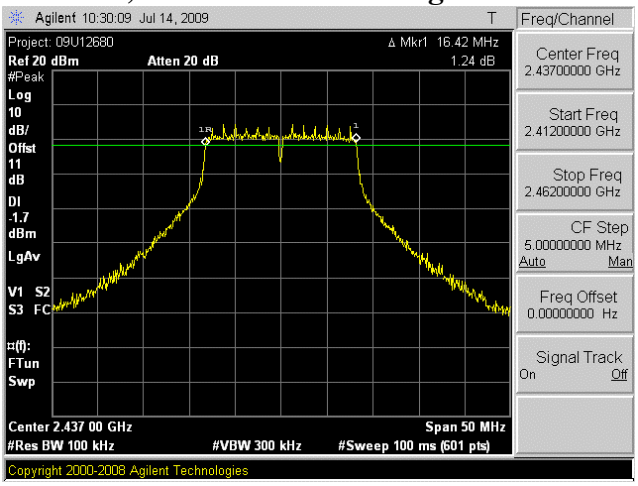
6 dB BW, HIGH Channel 802.11b



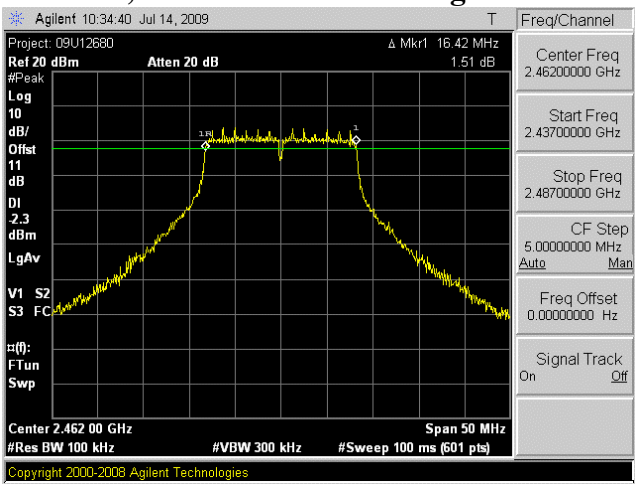
6 dB BW, LOW Channel 802.11g



6 dB BW, MID Channel 802.11g

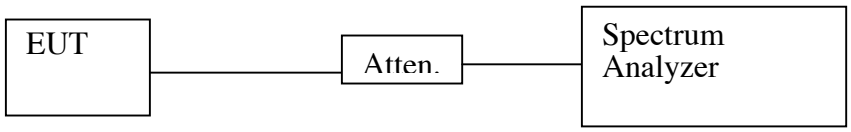


6 dB BW, HIGH Channel 802.11g



99% Bandwidth

Test Setup



Limit

None: for reporting purposes only.

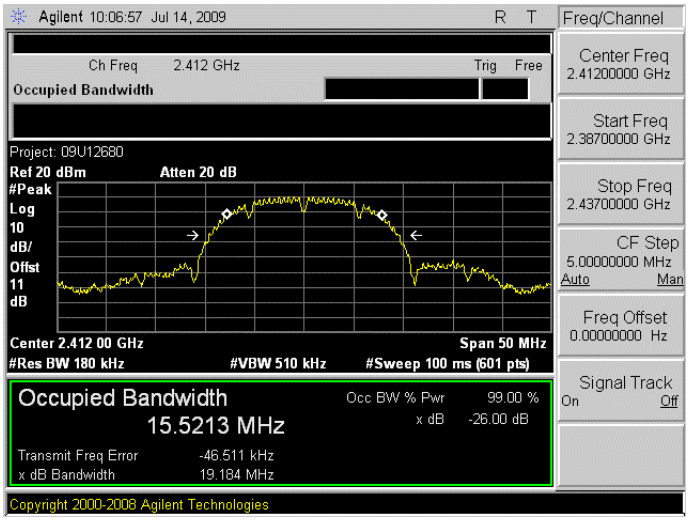
Test Procedure

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal OCCUPIED BW function was utilized.

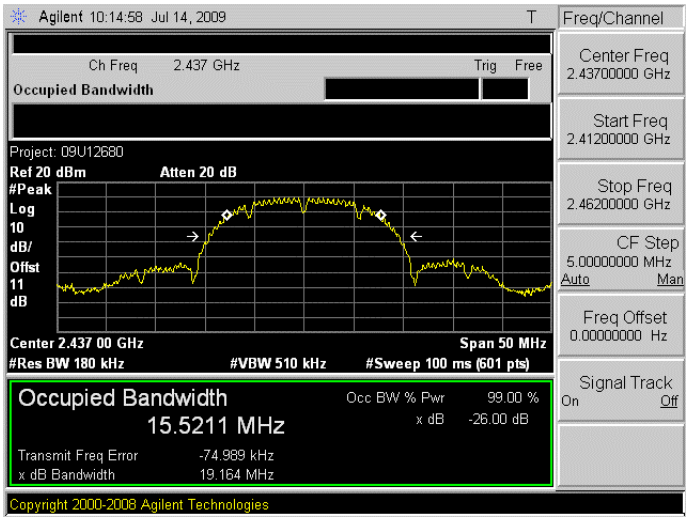
Test Results

Refer to spectrum analyzer charts below. Maximum 99% bandwidth is approximately 16.7 MHz.

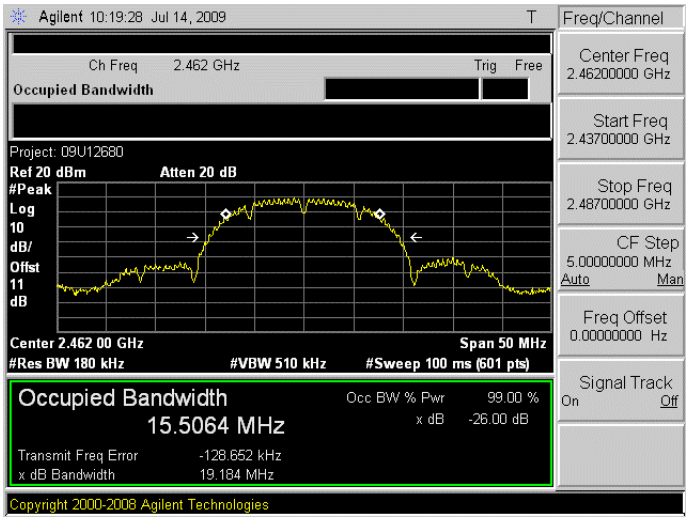
99% Bandwidth LOW Channel 802.11b



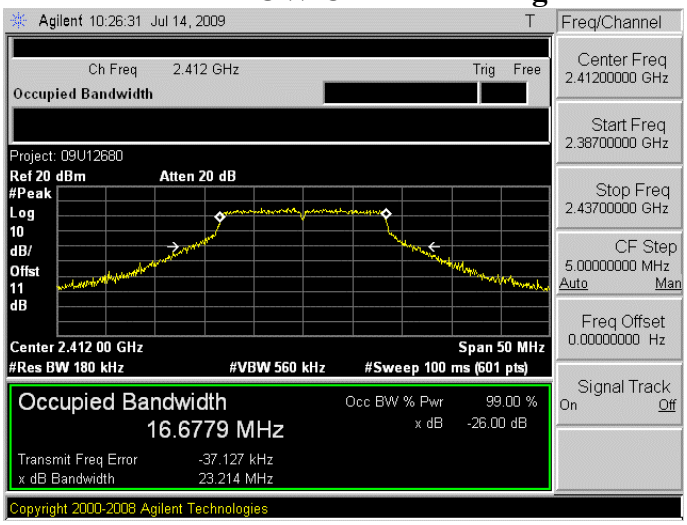
99% Bandwidth MID Channel 802.11b



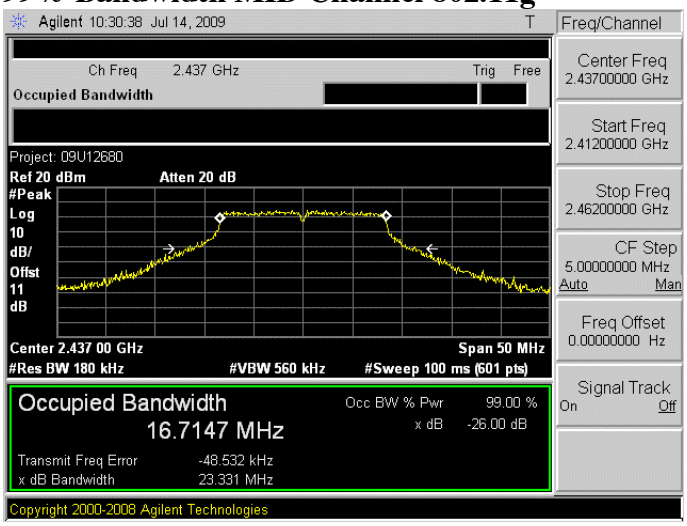
99% Bandwidth HIGH Channel 802.11b



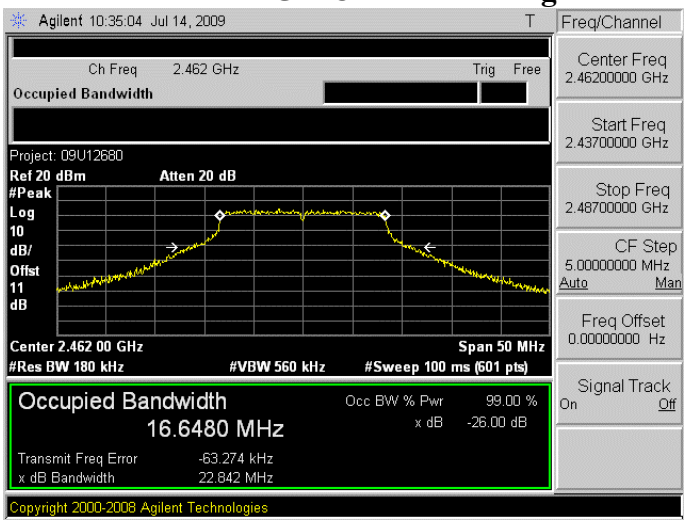
99% Bandwidth LOW Channel 802.11g



99% Bandwidth MID Channel 802.11g

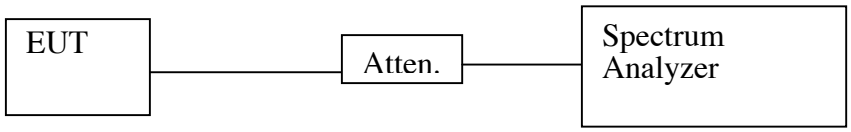


99% Bandwidth HIGH Channel 802.11g



RF Power Output
Test Requirement: FCC: 15.247(b)
IC: RSS-210 Sec. 6.2.2(o)(iv)

Test Setup



Test Procedures

1.The EUT was configured on a test bench. Spectrum analyzer was set to RBW = VBW=1 MHz, PEAK Linear Detector

2. Spectrum analyzer BAND POWER measurement function was used to integrate power over the 6 dBc emission bandwidth.

Test Results

Refer to excel spread sheets and spectrum analyzer graphs. Offset corrects for external attenuation and cable loss.

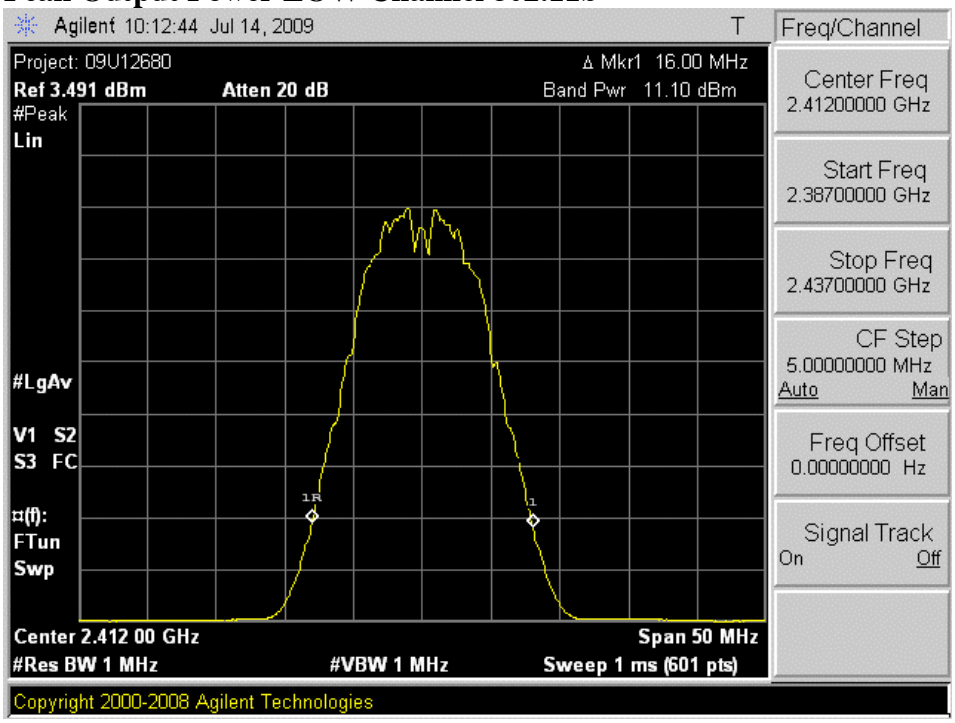
802.11b Output Power

Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	11.1	11	22.10	30	-7.90
Middle	2437	10.2	11	21.20	30	-8.80
High	2462	9.75	11	20.75	30	-9.25

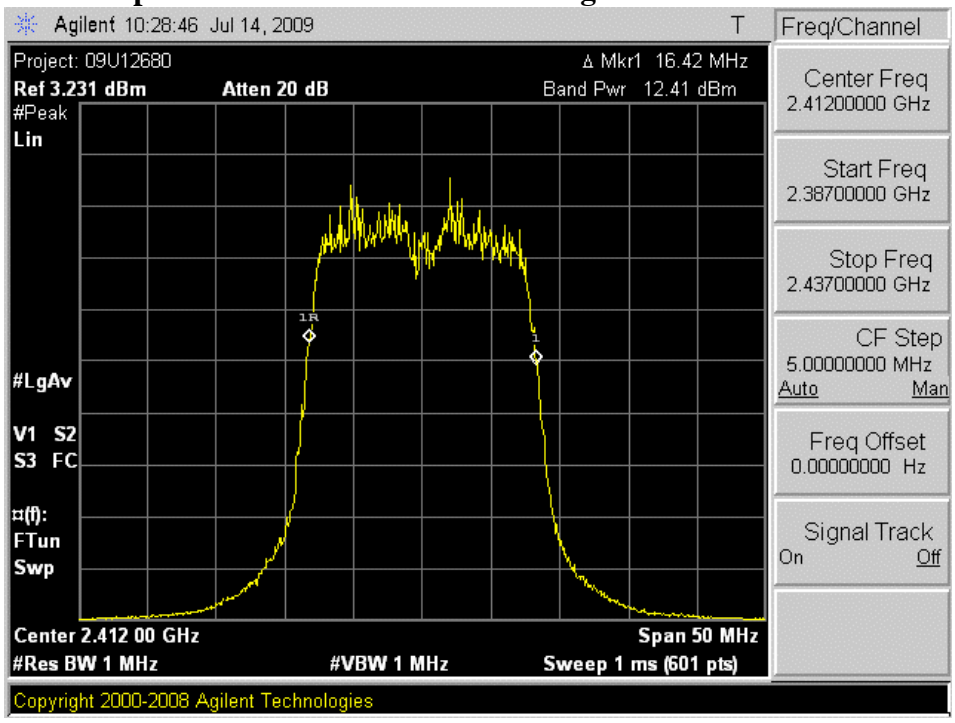
802.11g Output Power

Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	12.41	11	23.41	30	-6.59
Middle	2437	12.06	11	23.06	30	-6.94
High	2462	11.68	11	22.68	30	-7.32

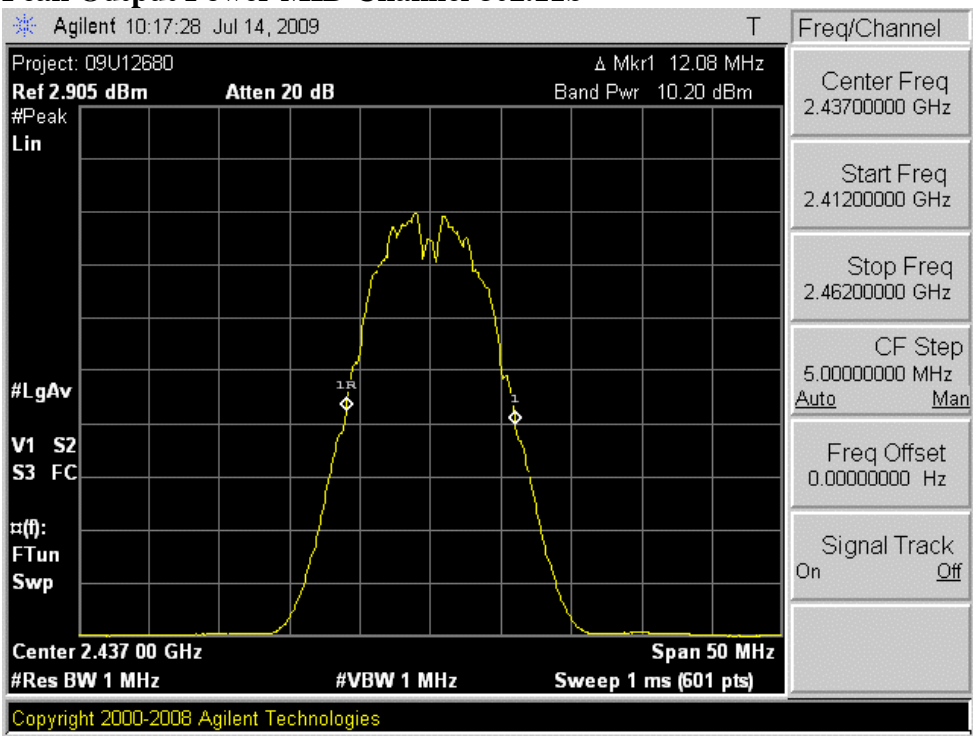
Peak Output Power LOW Channel 802.11b



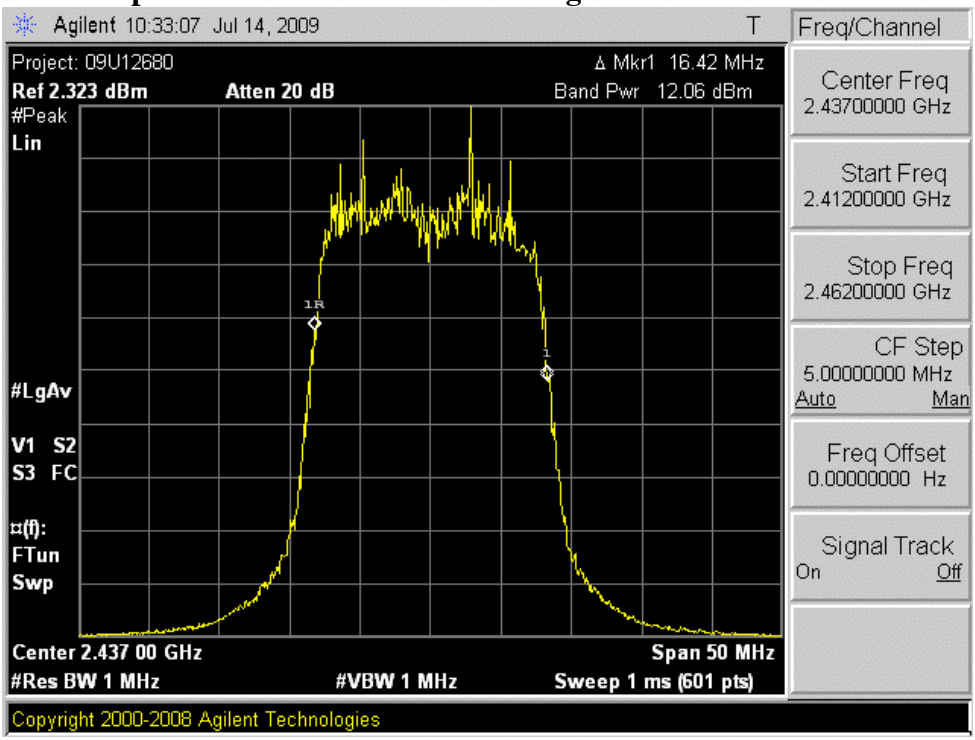
Peak Output Power LOW Channel 802.11g



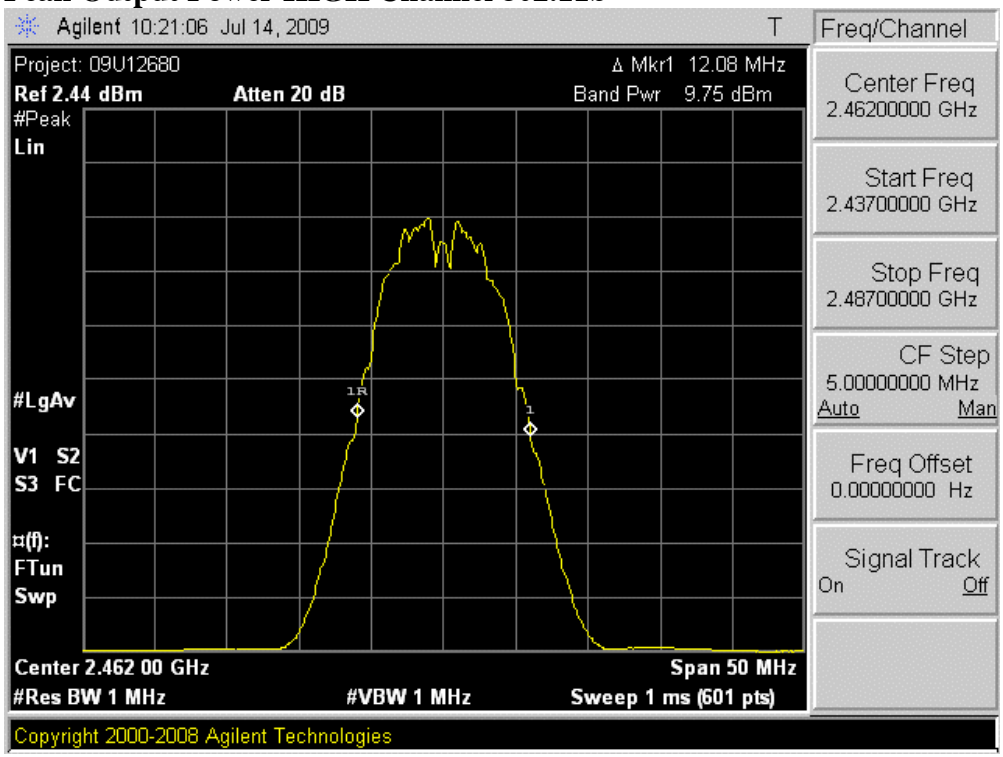
Peak Output Power MID Channel 802.11b



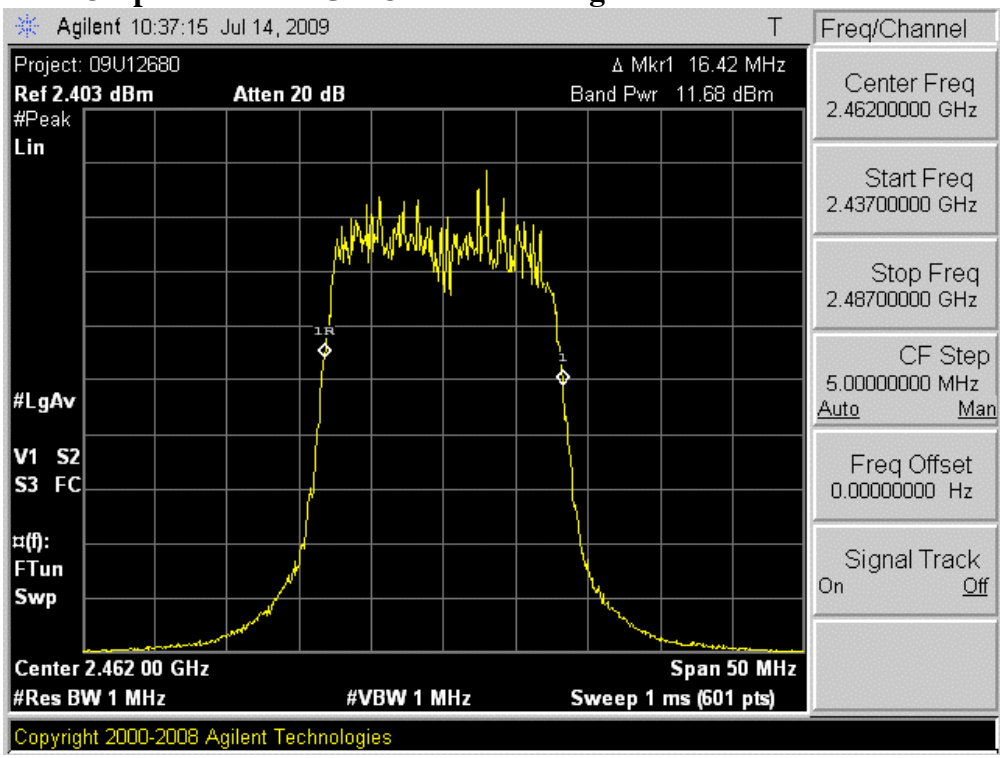
Peak Output Power MID Channel 802.11g



Peak Output Power HIGH Channel 802.11b

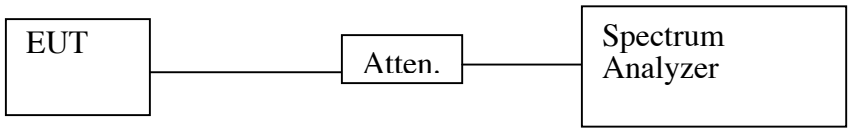


Peak Output Power HIGH Channel 802.11g



Spurious Emissions, Conducted
Test Requirement: FCC: 15.247(d)
IC: RSS-210 Sec. 6.2.2(o)(e1)

Test Setup



Test Procedure

1. The EUT was configured on a test bench. The cable was connected between the EUT antenna port and the spectrum analyzer input port.

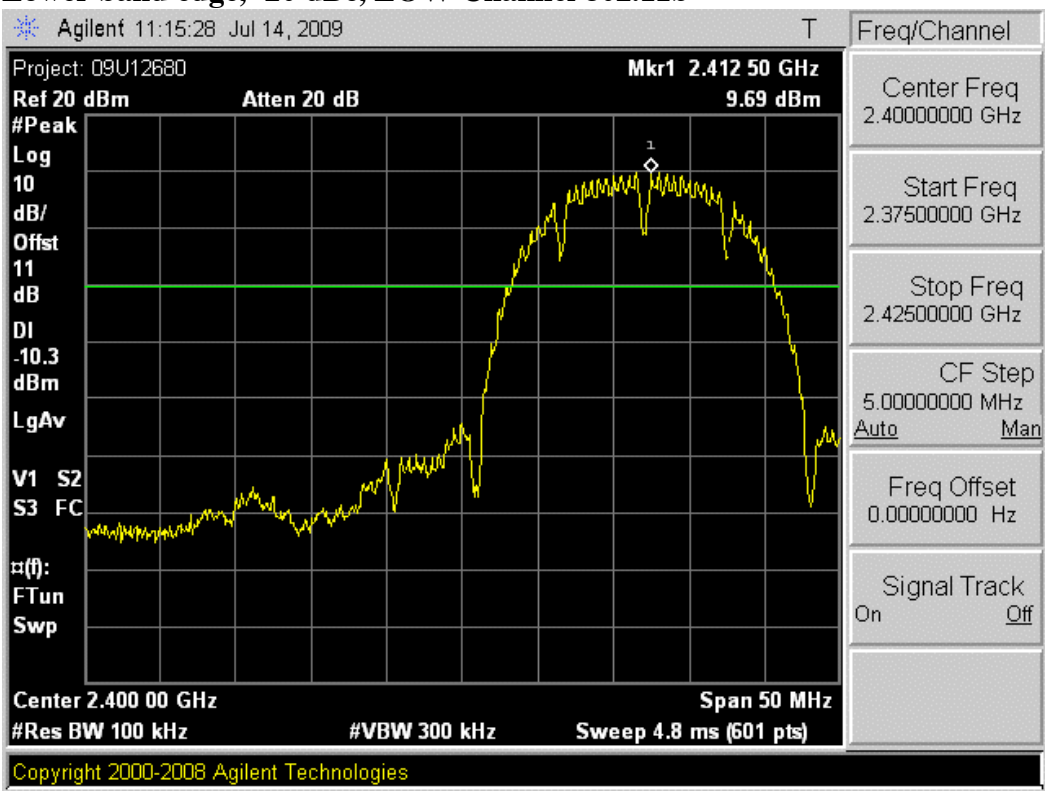
Spectrum analyzer RES BW was set to 100 kHz. While the transmitter broadcast a steady stream of digital data, the analyzer MAX HOLD function was used to capture the envelope of the transmission.

Readings were taken out to 10fo.

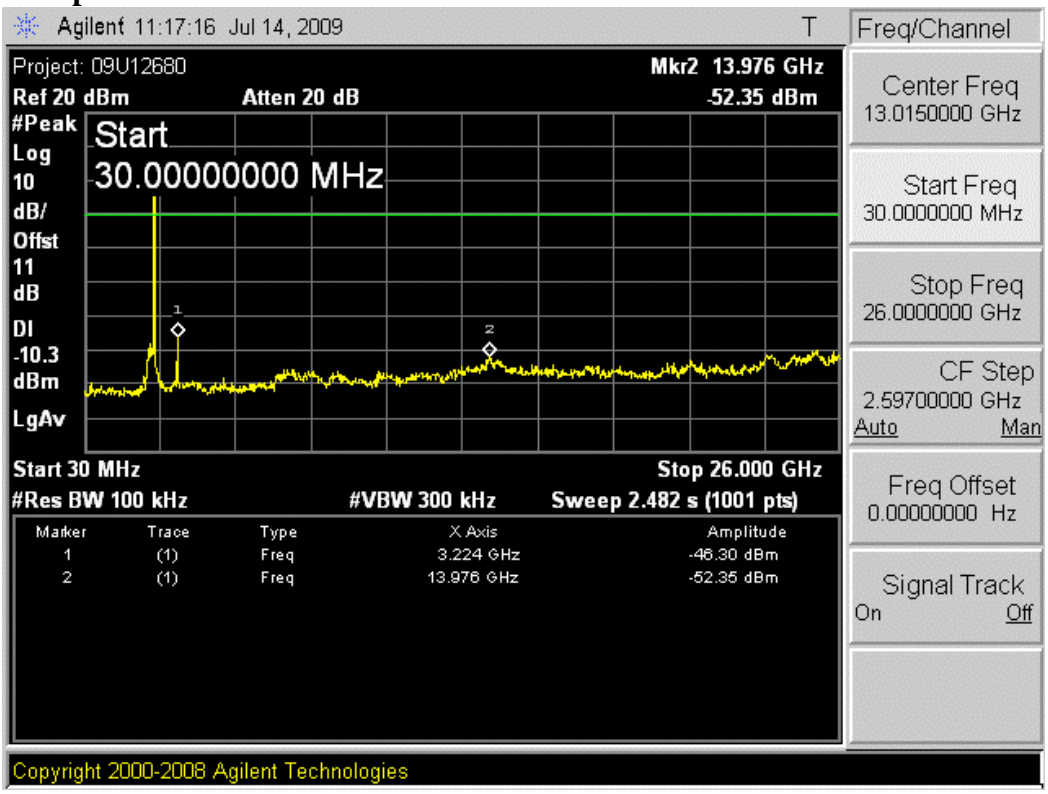
Test Results

Refer to spectrum analyzer plots. Data shows out of band emissions are suppressed well below the -20 dBc minimum required by the Rules.

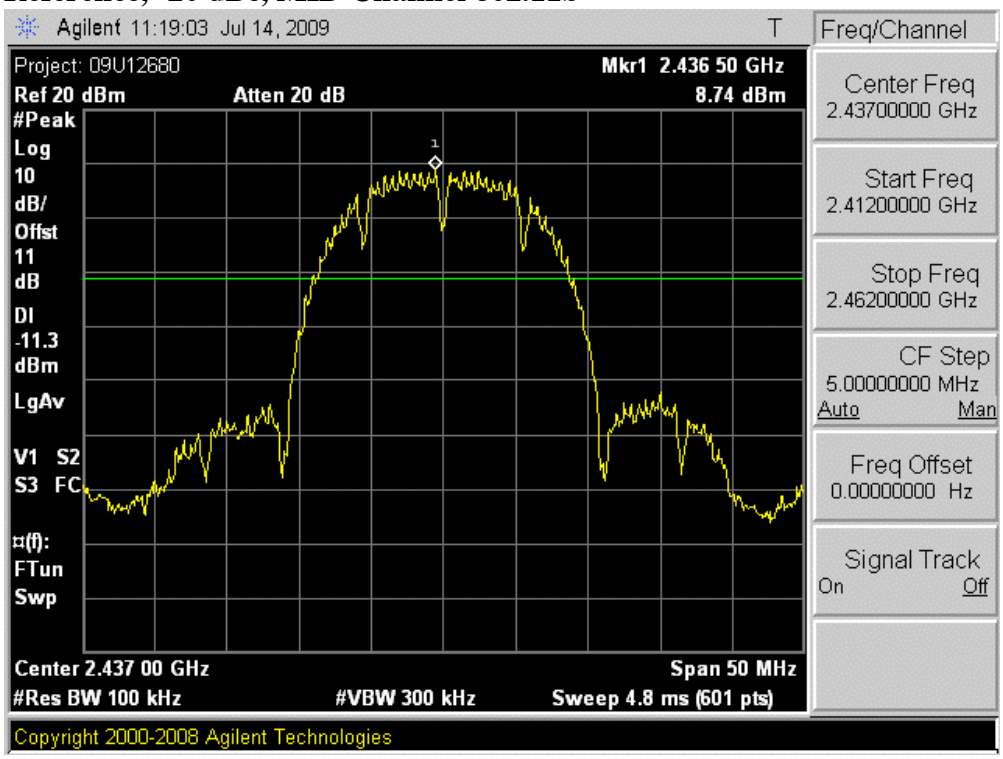
Lower band edge, -20 dBc, LOW Channel 802.11b



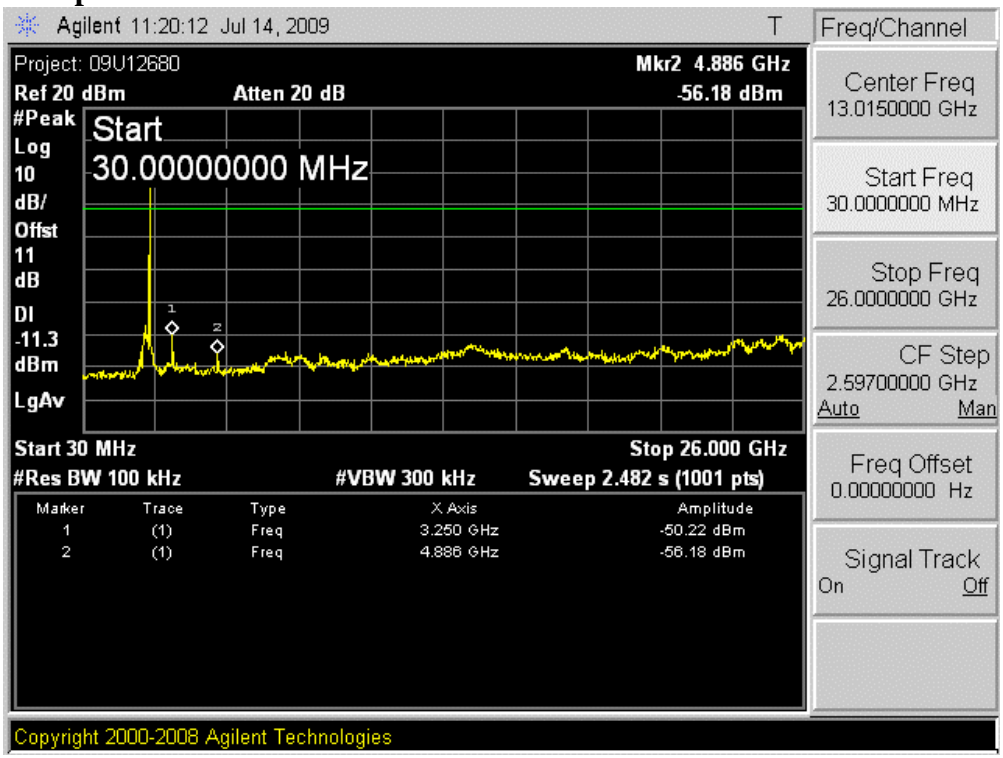
TX Spurious Emissions LOW Channel 802.11b



Reference, -20 dBc, MID Channel 802.11b

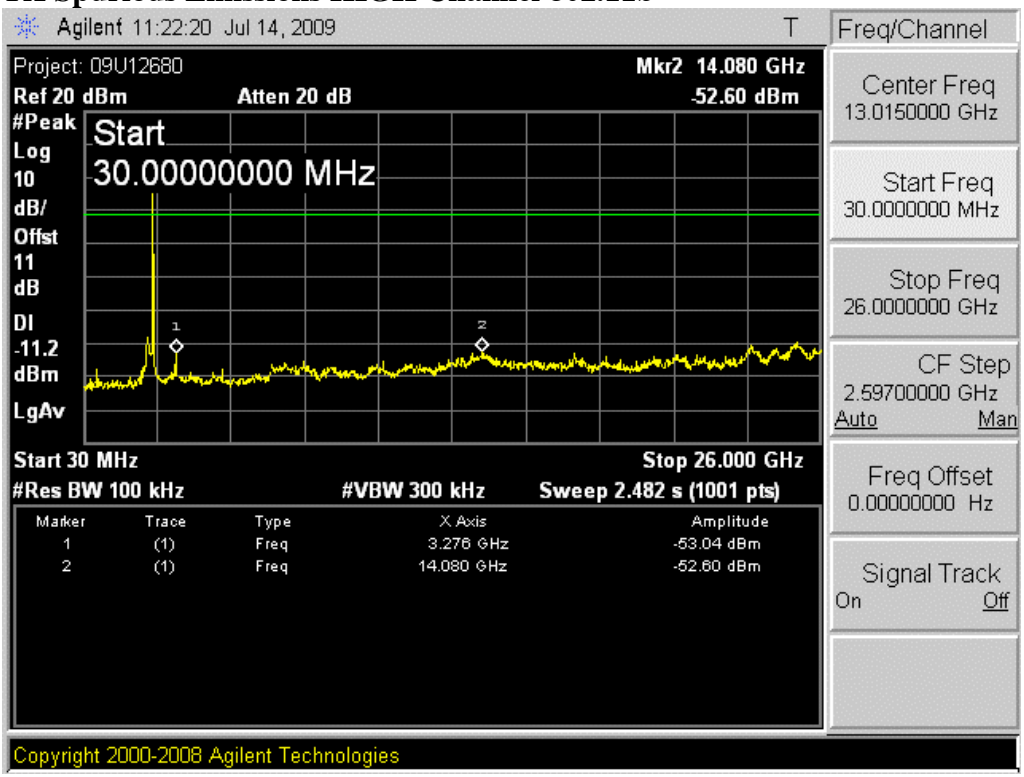


TX Spurious Emissions MID Channel 802.11b

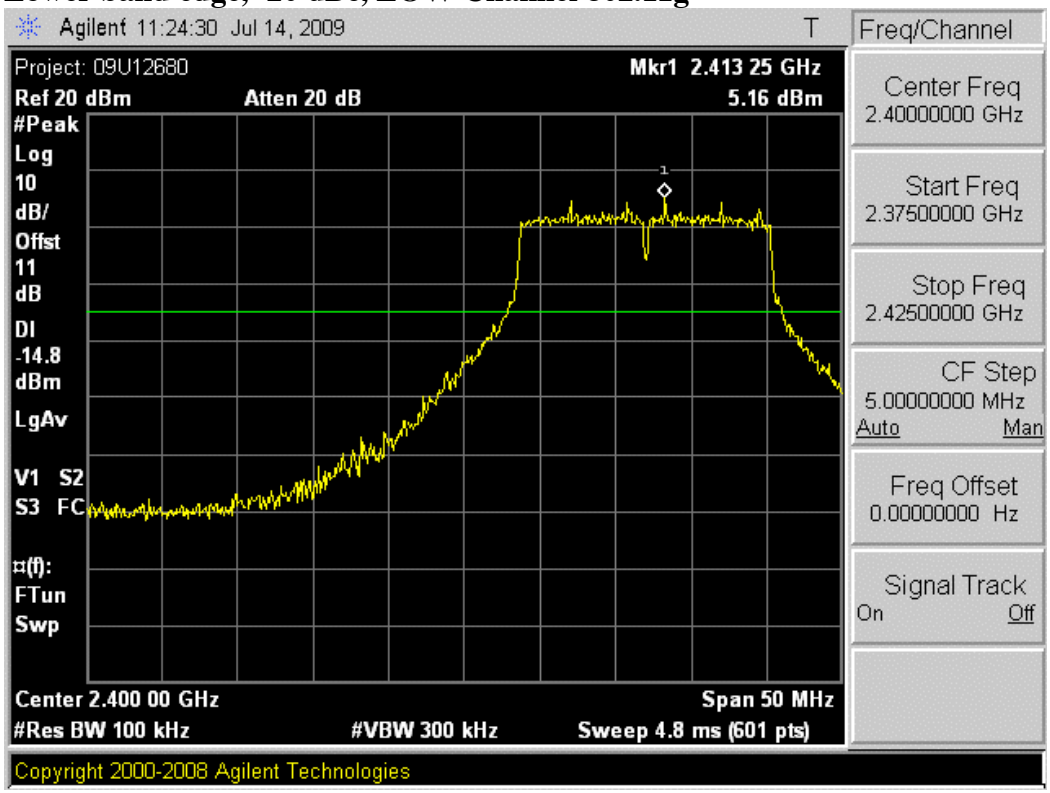


Upper band edge, -20 dBc, HIGH Channel 802.11b

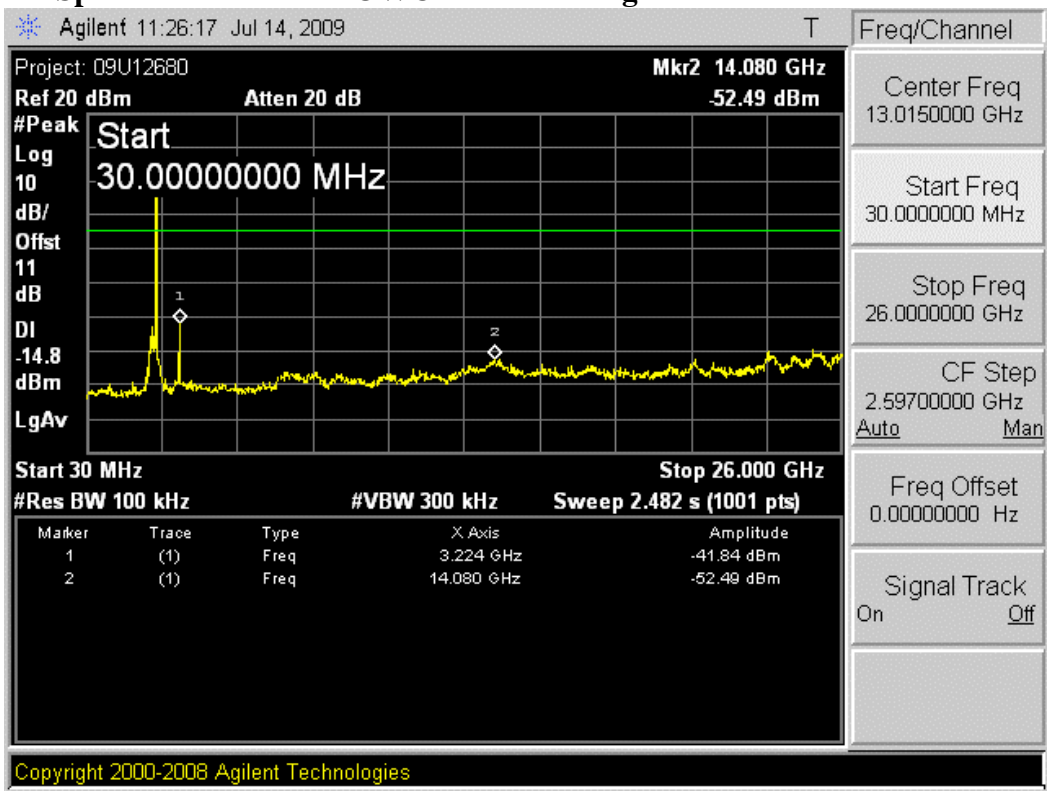
TX Spurious Emissions HIGH Channel 802.11b



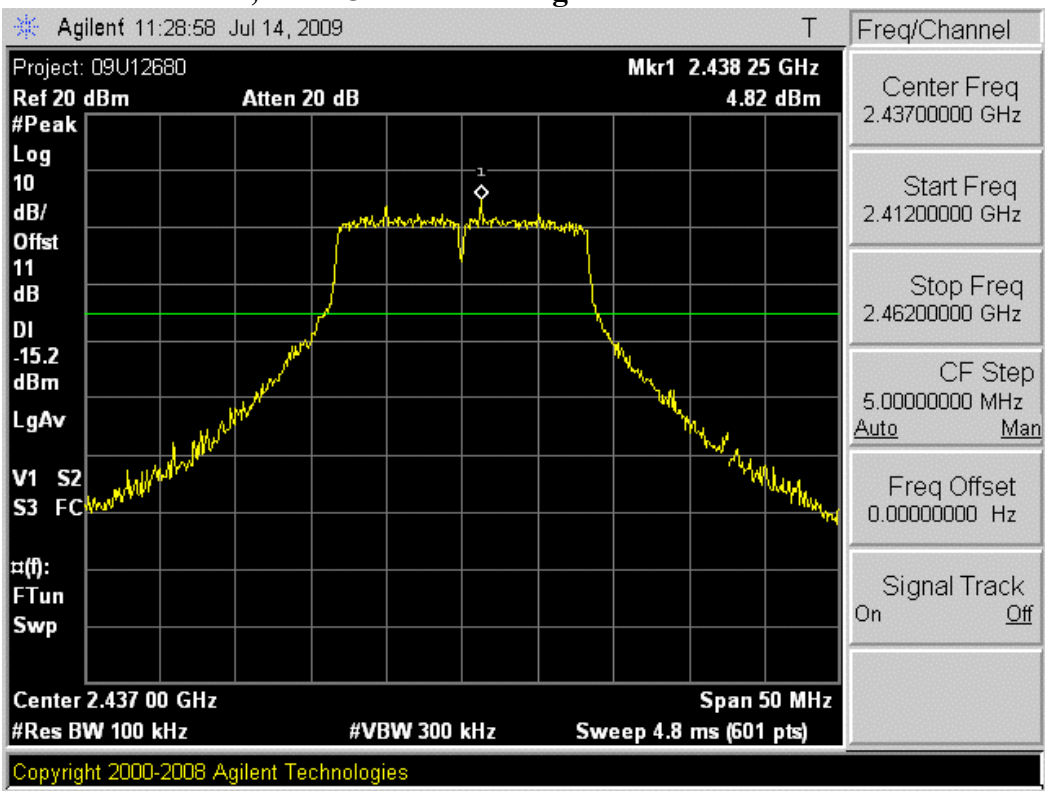
Lower band edge, -20 dBc, LOW Channel 802.11g



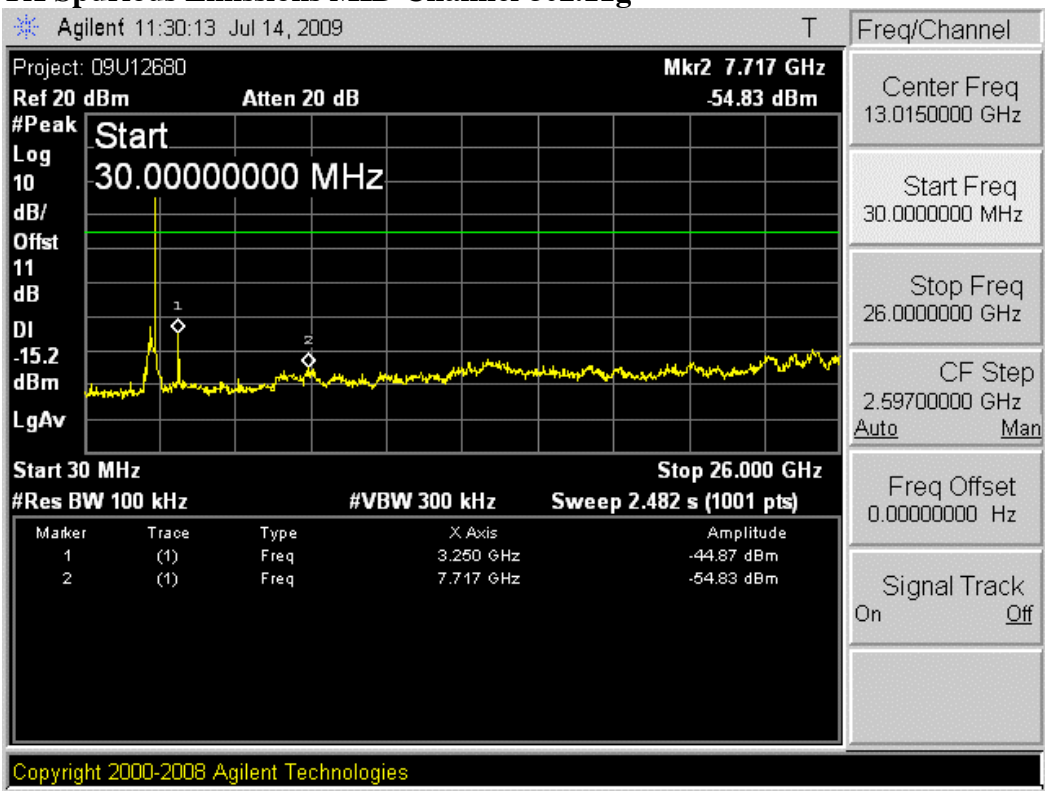
TX Spurious Emissions LOWChannel 802.11g



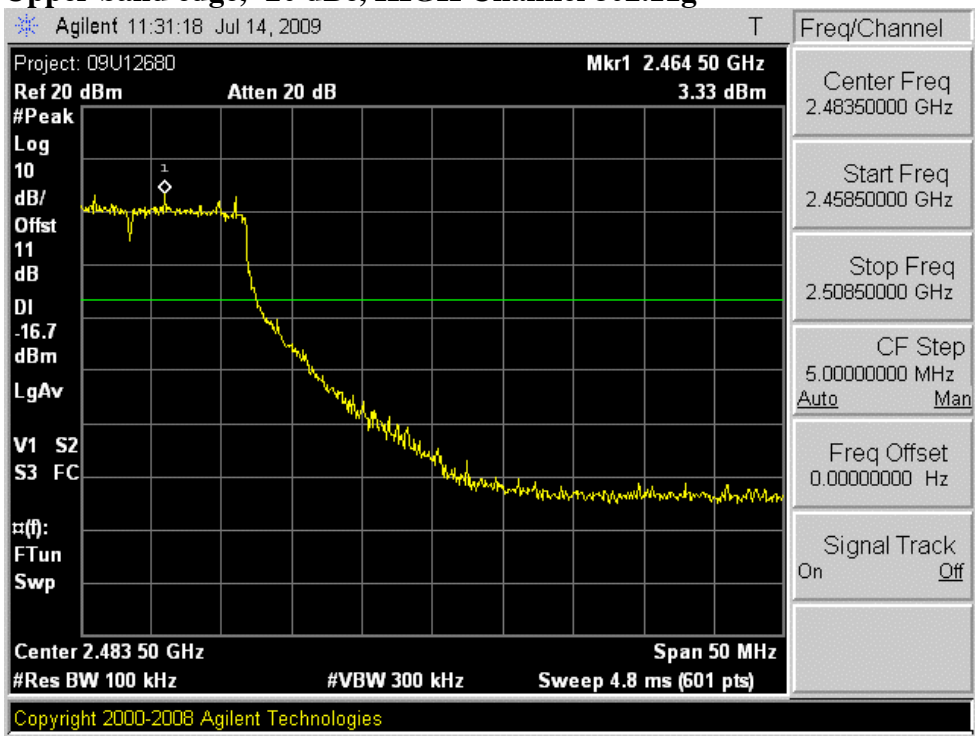
Reference -20 dBc, MID Channel 802.11g



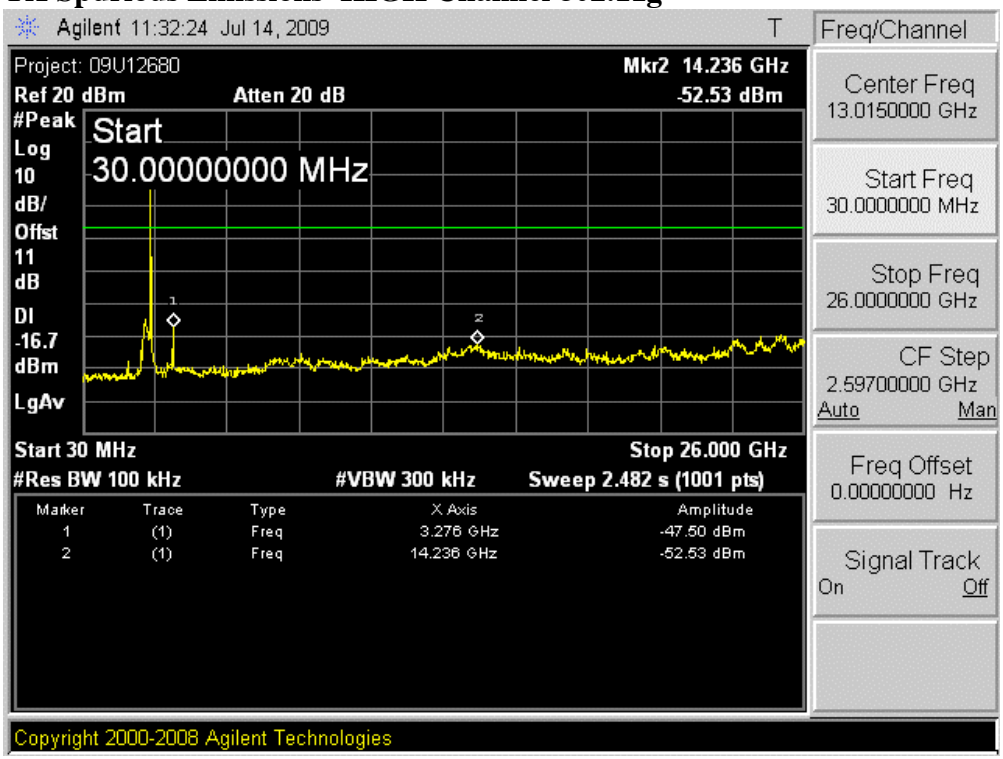
TX Spurious Emissions MID Channel 802.11g



Upper band edge, -20 dBc, HIGH Channel 802.11g

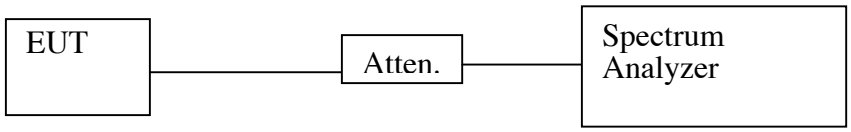


TX Spurious Emissions HIGH Channel 802.11g



Power Spectral Density
Test Requirement: 15.247(e)
RSS-210 Sec. 6.2.2(o)(iv)

Test Setup



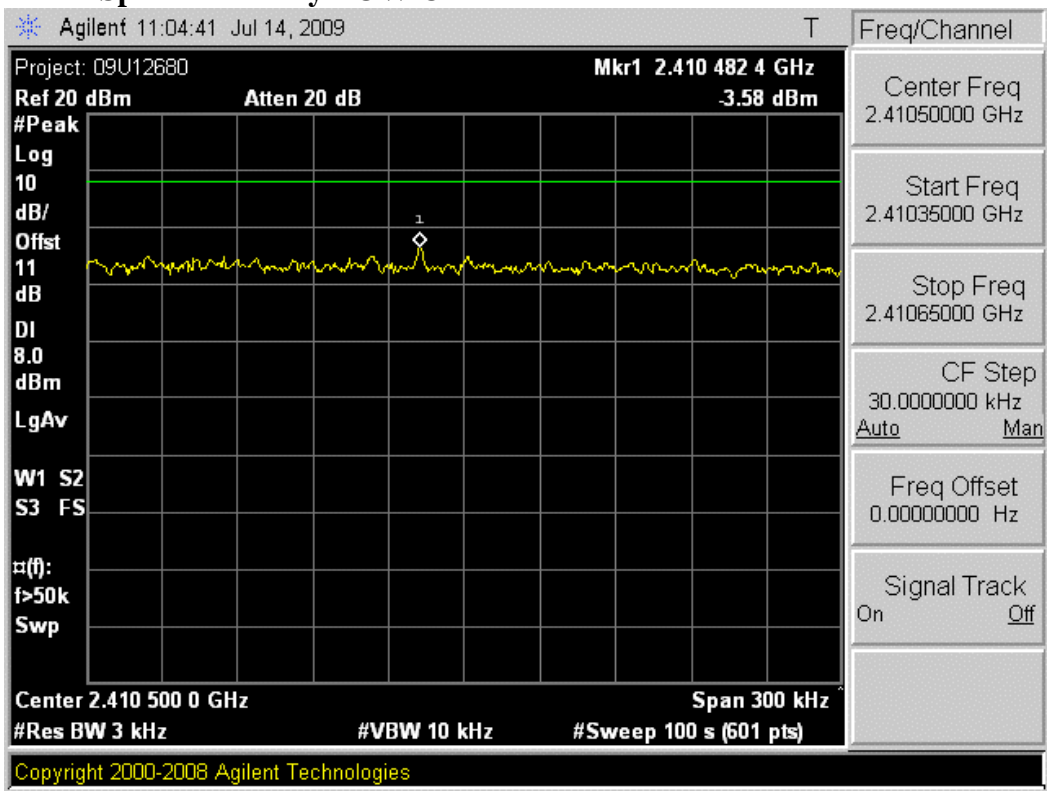
Test Procedure

1. Determine frequency at which maximum emission occurs during pre-scan.
2. Reduce SPAN to 300 kHz, while adjusting tuning frequency so that peak remains at center of screen.
3. Set RES BW =3 kHz, VID BW = 10 kHz, SWEEP = 100 sec.
4. Record highest reading and compare to 8 dBm limit.

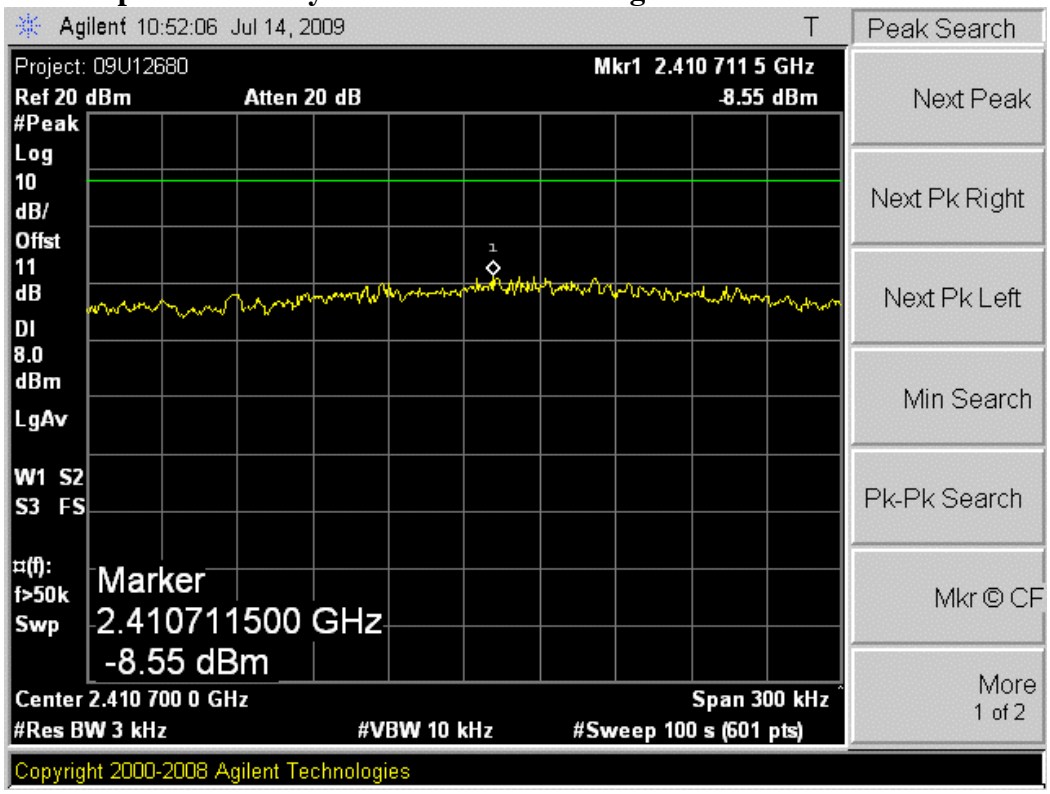
Test Results

Maximum PSD was -3.58 dBm. Refer to attached spectrum analyzer chart.

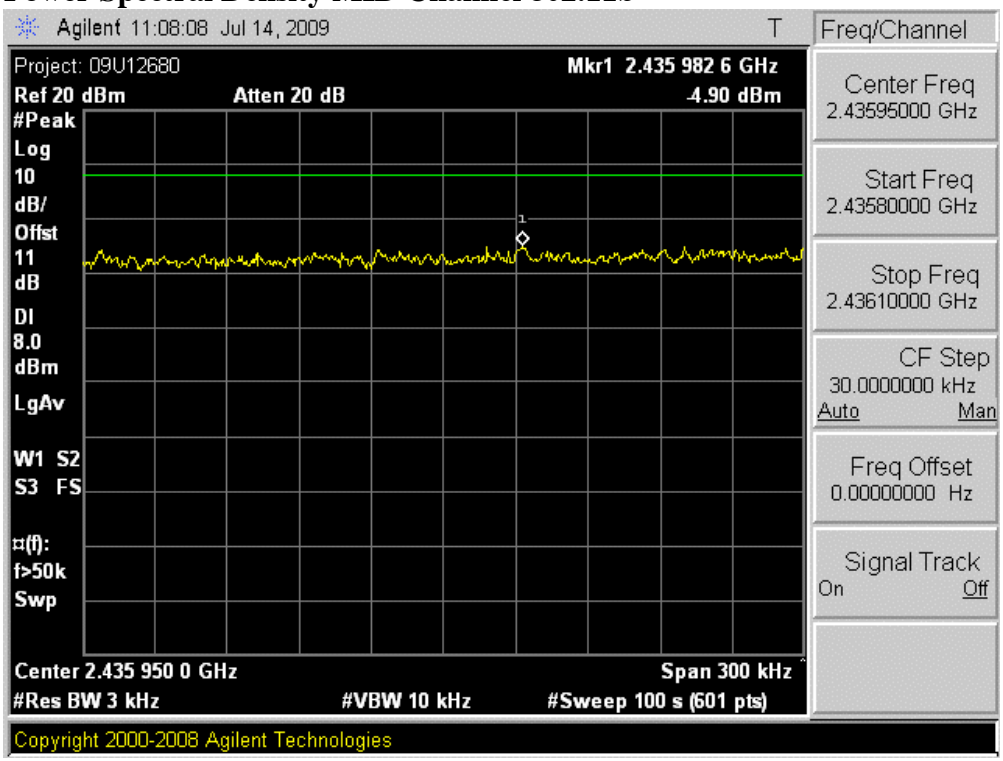
Power Spectral Density LOW Channel 802.11b



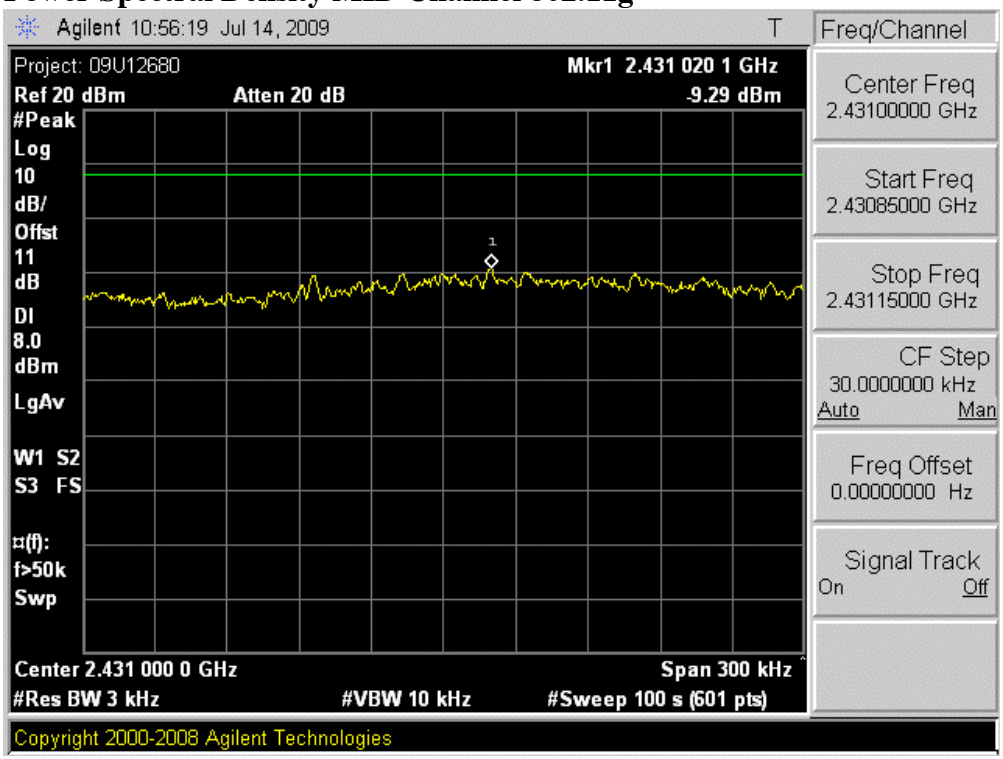
Power Spectral Density LOW Channel 802.11g



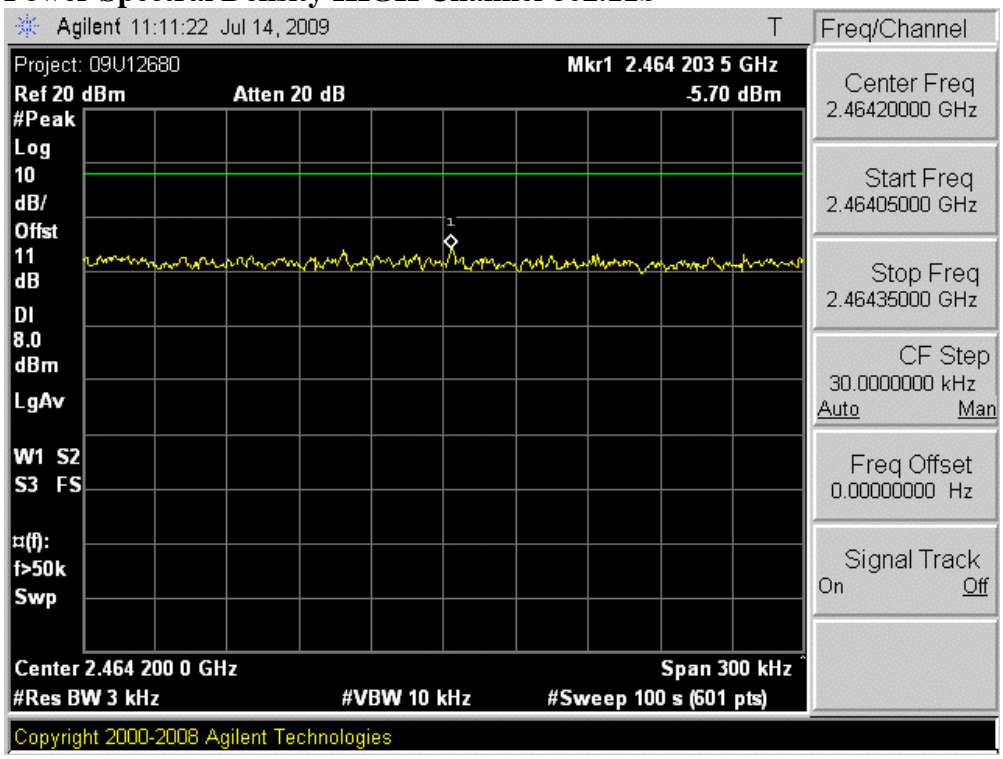
Power Spectral Density MID Channel 802.11b



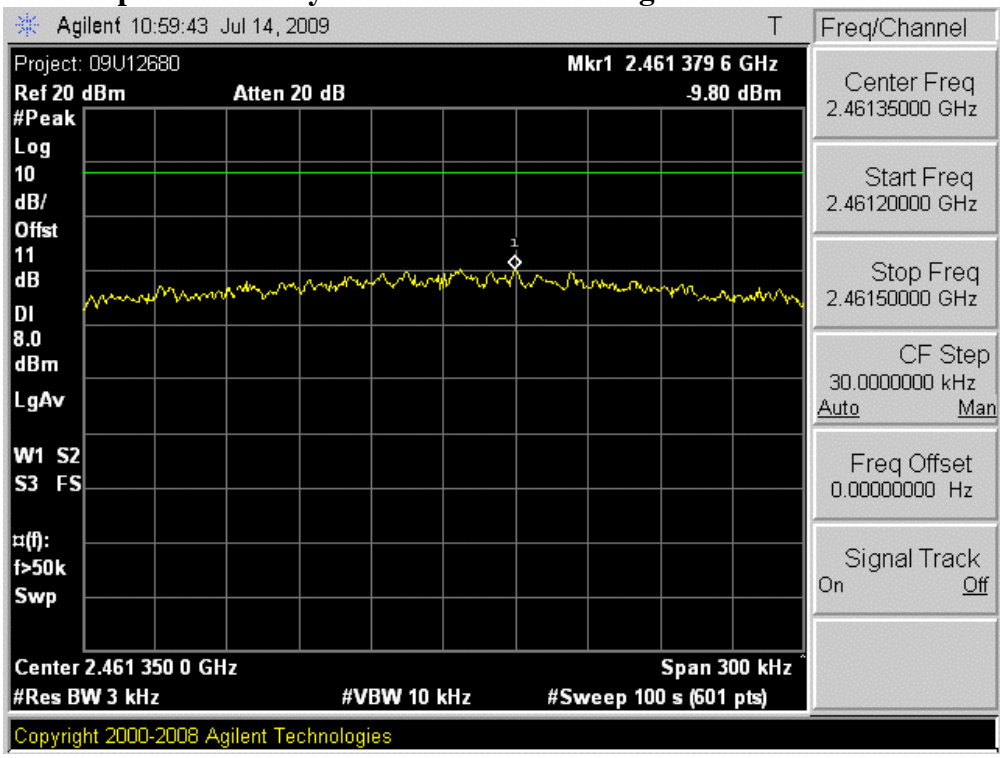
Power Spectral Density MID Channel 802.11g



Power Spectral Density HIGH Channel 802.11b



Power Spectral Density HIGH Channel 802.11g



RF Exposure (MPE) Calculations

- Refer to separate exhibit.

LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator 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 boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (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

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

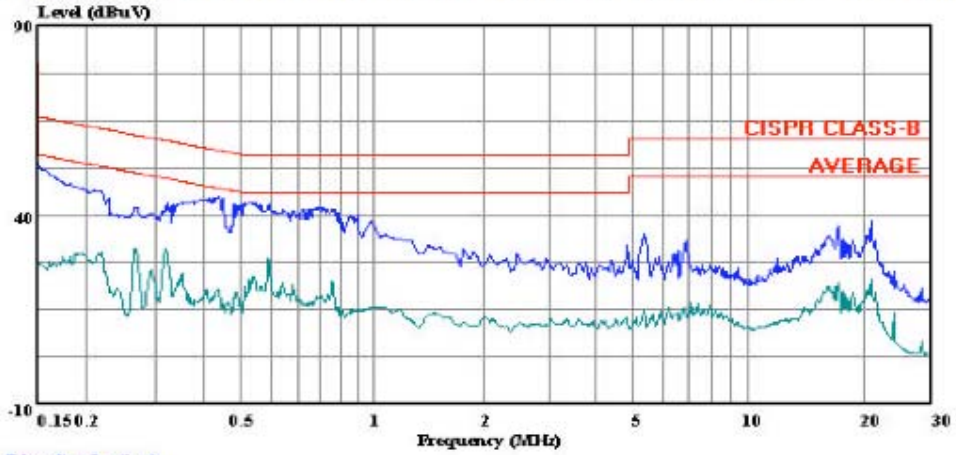
RESULTS

No non-compliance noted:

AC Line Conducted Emissions Line 1

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

Data#: 7 File#: 09U12680 LC.EMI Date: 07-14-2009 Time: 08:41:50



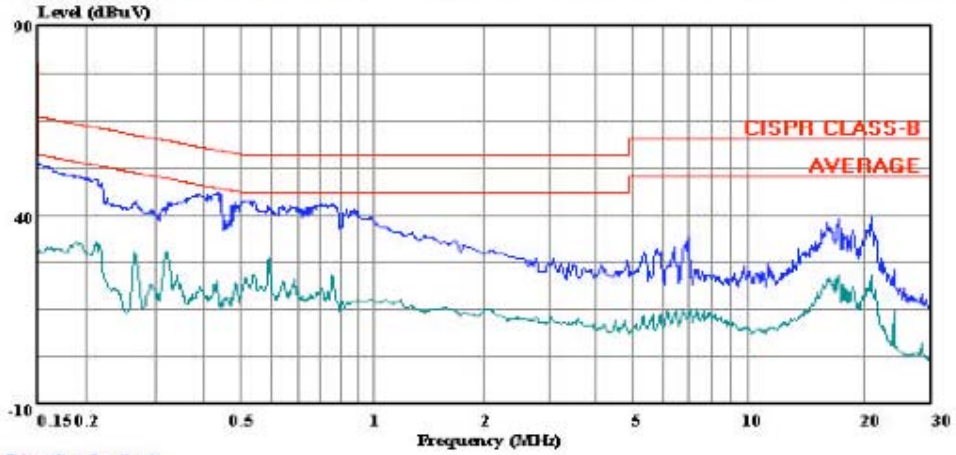
Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Tom Chen
Project #: : 09U12680
Company: : Novariant, Inc.
EUT Description:: TBD
Mode: : TX Worst case
Target: : FCC Class B
Voltage: : 115VAC, 60Hz
: L1: Peak (Blue) , Average (Green)

AC Line Conducted Emissions Line 2

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

Data#: 14 File#: 09U12680 LC.EMI Date: 07-14-2009 Time: 08:54:57

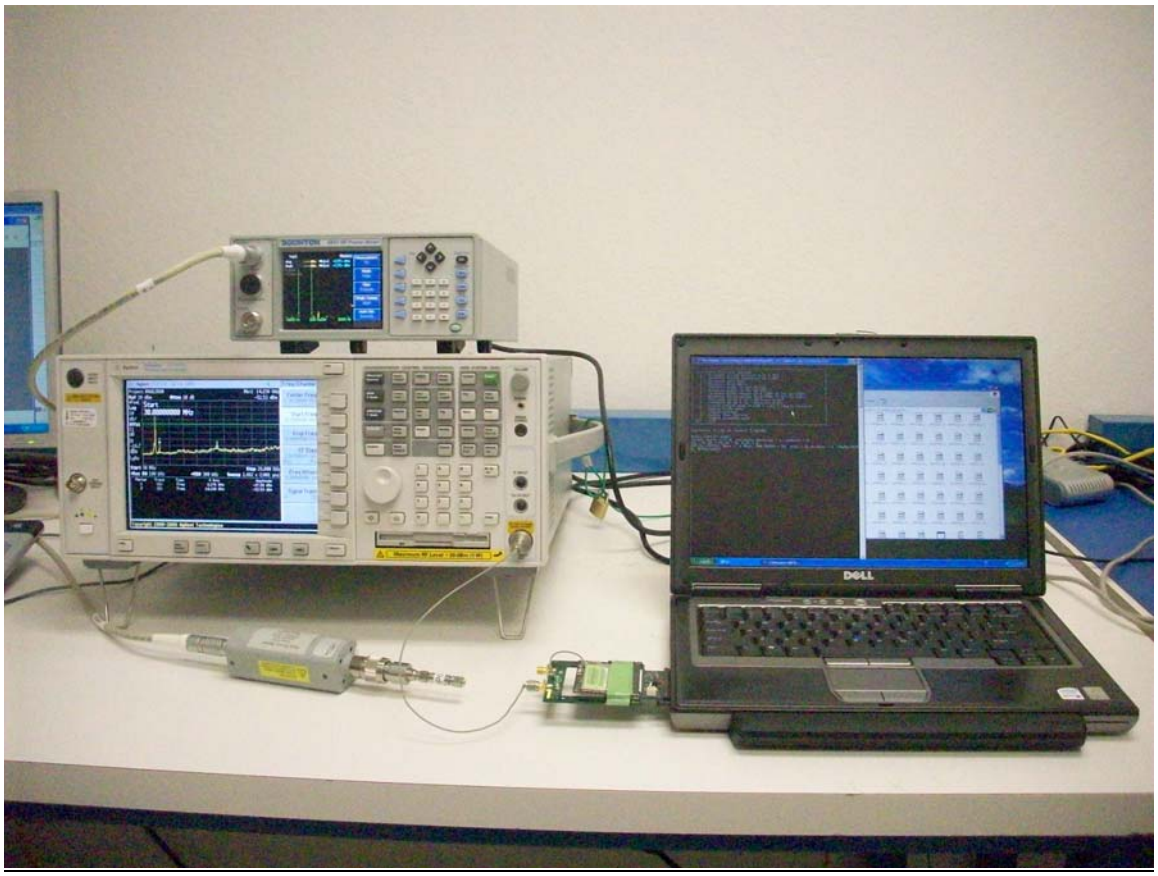


Trace: 12 Ref Trace:

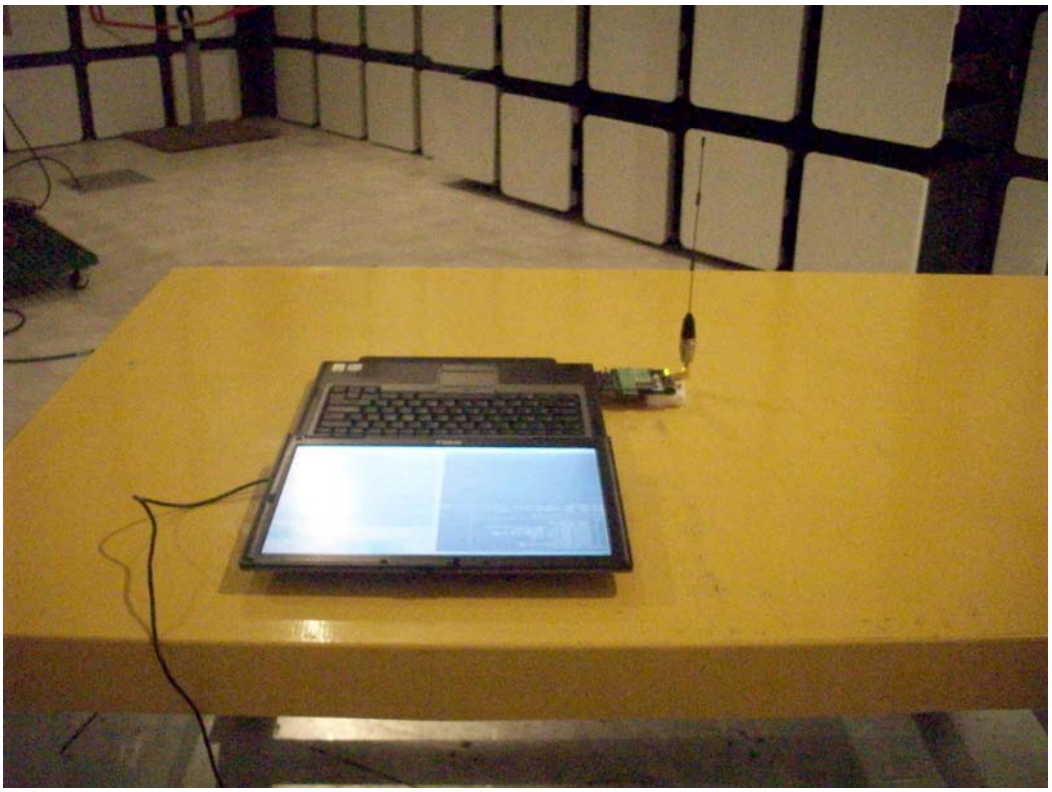
Condition: CISPR CLASS-B
Test Operator: : Tom Chen
Project #: : 09U12680
Company: : Novariant, Inc.
EUT Description:: TBD
Mode: : TX Worst case
Target: : FCC Class B
Voltage: : 115VAC, 60Hz
: L2: Peak (Blue) , Average (Green)

SETUP PHOTOS

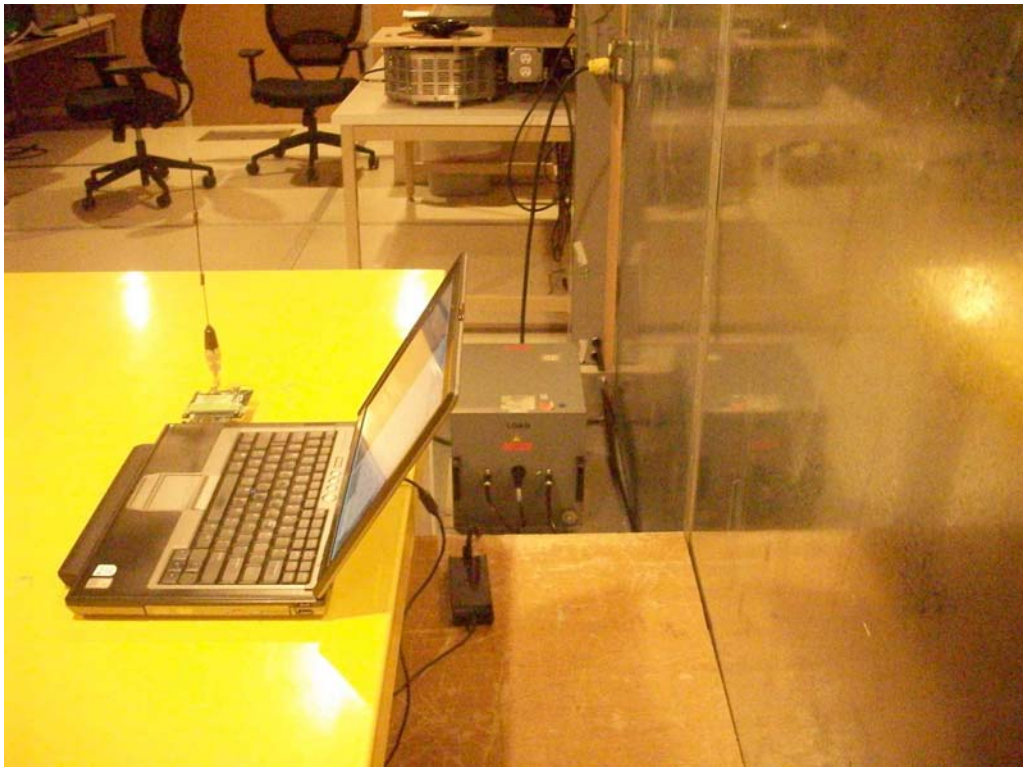
ANTENNA PORT CONDUCTED TESTS



RADIATED RF MEASUREMENT SETUP



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP



END OF REPORT

Report Revision History

Revision No.	Revision Description	Pages Revised	Revised by	Date
-	Original Issue		T. Cokenias	8/15/2009