

## FCC CFR47 PART 15 SUBPART C CERTIFICATION TEST REPORT

FOR

# 802.11a/b/g CARDBUS CARD

## MODEL NUMBER: AR5BCB-00062

FCC ID: PPD-AR5BCB-00062

**REPORT NUMBER: O4U3043-1** 

ISSUE DATE: DECEMBER 21, 2004 Prepared for ATHEROS COMMUNICATIONS, INC. 529 ALMANOR AVE. SUNNYVALE, CA 94085 U.S.A.

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### Revision History

Rev. Revisions

Revised By

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8.	SETUP PHOTOS	15	54
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## **1. ATTESTATION OF TEST RESULTS**

COMPANY NAME:	ATHEROS COMMUNICATIONS, INC. 529 ALMANOR AVE. SUNNYVALE, CA 94085 U.S.A.				
EUT DESCRIPTION:	802.11a/b/g CARDBUS CARD				
MODEL:	AR5BCB-00062				
SERIAL NUMBER:	CB62-420-36				
DATE TESTED:	NOVEMBER 30 – DECEMBER 20, 2004				
APPLICABLE STANDARDS					
STANDARD	TEST RESULTS				
FCC PART 15 SUBF	PART C NO NON-COMPLIANCE NOTED				

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. 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 Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services 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:

YAN ZHENG EMC SUPERVISOR COMPLIANCE CERTIFICATION SERVICES Tested By:

HITESH SOLANKI EMC ENGINEER COMPLIANCE CERTIFICATION SERVICES

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# 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

# 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

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

# 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. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

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

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# 5. EQUIPMENT UNDER TEST

## 5.1. DESCRIPTION OF EUT

The EUT is an 802.11a/b/g with turbo mode transceiver Cardbus Card.

The radio module is manufactured by Atheros Communications Inc.

## 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

2400 to 2483.5 MHz Authorized Band

Frequency Range	Mode	Output Power	Output Power
(MHz)		(dBm)	(mW)
2412 - 2462	802.11b	22.92	195.88
2412 - 2462	802.11g	26.41	437.52
2412 - 2462	802.11g Turbo	25.14	326.59

5725 to 5850 MHz Authorized Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5745 - 5825	802.11a	24.44	277.97
5760 - 5805	802.11a Turbo	23.64	231.21

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### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes two integrated TX/RX antennas for diversity, each with a maximum gain of 0 dBi.

## 5.4. SOFTWARE

The test utility software used during testing was "ART program" rev. V5\_2\_b55.

## 5.5. WORST-CASE CONFIGURATION AND MODE

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

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### 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Description	Description Manufacturer Model Number Serial Number					
Laptop PC	IBM	R40	FX-28550	DoC		
AC Adapter	IBM	02K6657	A261766	N/A		
Laptop PC	Dell	PP05L	CN-04Y212-484643-34-T-3374	DoC		
AC Adapter	Dell	AA22850	CN-045U092-16291-34K-03NQ	N/A		
Laptop PC	Dell	PP011	52XMUL-36273-FB-E	DoC		
AC Adapter	Dell	AA20031	9364U	N/A		

### I/O CABLES

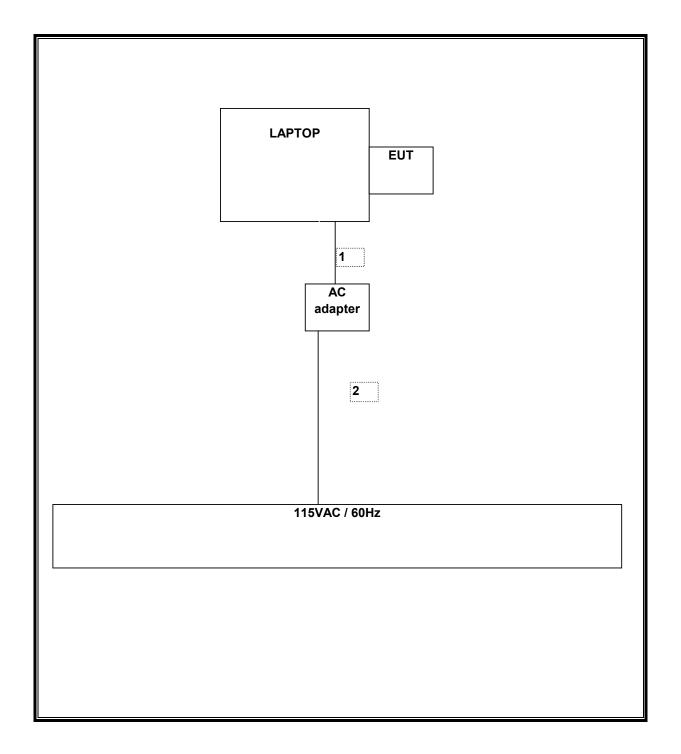
	I/O CABLE LIST							
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks		
1	DC	1	DC	Unshielded	1.8	No		
2	AC	1	IEC	Unshielded	1.5	No		

### TEST SETUP

The EUT is installed in a host laptop computer via a PCMCIA slot during the tests. The test software exercised the radio card.

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### SETUP DIAGRAM FOR TESTS



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# 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	
Peak Power Meter	Agilent	E4416A	GB41291160	2/9/2006	
Peak / Average Power Sensor	Agilent	E9327A	US40440755	2/10/2006	
Spectrum Analyzer 20 Hz ~ 44 GHz	Agilent	E4446A	US42070220	4/1/2005	
Antenna, Horn 1 ~ 18 GHz	EMCO	3117	29310	9/12/2005	
Preamplifier, 1 ~ 26 GHz	Miteq	NSP2600-44	646456	8/17/2005	
5.15-5.35 GHz Rejection filter	Microtronics	BRC13190	2	CNR	
5.47-5.725 GHz Rejection filter	Microtronics	BRC13191	1	CNR	
5.725-5.825 GHz Rejection filter	Microtronics	BRC13192	1	CNR	
1.5 GHz High pass filter	Microtronics	HPM13193	3	CNR	
EMI Test Receiver	R & S	ESHS 20	827129/006	10/22/2005	
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/2005	
Site A Line Stabilizer / Conditioner	Tripplite	LC-1800a	A0051681	CNR	
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	10/21/2005	
AC Power Source, 10KVA	ACS	AFC-10K-AFC-2	J1568	CNR	
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	29800	5/13/2005	
AC Power Source, 8KVA	APC	AFP2-8KVA	J5061	CNR	

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## 7. LIMITS AND RESULTS

### 7.1. CHANNEL TESTS FOR THE 2400 TO 2483.5 MHz BAND

### 7.1.1.6 dB BANDWIDTH

### <u>LIMIT</u>

§15.247 (a) (2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

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### **RESULTS**

No non-compliance noted:

### 802.11b Mode

Channel	Frequency	6 dB Bandwidth	Minimum Limit	Margin
	(MHz)	(kHz)	(kHz)	(kHz)
Low	2412	10080	500	9580
Low	2417	12000	500	11500
Middle	2437	10170	500	9670
High	2457	12080	500	11580
High	2462	12080	500	11580

### 802.11g Mode

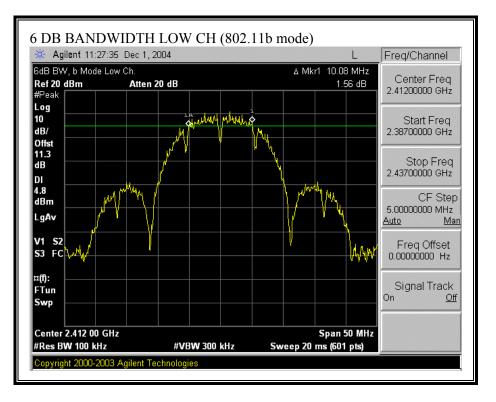
Channel	Frequency	6 dB Bandwidth	Minimum Limit	Margin
	(MHz)	(kHz)	(kHz)	(kHz)
Low	2412	16420	500	15920
Low	2417	16420	500	15920
Middle	2437	16330	500	15830
High	2457	16330	500	15830
High	2462	16330	500	15830

802.11g Turbo Mode

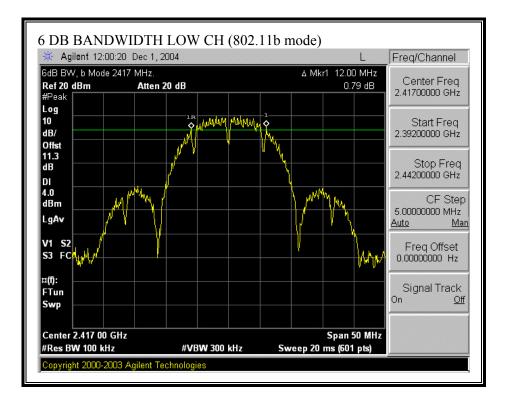
Channel	Frequency	6 dB Bandwidth	Minimum Limit	Margin
	(MHz)	(kHz)	(kHz)	(kHz)
Middle	2437	31330	500	30830

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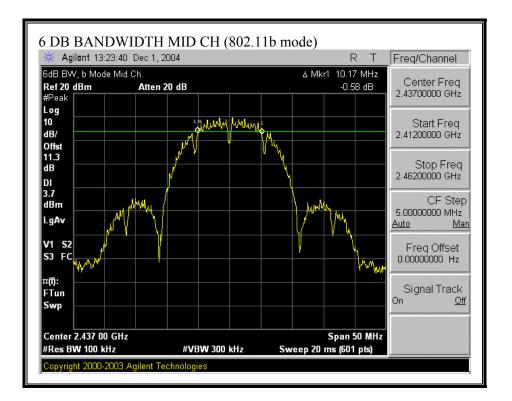
### 6 DB BANDWIDTH (802.11b MODE)



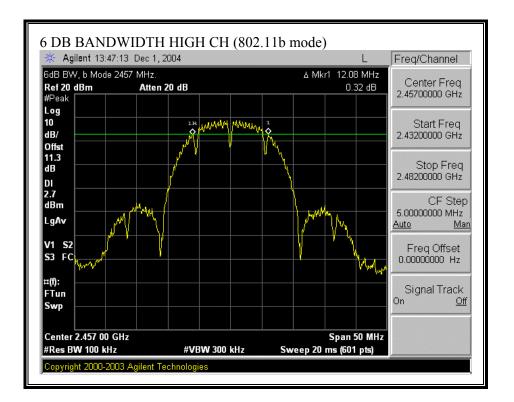
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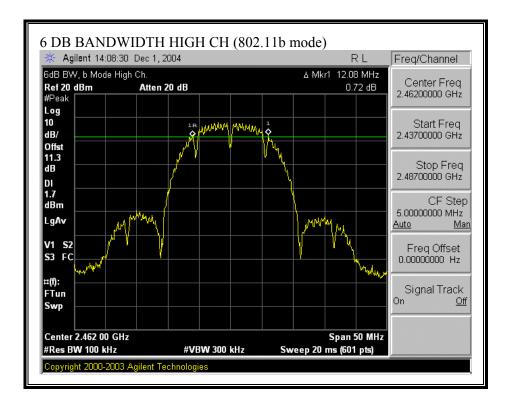
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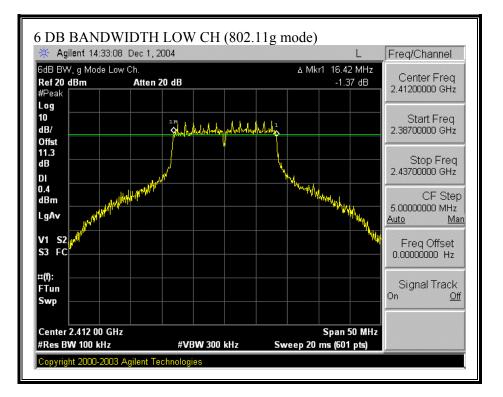


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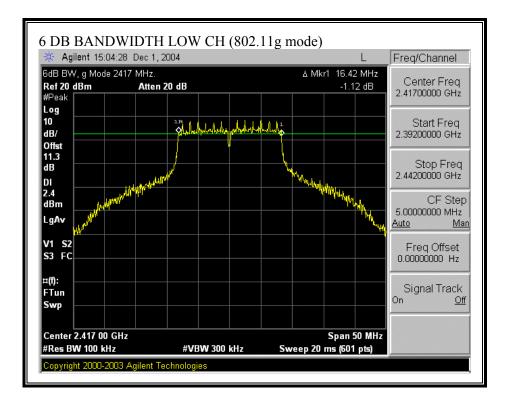


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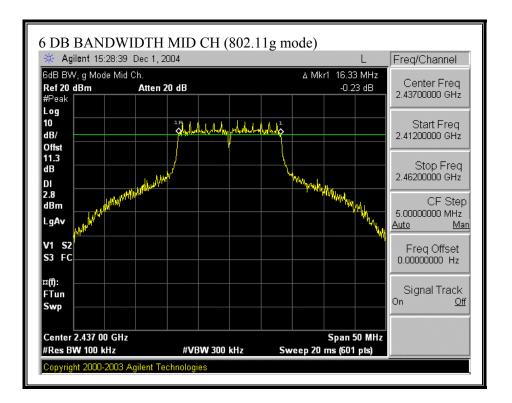
#### 6 DB BANDWIDTH (802.11g MODE)



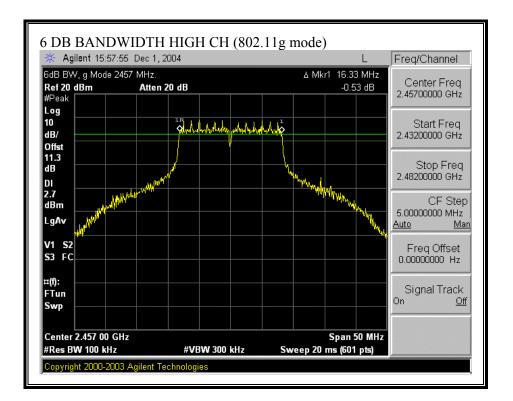
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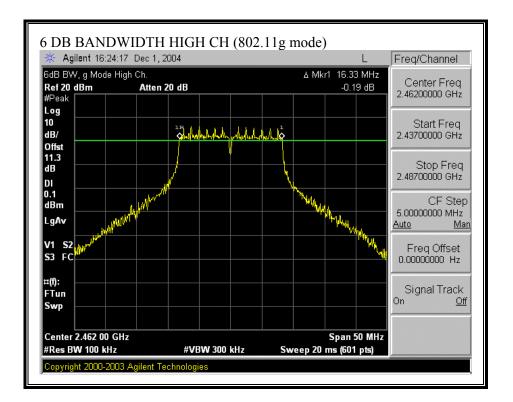
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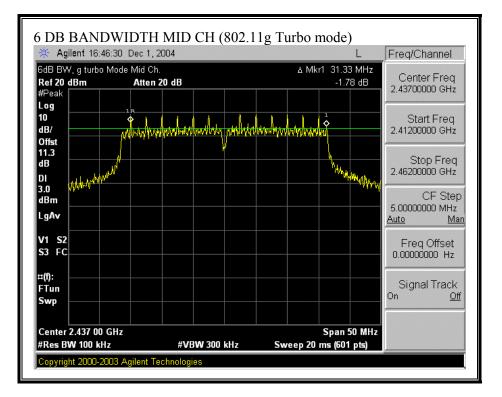


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#### 6 DB BANDWIDTH (802.11g TURBO MODE)



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### 7.1.2. 99% BANDWIDTH

### <u>LIMIT</u>

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 99% bandwidth function is utilized.

### **RESULTS**

No non-compliance noted:

Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	2412	15.9103
Low	2417	15.8737
Middle	2437	15.6847
High	2457	15.6077
High	2462	15.5654

802.11b Mode

### 802.11g Mode

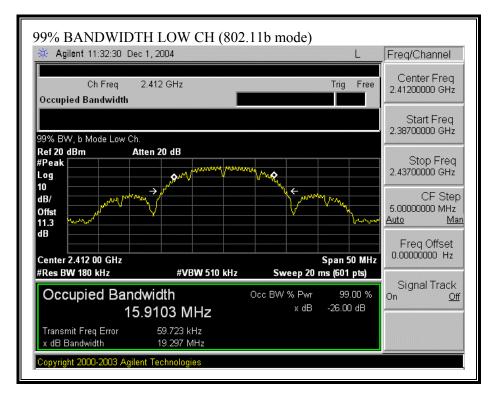
Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	2412	17.0955
Low	2417	17.8001
Middle	2437	17.4479
High	2457	17.3394
High	2462	16.7586

802.11g Turbo Mode

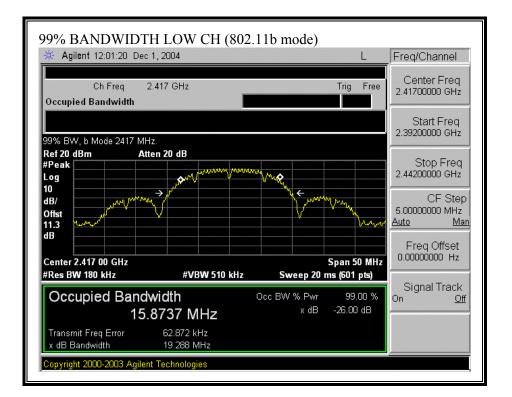
Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Middle	2437	33.7235

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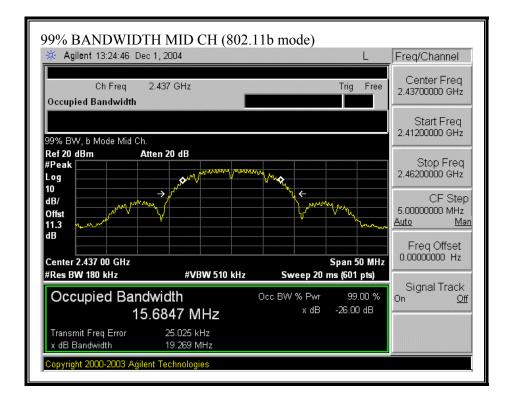
#### 99% BANDWIDTH (802.11b MODE)



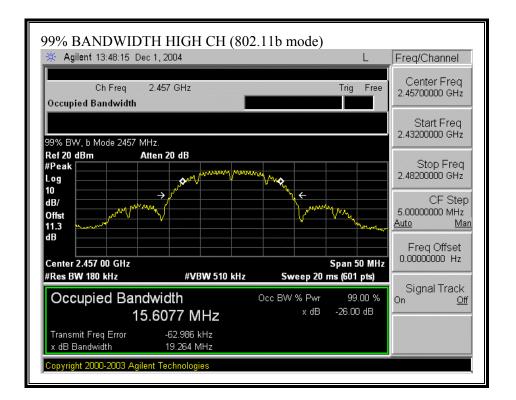
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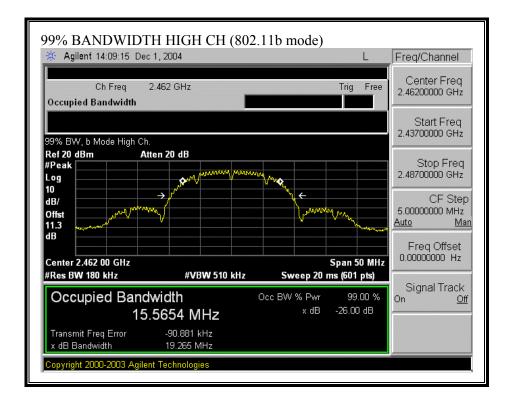
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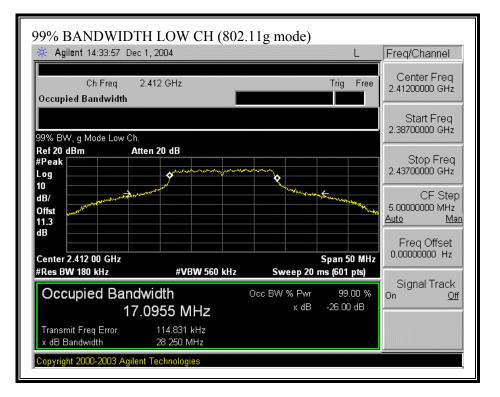


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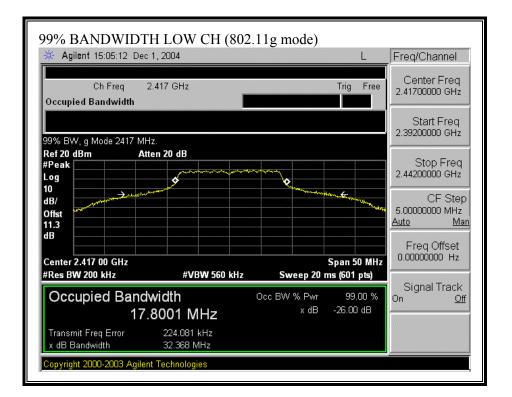


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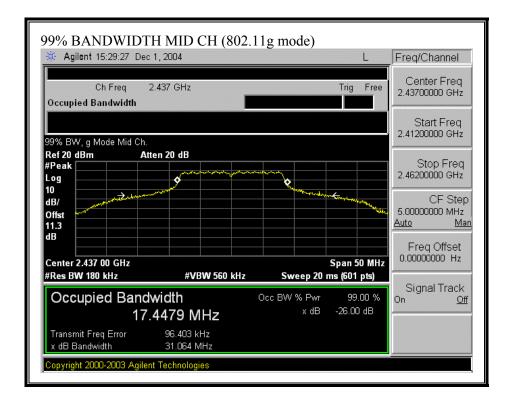
#### 99% BANDWIDTH (802.11g MODE)



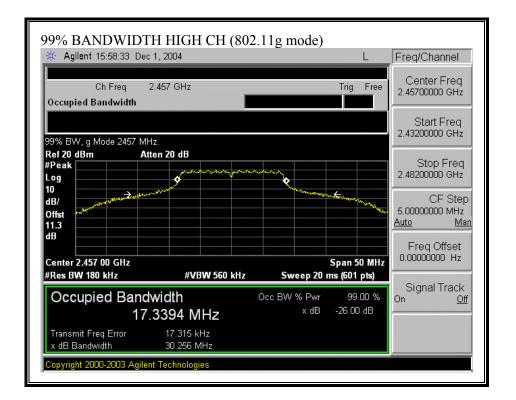
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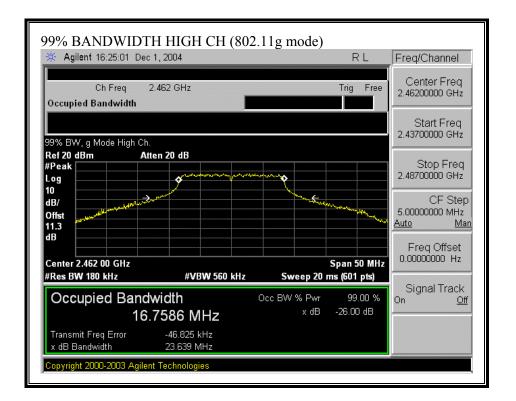
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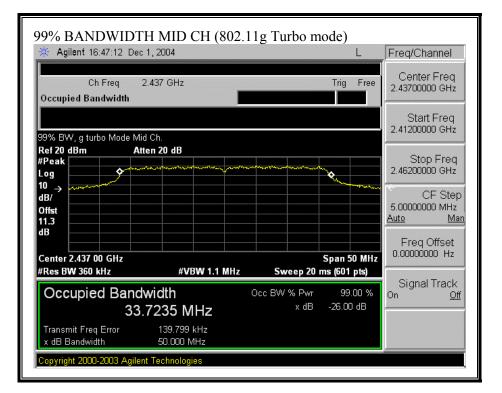


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#### 99% BANDWIDTH (802.11g TURBO MODE)



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### 7.1.3. PEAK OUTPUT POWER

### PEAK POWER LIMIT

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz , and 5725-5850 MHz bands: 1 watt.

\$15.247 (b) (4) Except as shown in paragraphs (b)(4) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.247 (b) (4) (i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth.

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## **RESULTS**

The maximum antenna gain is 0 dBi for other than fixed, point-to-point operations, therefore the limit is 30 dBm.

No non-compliance noted:

802.11b Mode

Channel	Frequency	<b>Peak Power</b>	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	22.92	30	-7.08
Low	2417	22.55	30	-7.45
Middle	2437	22.62	30	-7.38
High	2457	22.20	30	-7.80
High	2462	21.39	30	-8.61

802.11g Mode

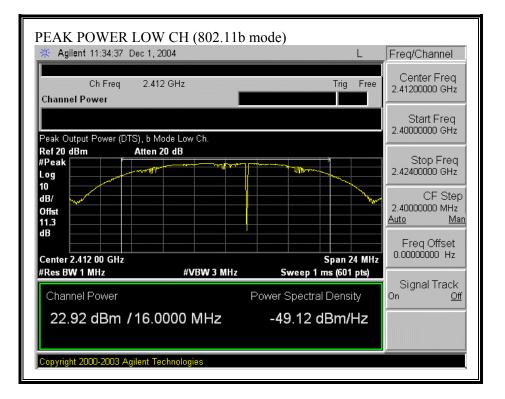
Channel	Frequency	<b>Peak Power</b>	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	25.39	30	-4.61
Low	2417	25.94	30	-4.06
Middle	2437	26.37	30	-3.63
High	2457	26.41	30	-3.59
High	2462	25.51	30	-4.49

802.11g Turbo Mode

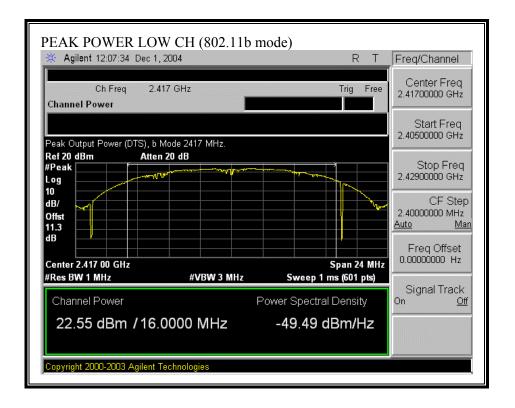
Channel	Frequency	Peak Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Middle	2437	25.14	30	-4.86

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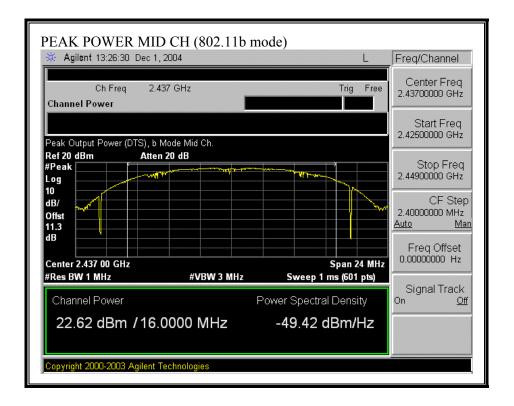
#### OUTPUT POWER (802.11b MODE)



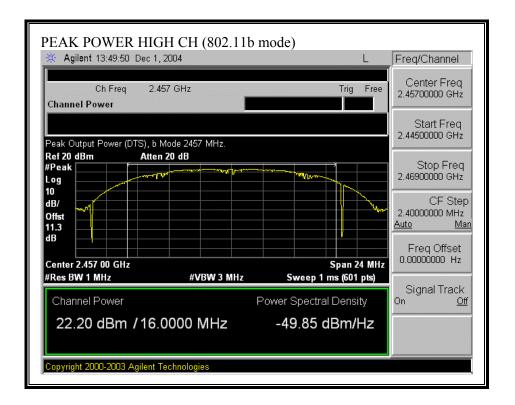
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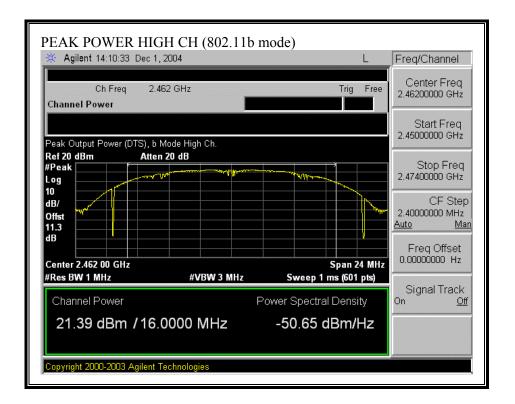
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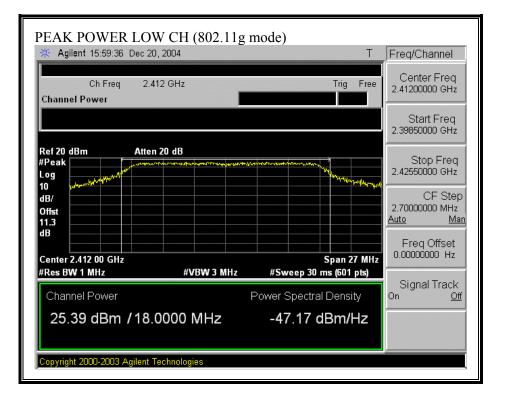


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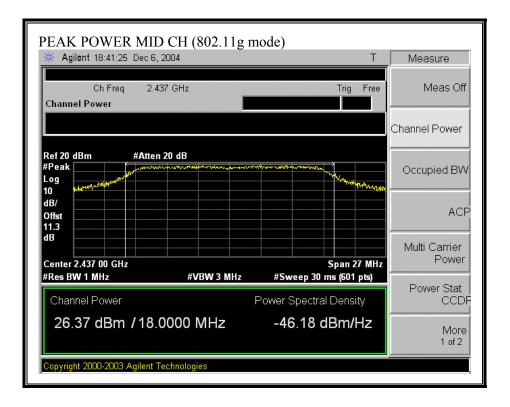
#### OUTPUT POWER (802.11g MODE)



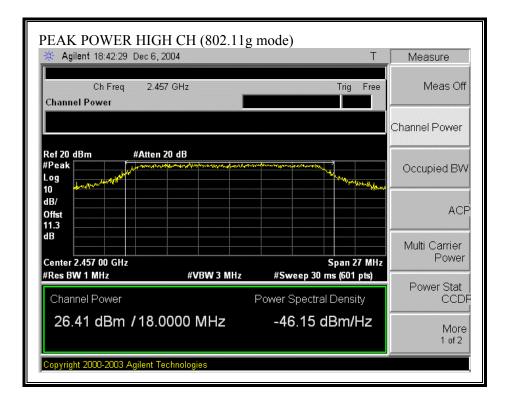
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PEAK POWER LOV		node)	_	
🔆 Agilent 18:40:31 Dec 6,	2004			Measure
Ch Freq 2.4 Channel Power	17 GHz	Trig	Free	Meas Off
				Channel Power
Ref 20 dBm #Atten #Peak Log 10 Water Water and Andrews	20 dB alp		Waldwington	Occupied BW
dB/				ACP
dB Center 2.417 00 GHz		Span 2		Multi Carrier Power
#Res BW 1 MHz Channel Power	#VBW 3 MHz	#Sweep 30 ms (601 Power Spectral Densi		Power Stat CCDF
25.94 dBm /18.0	0000 MHz	-46.61 dBm/l	Ηz	More 1 of 2
Copyright 2000-2003 Agilent T	echnologies			

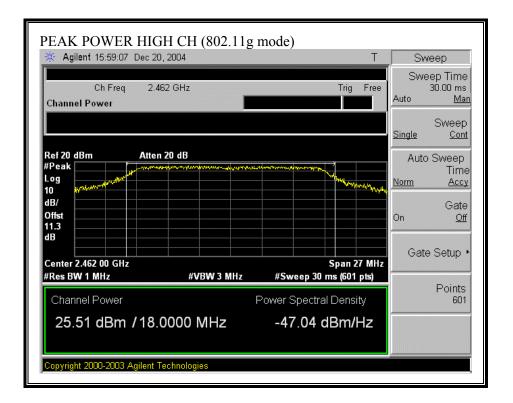
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## OUTPUT POWER (802.11g TURBO MODE)

PEAK POWER (802	.11g Turbo moc	le)	
🔆 Agilent 18:44:57 Dec 6, 3	2004	Т	Measure
Ch Freq 2.43 Channel Power	37 GHz	Trig Free	Meas Off
			Channel Power
Ref 20 dBm #Atten #Peak Log 10 dB/ Offst 11.3 dB	20 dB		Occupied BW ACP Multi Carrier
Center 2.437 00 GHz		Span 52.5 MHz	Power
#Res BW 1 MHz Channel Power		#Sweep 30 ms (601 pts) Power Spectral Density	Power Stat CCDF
25.14 dBm /35.0	0000 MHz	-50.30 dBm/Hz	More 1 of 2
Copyright 2000-2003 Agilent Te	echnologies		

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## 7.1.4. AVERAGE POWER

### **AVERAGE POWER LIMIT**

None; for reporting purposes only.

## TEST PROCEDURE

The transmitter output is connected to a power meter.

## **RESULTS**

No non-compliance noted:

The cable assembly insertion loss of 11.3 dB (including 10 dB pad and 1.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11b Mode

Channel	Frequency	Power
	(MHz)	(dBm)
Low	2412	20.3
Low	2417	20.1
Middle	2437	19.7
High	2457	19.6
High	2462	18.6

802.11g Mode

Channel	Frequency	Power
	(MHz)	(dBm)
Low	2412	18.4
Low	2417	19.3
Middle	2437	19.3
High	2457	19.4
High	2462	18.7

802.11g Turbo Mode

Channel	Frequency (MHz)	Power (dBm)
Middle	2437	19.0

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# 7.1.5. PEAK POWER SPECTRAL DENSITY

## <u>LIMIT</u>

§15.247 (d) For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

## TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

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## **RESULTS**

No non-compliance noted:

802.11b Mode

Channel	Frequency	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	-3.33	8	-11.33
Low	2417	-4.25	8	-12.25
Middle	2437	-3.86	8	-11.86
High	2457	-4.38	8	-12.38
High	2462	-5.00	8	-13.00

#### 802.11g Mode

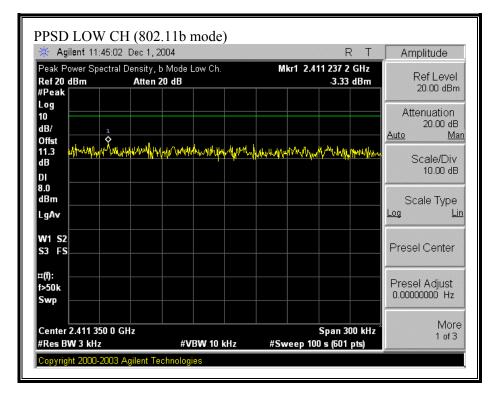
Channel	Frequency	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	-5.07	8	-13.07
Low	2417	-4.93	8	-12.93
Middle	2437	-3.82	8	-11.82
High	2457	-7.03	8	-15.03
High	2462	-5.38	8	-13.38

802.11g Turbo Mode

Channel	Frequency	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Middle	2437	-9.44	8	-17.44

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#### PEAK POWER SPECTRAL DENSITY (802.11b MODE)



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🔆 Agilent 12:1	3:24 Dec 1, 2004	L	Amplitude
Peak Power Spec Ref 20 dBm #Peak	tral Density, b Mode 2417 MHz Atten 20 dB	Mkr1 2.420 647 8 GHz -4.25 dBm	Ref Level 20.00 dBm
Log 10 dB/ Offst		1	Attenuation 20.00 dB <u>Auto Mar</u>
11.3 dB	water and the state of the second	were and the second of the sec	Scale/Div 10.00 dB
DI 8.0 dBm			Scale Type
LgAv			Log Lir
W1 S2 S3 FS			Presel Center
¤(f): f>50k Swp			Presel Adjust 0.00000000 Hz
Center 2.420 600 #Res BW 3 kHz	0 GHz #VBW 10 kH	Span 300 kHz z #Sweep 100 s (601 pts)	More 1 of 3

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🔆 Agilent 13:3	2:50 Dec 1, 2004			L	Amplitude
Ref 20 dBm #Peak	tral Density, b Mod Atten 20 dB	e Mid Ch.	Mkr1 2.436	222 5 GHz -3.86 dBm	Ref Level 20.00 dBm
Log 10 dB/ Offst	1				Attenuation 20.00 dB <u>Auto Ma</u> i
11.3 կտակումը/ dB DI	hannyllen hallyn yr ithin yw ar	while where	uthanfan Martin Marayan y	www.montreadure	Scale/Div 10.00 dB
8.0 dBm LgAv					Scale Type Log Lir
W1 S2 S3 FS					Presel Center
¤(f): f>50k Swp					Presel Adjust 0.00000000 Hz
Center 2.436 300 #Res BW 3 kHz		VBW 10 kHz	S Sweep 100	pan 300 kHz ´ s (601 pts)	More 1 of 3

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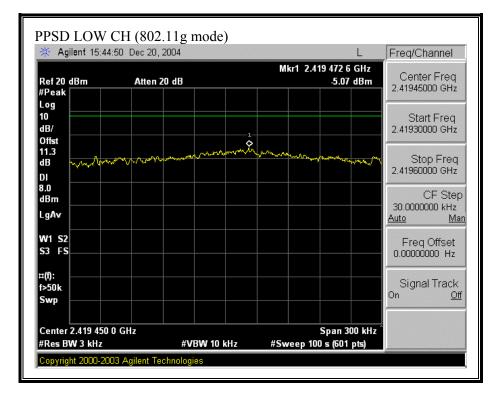
🔆 Agilent 13	:54:37 Dec 1	, 2004		L	Amplitude
Ref 20 dBm #Peak		y, b Mode 2457 MHz n <b>20 dB</b>	Mkr1 2.4	57 648 1 GHz -4.38 dBm	Ref Level 20.00 dBm
Log 10 dB/ Offst 11.3 but Max	i a alta data	6 1. N	and a shipton s association		Attenuation 20.00 dB <u>Auto Mar</u>
DI	2024/124 JUL-1344	an a chan a th' All had a	All Andrewski Antronomik	Allowed Anna Autoria	Scale/Div 10.00 dB
dBm LgAv					Scale Type Log Lir
W1 S2 S3 FS					Presel Center
¤(f): f>50k Swp					Presel Adjust 0.00000000 Hz
Center 2.457 5 #Res BW 3 kH		#VBW 10 kł	Iz #Sweep 10	Span 300 kHz )0 s (601 pts)	More 1 of 3

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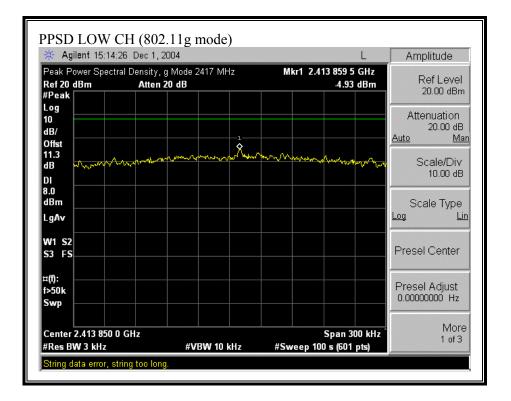
🔆 Agilent 14:	15:01 Dec 1, 2004	L	Freq/Channel
Peak Power Spe Ref 20 dBm #Peak	ctral Density, b Mode High Ch. Atten 20 dB	Mkr1 2.461 505 3 GHz -5.00 dBm	Center Freq 2.46145000 GHz
Log 10 dB/ Offst			Start Freq 2.46130000 GHz
	ingganylmyet <sup>na</sup> lla <mark>lla<sub>n</sub>da</mark> llanthathanin chaqayettilgariya	nt was the many providence of the providence of	Stop Freq 2.46160000 GHz
8.0 dBm LgAv			CF Step 30.0000000 kHz <u>Auto Ma</u>
W1 S2 S3 FS			Freq Offset 0.00000000 Hz
¤(f): f>50k Swp			Signal Track On <u>Off</u>
Center 2.461 45 #Res BW 3 kHz		Span 300 kHz #Sweep 100 s (601 pts)	

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#### PEAK POWER SPECTRAL DENSITY (802.11g MODE)



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🔆 Agilent 15:34	:49 Dec 1, 2004	L	Amplitude
Peak Power Spect Ref 20 dBm #Peak	ral Density, g Mode Mid Ch. Atten 20 dB	Mkr1 2.435 733 9 GHz -3.82 dBm	Ref Level 20.00 dBm
Log 10 dB/ Offst			Attenuation 20.00 dB <u>Auto Mar</u>
ab	mar and	man many when a me	Scale/Div 10.00 dB
8.0 dBm LgAv			Scale Type Log Lin
W1 S2 S3 FS			Presel Center
¤(f): f>50k Swp			Presel Adjust 0.00000000 Hz
Center 2.435 750 #Res BW 3 kHz	0 GHz #VBW 10 kHz	Span 300 kHz #Sweep 100 s (601 pts)	More 1 of 3

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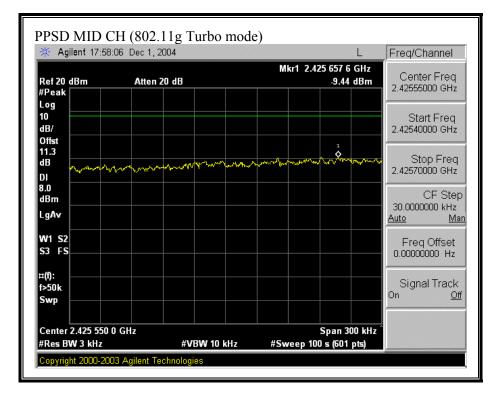
🔆 Agilent 16:30	0:27 Dec 1, 2004	RT	Freq/Channel
Ref 20 dBm #Peak	tral Density, g Mode High Ch. Atten 20 dB	Mkr1 2.457 610 0 GHz _7.03 dBm	Center Freq 2.45760000 GHz
Log 10 dB/ Offst			Start Freq 2.45745000 GHz
11 3	war war and the second s	and a second and a s	Stop Freq 2.45775000 GHz
8.0 dBm LgAv			CF Step 30.000000 kHz <u>Auto Mar</u>
W1 S2 S3 FS			Freq Offset 0.00000000 Hz
¤(f): f>50k Swp			Signal Track On <u>Off</u>
Center 2.457 600 #Res BW 3 kHz	0 GHz #VBW 10 kHz	Span 300 kHz #Sweep 100 s (601 pts)	•

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🔆 Agilent 16:0	4:10 Dec 20, 2004	L	Freq/Channel
Peak Power Spec Ref 20 dBm #Peak	tral Density, g Mode High Ch. Atten 20 dB	Mkr1 2.463 272 1 GHz -5.38 dBm	Center Freq 2.46325000 GHz
Log 10 dB/			Start Freq 2.46310000 GHz
Offst 11.3 dB argania	www.wyman.hungham.	when the second and the second th	5 Stop Freq 2.46340000 GHz
8.0 dBm			CF Step 30.0000000 kHz
LgAv			<u>Auto Ma</u>
W1 S2 S3 FS			Freq Offset 0.00000000 Hz
¤(f): f>50k Swp			Signal Track On <u>Of</u>
Center 2.463 250 #Res BW 3 kHz	0 GHz #VBW 10 kHz	Span 300 kHz #Sweep 100 s (601 pts)	*

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#### PEAK POWER SPECTRAL DENSITY (802.11g TURBO MODE)



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# 7.1.6. CONDUCTED SPURIOUS EMISSIONS

## LIMITS

§15.247 (c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions, which fall in the restricted bands, as defined in§15.205(a), must also comply with the radiated emission limits specified in §15.205(a).

## TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

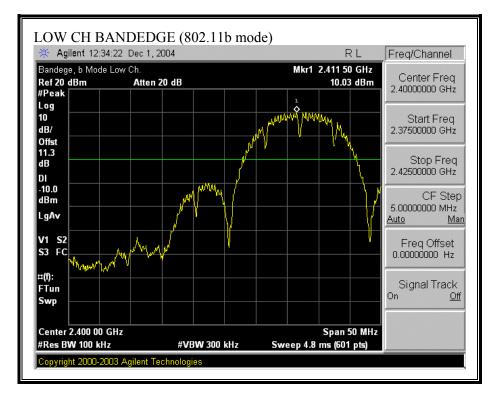
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

## **RESULTS**

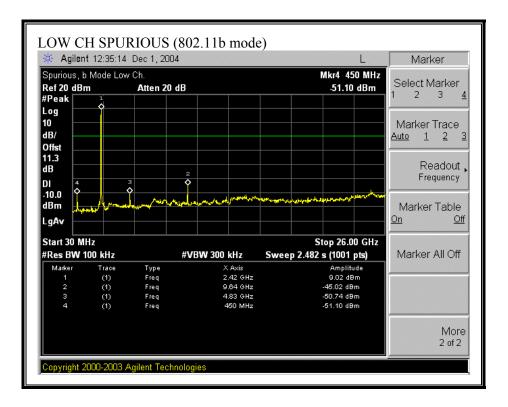
No non-compliance noted:

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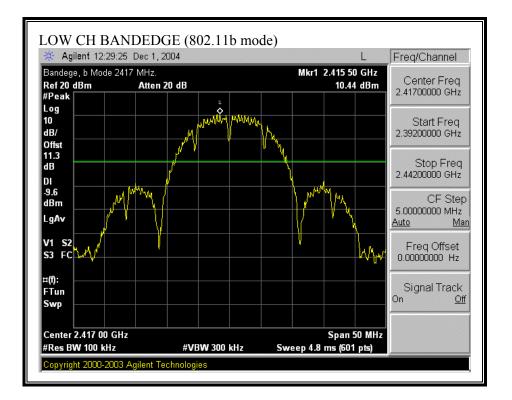
#### SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE)



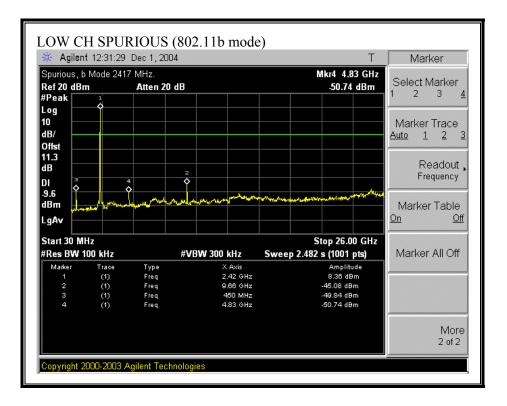
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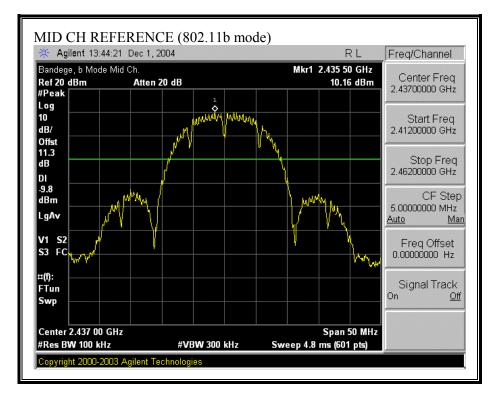


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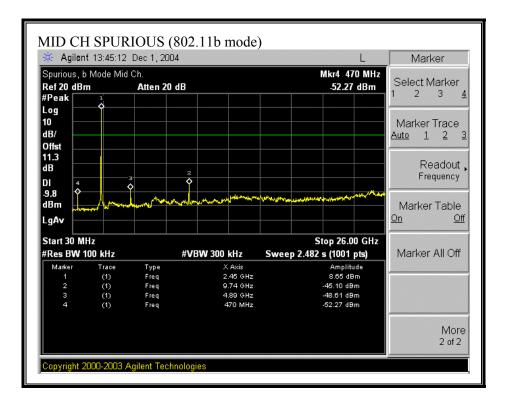


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#### SPURIOUS EMISSIONS, MID CHANNEL (802.11b MODE)

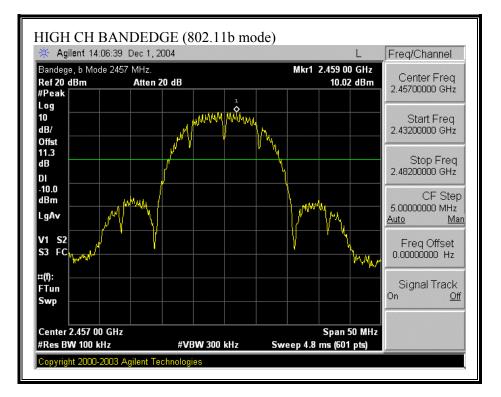


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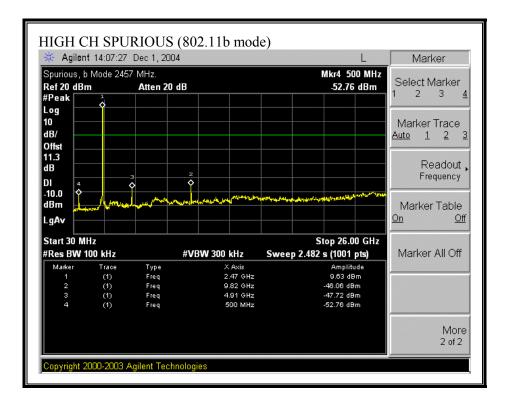


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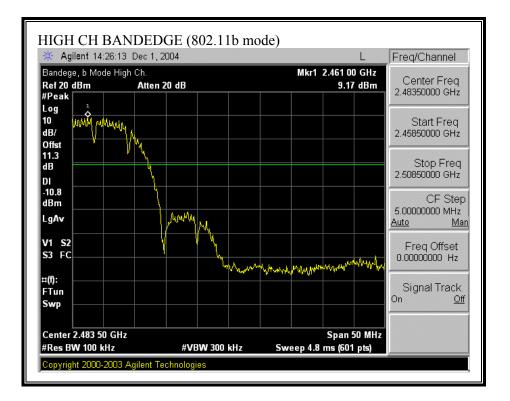
#### SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE)



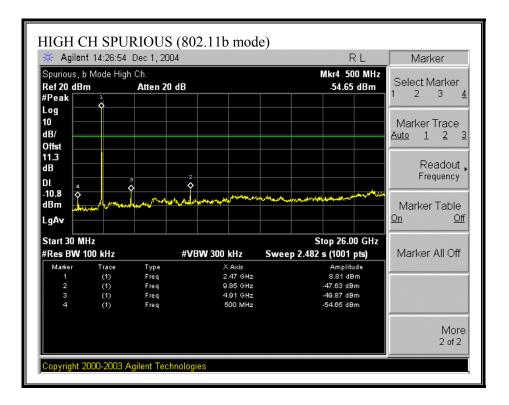
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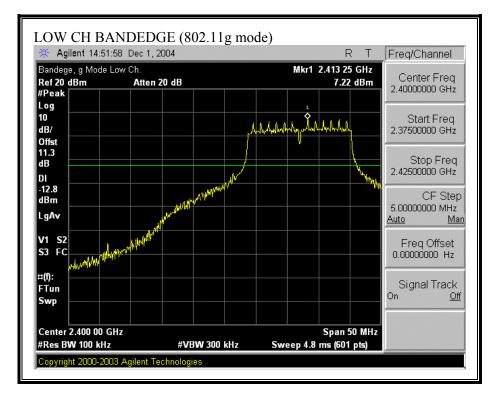


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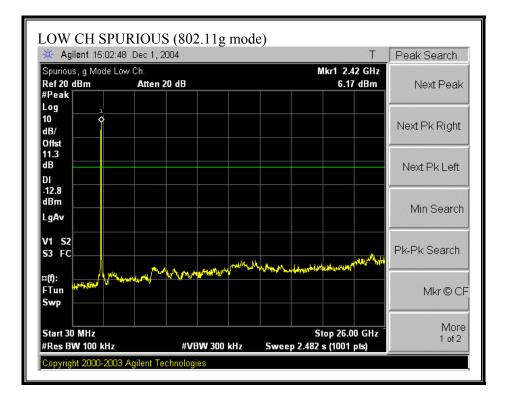


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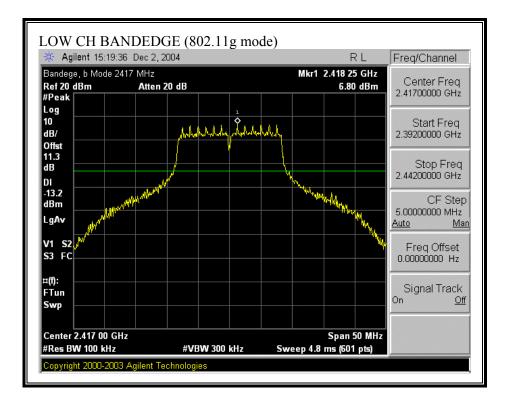
### SPURIOUS EMISSIONS, LOW CHANNEL (802.11g MODE)



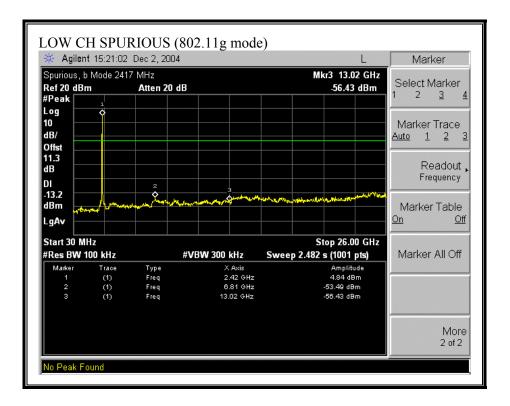
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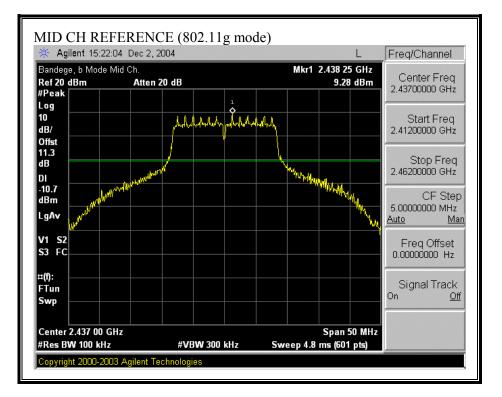


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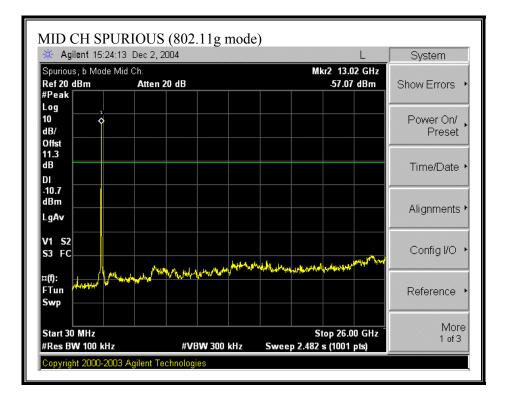


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### SPURIOUS EMISSIONS, MID CHANNEL (802.11g MODE)

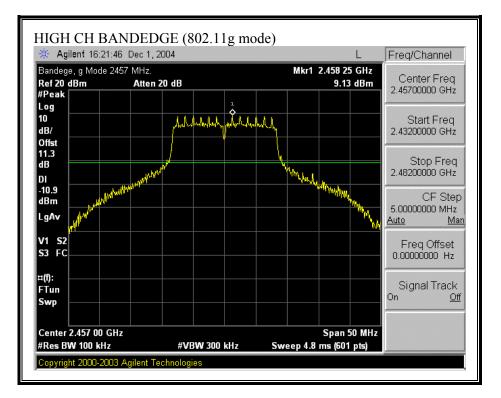


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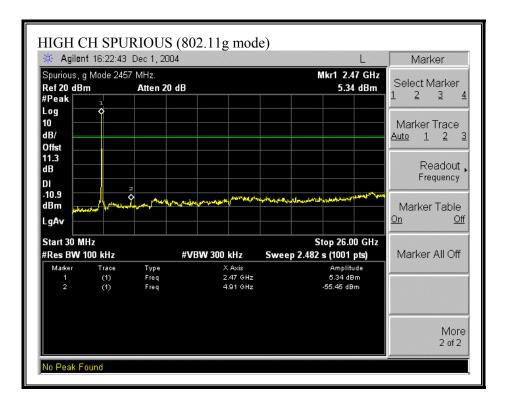


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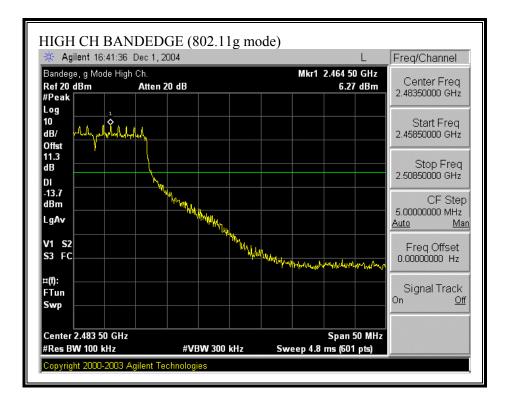
### SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g MODE)



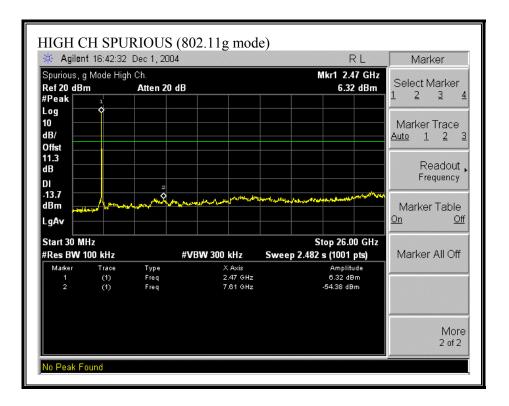
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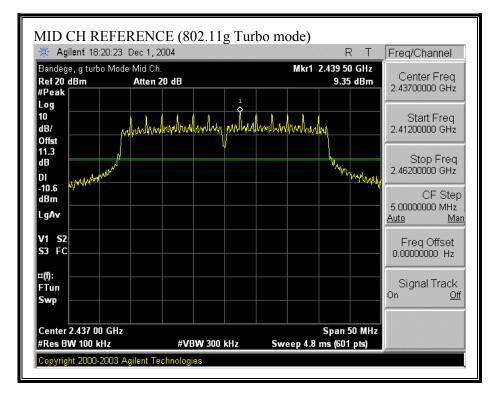


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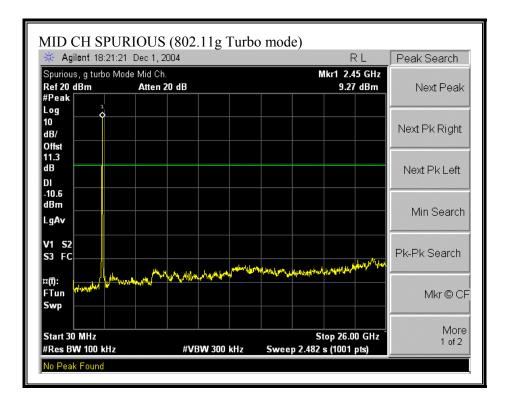


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### SPURIOUS EMISSIONS, MID CHANNEL (802.11g TURBO MODE)



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# 7.2. CHANNEL TESTS FOR THE 5725 TO 5850 MHz BAND

## 7.2.1. 6 dB BANDWIDTH

## <u>LIMIT</u>

§15.247 (a) (2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

## TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

## **RESULTS**

No non-compliance noted:

### 802.11a Mode

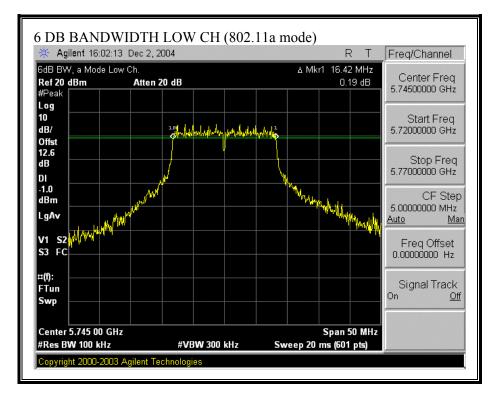
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	5745	16420	500	15920
Middle	5785	16420	500	15920
High	5825	16420	500	15920

## 802.11a Turbo Mode

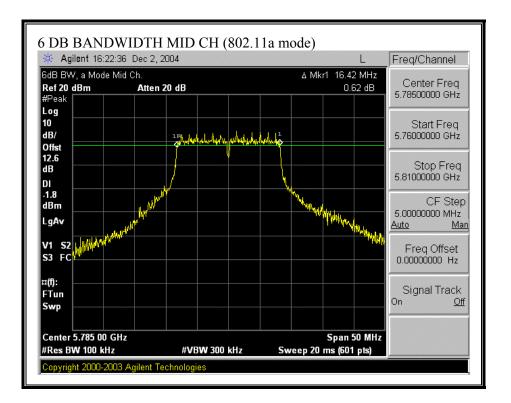
Channel	Frequency	6 dB Bandwidth	Minimum Limit	Margin
	(MHz)	(kHz)	(kHz)	(kHz)
Low	5760	32580	500	32080
High	5805	32580	500	32080

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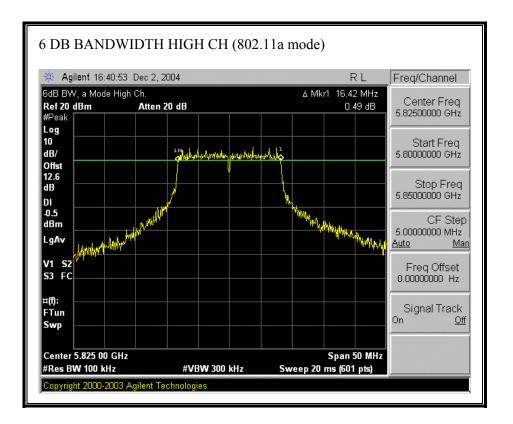
### 6 DB BANDWIDTH (802.11a MODE)



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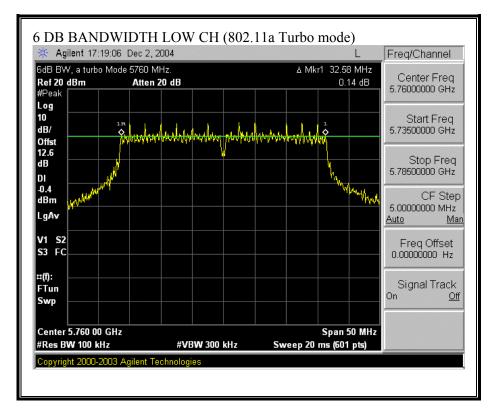


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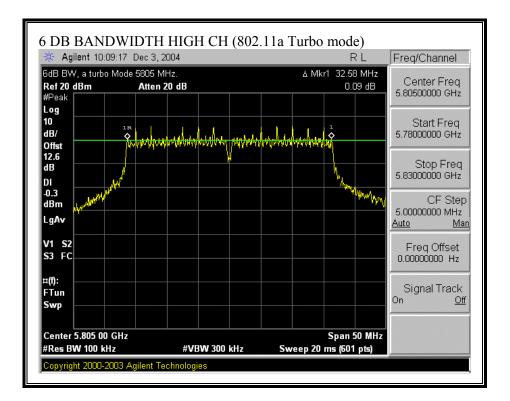


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#### 6 DB BANDWIDTH (802.11a TURBO MODE)



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## 7.2.2. 99% BANDWIDTH

## <u>LIMIT</u>

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 99% bandwidth function is utilized.

## <u>RESULTS</u>

No non-compliance noted:

802.11a Mode

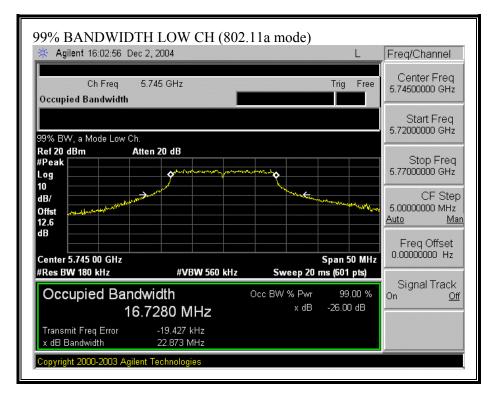
Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	5745	16.728
Middle	5785	16.6995
High	5825	16.7966

802.11a Turbo Mode

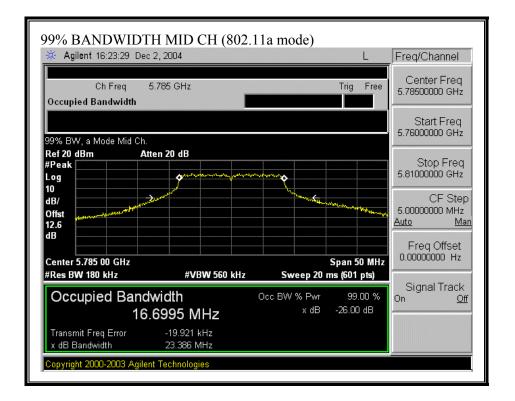
Channel	Frequency	99% Bandwidth	
	(MHz)	(MHz)	
Low	5760	33.2901	
High 5805		33.3751	

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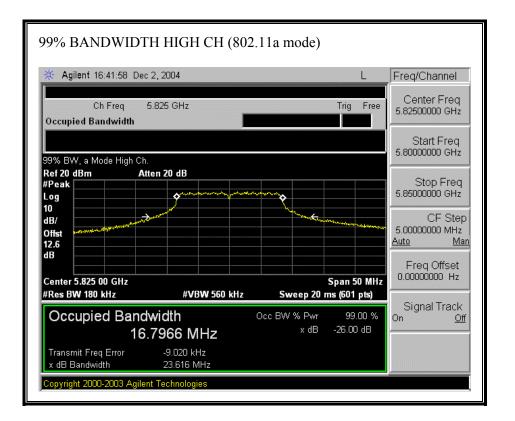
### 99% BANDWIDTH (802.11a MODE)



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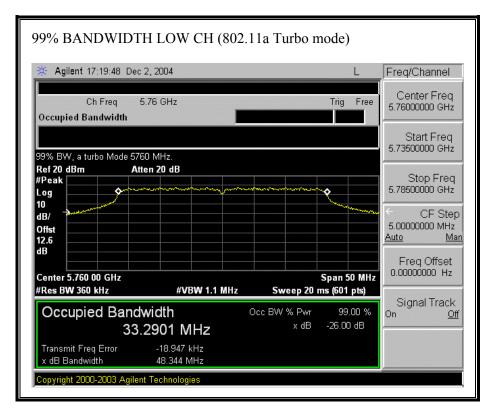


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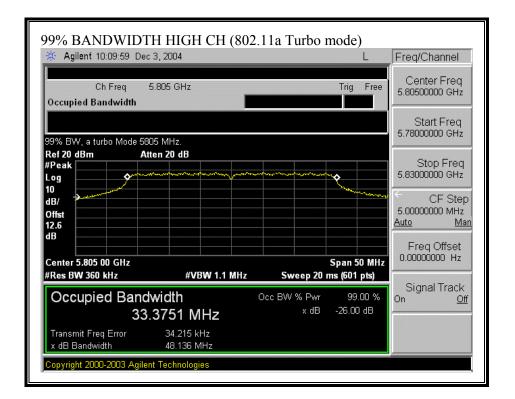


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### 99% BANDWIDTH (802.11a TURBO MODE)



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## 7.2.3. PEAK OUTPUT POWER

## PEAK POWER LIMIT

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz , and 5725-5850 MHz bands: 1 watt.

§15.247 (b) (4) Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.247 (b) (4) (ii) Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

## TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth.

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## **RESULTS**

The maximum antenna gain is 0 dBi for other than fixed, point-to-point operations, therefore the limit is 30 dBm.

No non-compliance noted:

802.11a Mode

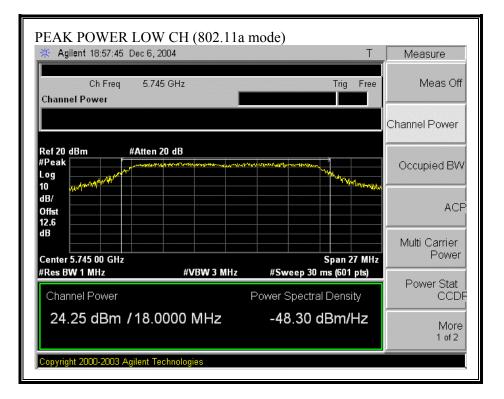
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	5745	24.25	30	-5.75
Middle	5785	24.30	30	-5.70
High	5825	24.44	30	-5.56

802.11a Turbo Mode

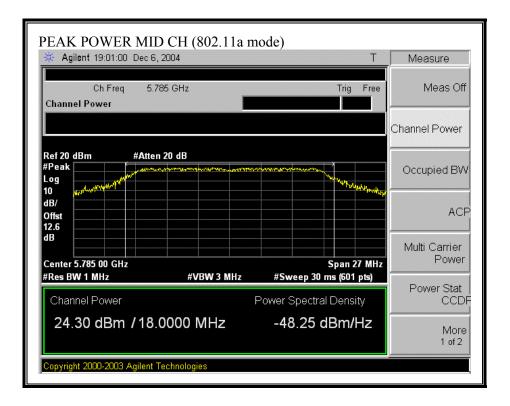
Channel	Frequency	<b>Peak Power</b>	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5760	23.35	30	-6.65
High	5805	23.64	30	-6.36

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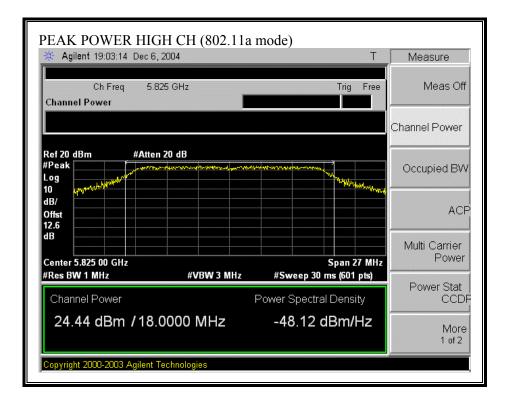
### OUTPUT POWER (802.11a MODE)



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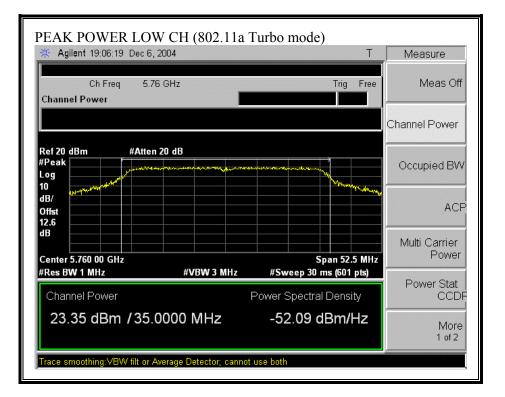


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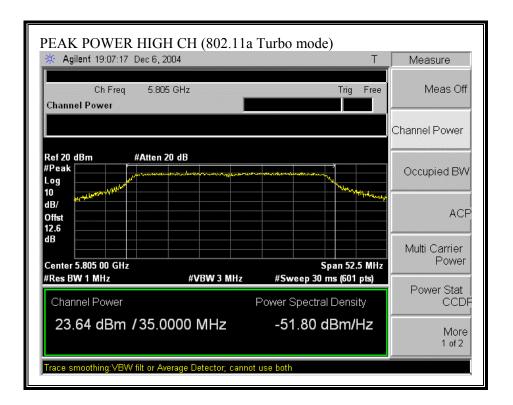


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### OUTPUT POWER (802.11a TURBO MODE)



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## 7.2.4. AVERAGE POWER

### **AVERAGE POWER LIMIT**

None: for reporting purposes only.

## TEST PROCEDURE

The transmitter output is connected to a power meter.

## **RESULTS**

No non-compliance noted:

The cable assembly insertion loss of 12.6 dB (including 10 dB pad and 2.6 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11a Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	5745	17.0
Middle	5785	17.1
High	5825	17.0

802.11a Turbo Mode

Channel	Frequency	Average Power
	(MHz)	(dBm)
Low	5760	16.7
High	5805	17

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## 7.2.5. PEAK POWER SPECTRAL DENSITY

## <u>LIMIT</u>

§15.247 (d) For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

## TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

### RESULTS

No non-compliance noted:

#### 802.11a Mode

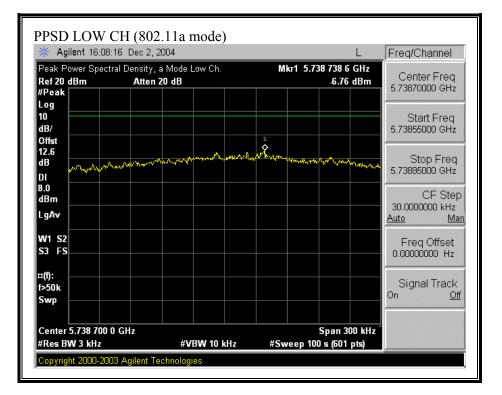
Channel	Frequency	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5745	-6.76	8	-14.76
Middle	5785	-6.84	8	-14.84
High	5825	-7.57	8	-15.57

## 802.11a Turbo Mode

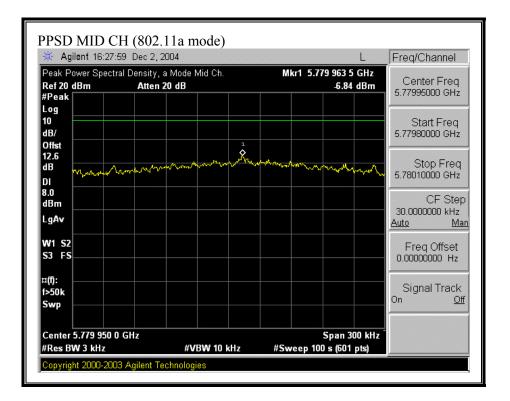
Channel	Frequency	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5760	-8.21	8	-16.21
High	5805	-9.16	8	-17.16

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### PEAK POWER SPECTRAL DENSITY (802.11a MODE)



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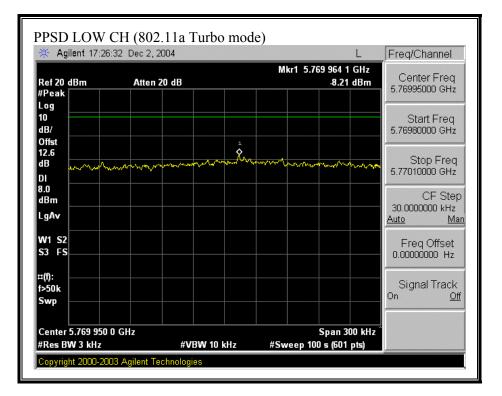


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🔆 Agilent 16:4	7:04 Dec 2, 2004	L	Freq/Channel
Ref 20 dBm #Peak	stral Density, a Mode High Ch. Atten 20 dB	Mkr1 5.832 742 5 GHz -7.57 dBm	Center Freq 5.83275000 GHz
Log 10 dB/			Start Freq 5.83260000 GHz
Offst 12.6 dB	www.www.www.	and all and the second and the second	Stop Freq 5.83290000 GHz
8.0 dBm LgAv			CF Step 30.0000000 kHz <u>Auto Mar</u>
W1 S2 S3 FS			Freq Offset 0.00000000 Hz
¤(f): f>50k Swp			Signal Track On <u>Off</u>
Center 5.832 750 #Res BW 3 kHz	0 GHz #VBW 10 kHz	Span 300 kHz #Sweep 100 s (601 pts)	-

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#### PEAK POWER SPECTRAL DENSITY (802.11a TURBO MODE)



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🔆 Agilent 10:2	6:50 Dec 3, 2004		L Freq/Channel
Ref 20 dBm #Peak	Atten 20 dB	Mkr1 5.807 52 -9.	3 6 GHz         Center Freq           16 dBm         5.80750000 GHz
Log 10 dB/ Offst			Start Freq 5.80735000 GHz
12.6	www.www.www.	m. Athan war	Stop Freq 5.80765000 GHz
8.0 dBm LgAv			CF Step 30.0000000 kHz Auto Mar
W1 S2 S3 FS			Freq Offset 0.00000000 Hz
¤(f): f>50k Swp			Signal Track On <u>Off</u>
Center 5.807 500 #Res BW 3 kHz	0 GHz #VBW 10		1 300 kHz ^

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# 7.2.6. CONDUCTED SPURIOUS EMISSIONS

## LIMITS

§15.247 (c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in§15.205(a), must also comply with the radiated emission limits specified in §15.205(a).

## TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

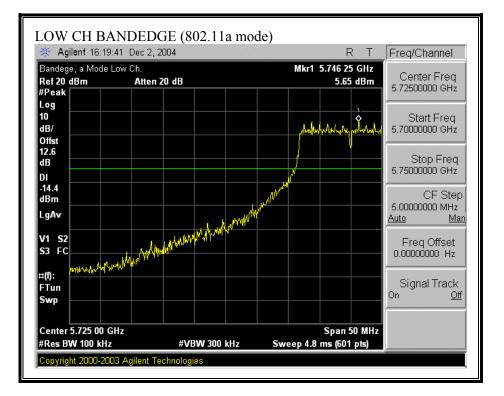
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

## **RESULTS**

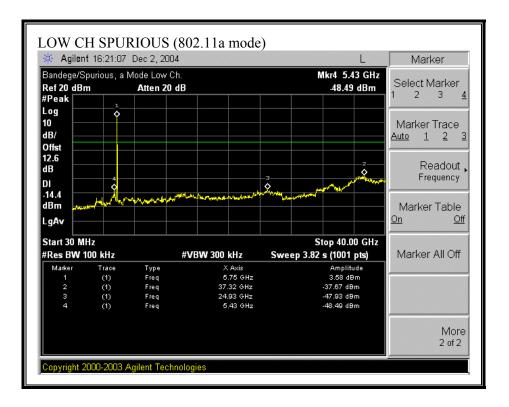
No non-compliance noted:

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#### SPURIOUS EMISSIONS, LOW CHANNEL (802.11a MODE)

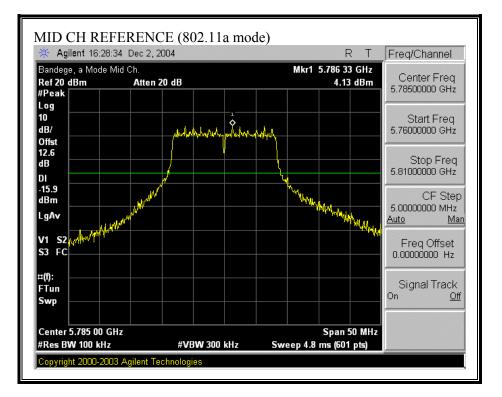


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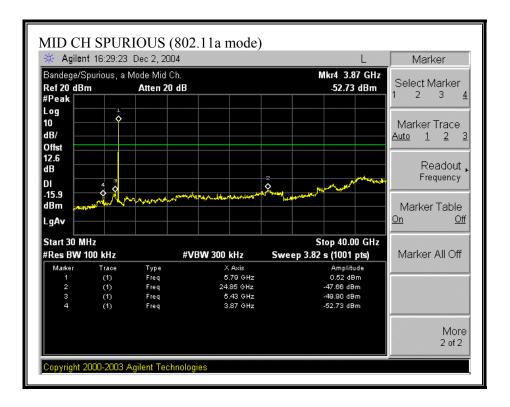


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#### SPURIOUS EMISSIONS, MID CHANNEL (802.11a MODE)

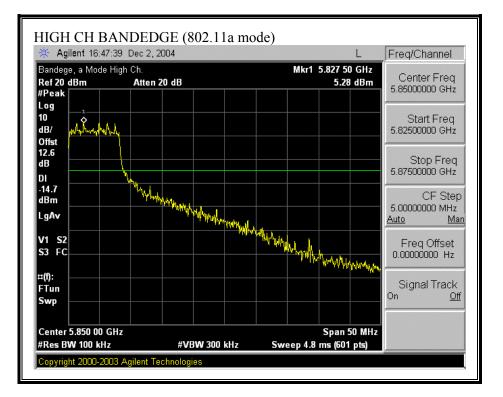


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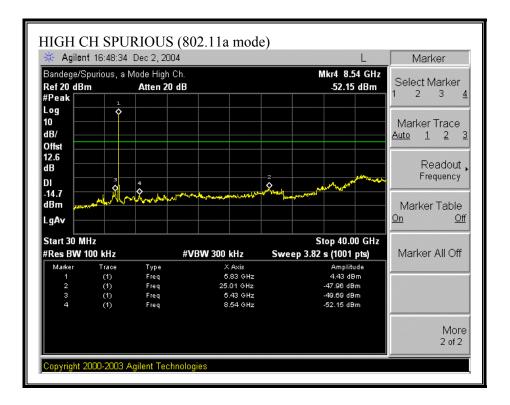


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#### SPURIOUS EMISSIONS, HIGH CHANNEL (802.11a MODE)

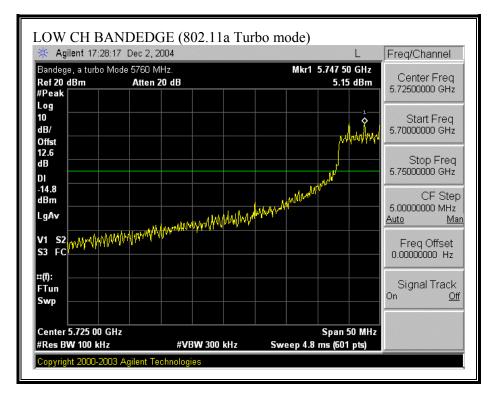


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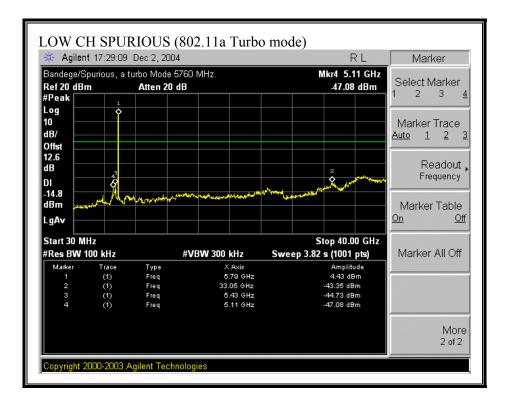


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#### SPURIOUS EMISSIONS, LOW CHANNEL (802.11a TURBO MODE)

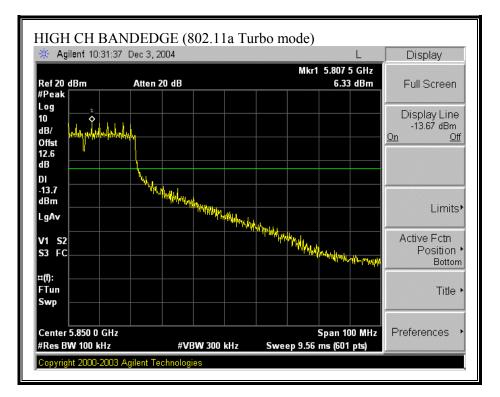


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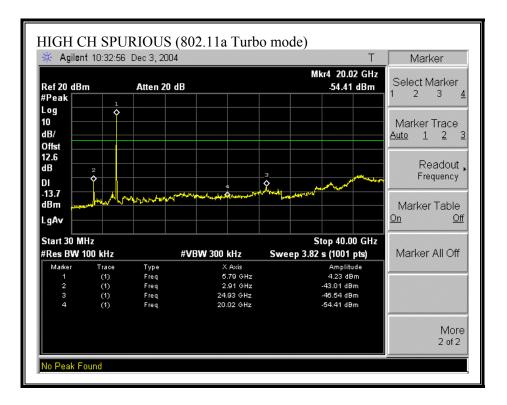


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#### SPURIOUS EMISSIONS, HIGH CHANNEL (802.11a TURBO MODE)



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# 7.3. RADIATED EMISSIONS

# 7.3.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

# LIMITS

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	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 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41			

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

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\$15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

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### TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

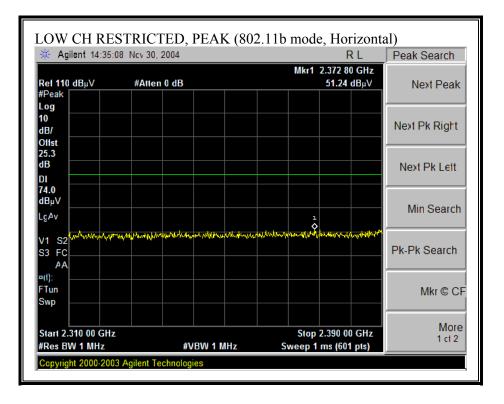
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

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# 7.3.2. TRANSMITTER ABOVE 1 GHz FOR 2400 TO 2483.5 MHz BAND

#### RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)

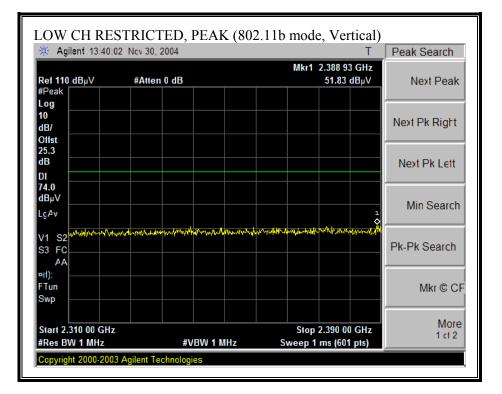


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🔆 Agilent 14:34	:33 Nev 30, 2004				Т	Peak Search
Ref 110 dBµV #Peak	#Atten 0 dB		Mkr1	2.389 47 40.42		Next Peak
Log 10 dB/ Oflst						Next Pk Right
25.3 dB DI 54.0						Next Pk Lett
dBμV LgAv						Min Search
V1 S2 S3 FC AA					1 0	Pk-Pk Search
¤(1): FTun Swp						Mkr © Cł
Start 2.310 00 GH #Res BW 1 MHz	z #VBW	10 Hz	Stop Sweep 6.23	2.390 00 88 s (601		More 1 ct 2

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#### RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)

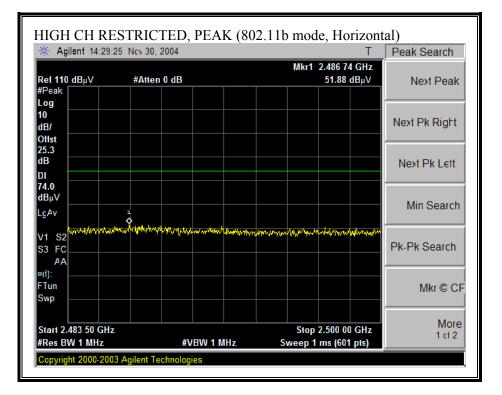


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🔆 Agilent 13:39	STRICTED, AVG :03 Ncv 30, 2004	<b>`</b>	Т	Peak Search
Ref 110 dBµV	#Atten 0 dB	M	xr1 2.389 60 GHz 39.85 dBμV	Next Peak
#Peak Log				
10 dB/				Next Pk Right
Offst 25.3 dB				Next Pk Lett
DI 54.0 dBµV				
LgAv				Min Search
V1 S2 S3 FC				Pk-Pk Search
¤(1): FTun Swp				Mkr © Cl
				More
Start 2.310 00 GH #Res BW 1 MHz	z #VBW 10		op 2.390 00 GHz .238 s (601 pts)	1 ct 2

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#### RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)

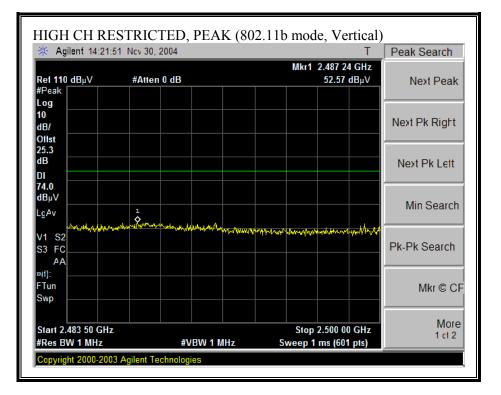


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🔆 Agilent 14:30:	01 Nov 30, 2004				Т	Peak Search
Rei 110 dBµV #Peak	#Atten 0 dB		M	(r1 2.487 9 40.48	8 GHz dBµV	Next Peak
Log 10 dB/ Ofist						Next Pk Right
25.3 dB DI 54.0						Next Pk Lett
54.0 dBμV LgAv						Min Search
V1 S2 S3 FC AA						Pk-Pk Search
¤(1): FTun Swp						Mkr © CI
Start 2.483 50 GHz #Res BW 1 MHz	#VBW	10 Hz		top 2.500 0 .287 s (601		More 1 ct 2

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#### RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)



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	59 Ncv 30, 2004	,1100 (002	2.11b mode	T	Peak Search
Ret 110 dBµV #Peak	#Atten 0 dB		Mkr1	2.488 01 GHz 43.04 dBµ∨	Next Peak
Log 10 dB/ Offst					Next Pk Right
25.3 dB DI 54.0					Next Pk Lett
54.0 dBμV LgAv					Min Search
V1 S2 S3 FC AA					Pk-Pk Search
¤(1): FTun Swp					Mkr © CF
Start 2.483 50 GHz #Res BW 1 MHz		₩VBW 10 Hz	Stop Sweep 1.28	2.500 00 GHz 7 s (601 pts)	More 1 ct 2

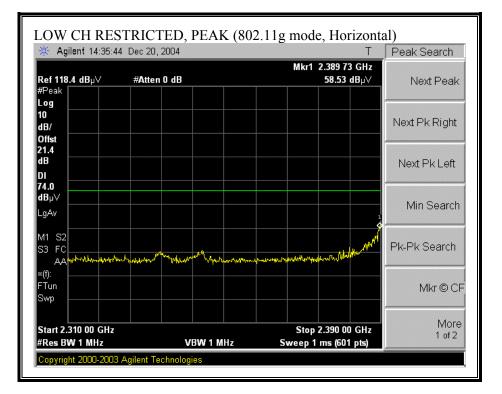
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## HARMONICS AND SPURIOUS EMISSIONS (b MODE)

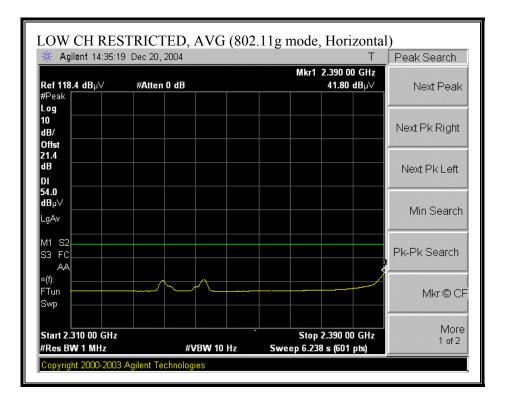
ЕМСС	ipment: ) Horn 1	-18GHz	-	lifer 1-26		Р	re-amplifer	26-400			Horn > 1	8GHz	•		
- Hi Frequ	uency Cabl			eq 64645					•			1		<u>Peak Measu</u> RBW=VBW	irements
2 10	oot cable	- 3_Day	id 🖉	4 foot c	able -		foot cable Yan	,	HPF_4	IPF	Rejeo	et Filter		Average Me	z ; VBW=10Hz
f GHz	Dist (m)	Read Pk dBuV	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		Avg Mar dB	Notes (V/H)
412 Cha .824	3.0	51.6	47.1	33.6	4.6	-35.5	0.0	0.6	54.9	50.4	74	54	-19.1	-3.6	V
824	3.0	51.7	47.6	33.6	4.6	-35.5	0.0	0.6	55.0	50.9	74	54	-19.0	-3.1	Н
17 Cha 334	nnel 3.0	50.0	45.9	33.6	4.6	-35.5	0.0	0.6	53.3	49.2	74	54	-20.7	-4.8	V
334	3.0	51.3	46.7	33.6	4.6	-35.5	0.0	0.6	54.6	50.0	74	54	-19.4	-4.0	H
37 Cha		46.0	45.0				0.0	0.5		46.1					••
874 874	3.0 3.0	48.9 49.9	45.0 45.3	33.7 33.7	4.6 4.6	-35.5 -35.5	0.0	0.6 0.6	52.3 53.3	48.4 48.7	74 74	54 54	-21.7 -20.7	-5.6 -5.3	V H
457 Cha	nnel														
.914	3.0	53.6	49.6	33.7	4.7	-35.5	0.0	0.6	57.1	53.1	74	54	-16.9	-0.9	V H ABT-195
914	3.0	53.1	50.4	33.7	4.7	-35.5	0.0	0.6	56.6	53.9	74	54	-17.4	-0.1	H, ART=19.5
462 Cha .924	nnel 3.0	50.9	47.9	33.7	4.7	-35.5	0.0	0.6	54.4	51.4	74	54	-19.6	-2.6	v
.924	3.0	53.6	49.7	33.7	4.7	-35.5	0.0	0.6	57.1	53.2	74	54	-16.9	-2.6 -0.8	H, ART=19
o furthe	r emissio	ns were detec	red.												
	f Dist Read AF CL	Measureme Distance to Analyzer R Antenna Fa Cable Loss	leading actor	y		Amp D Corr Avg Peak HPF	Average	Correc Field S d Peal	ct to 3 mete Strength @ < Field Stre r	3 m		Pk Lim	Peak Fiel Margin v	Field Strengt d Strength L s. Average L s. Peak Limit	imit imit

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#### RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, HORIZONTAL)

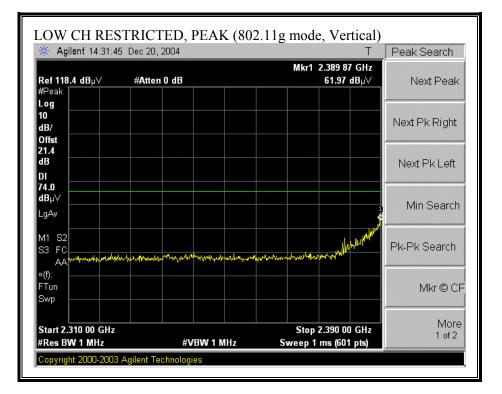


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#### RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, VERTICAL)

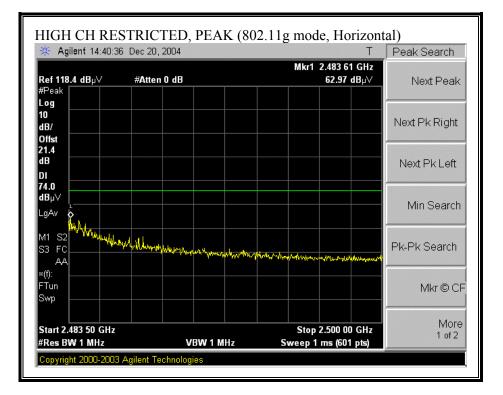


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🔆 Agilent 14:31:2	2 Dec 20, 2004		RT	Peak Search
Ref 118.4 dBµ∨ #Peak	#Atten 0 dB	Mkr1 2.390 45.	00 GHz 47 dBµ∨	Next Peak
Log 10 dB/ Offst				Next Pk Right
21.4 dB DI				Next Pk Left
54.0 dBµ√ LgAv				Min Search
M1 S2 S3 FC AA				Pk-Pk Search
«(f): FTun Swp				Mkr © C
Start 2.310 00 GHz #Res BW 1 MHz	#VBW 10	Stop 2.390 Hz Sweep 6.238 s (6)		More 1 of 2

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#### RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, HORIZONTAL)

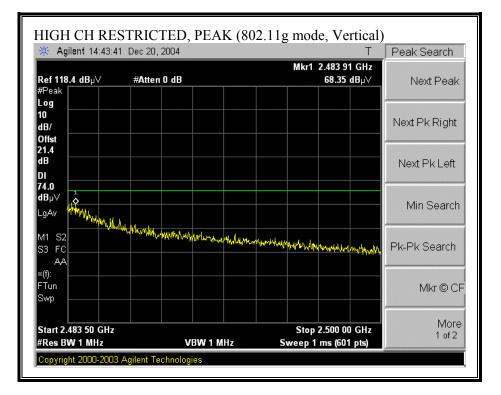


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🔆 Agilent 14:40:	18 Dec 20, 2004	Т	Peak Search
Ref 118.4 dBµ∨ #Peak	#Atten 0 dB	Mkr1 2.483 50 GHz 42.06 dBμ∨	Next Peak
Log 10 dB/ Offst			Next Pk Right
21.4 dB DI			Next Pk Left
<b>54.0</b> dBµ∨ LgAv			Min Search
M1 S2			Pk-Pk Search
×(f): FTun Swp			Mkr © Cl
Start 2.483 50 GHz #Res BW 1 MHz	//////////////////////////////////////	Ŝtop 2.500 00 GHz Iz Sweep 1.287 s (601 pts)	More 1 of 2

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#### RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, VERTICAL)



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🔆 Agilent 14:43:1	2 Dec 20, 2004	T	Peak Search
<b>Ref 118.4 dB</b> µ∨ #Peak	#Atten 0 dB	Mkr1 2.483 50 GHz 47.38 dBµ∨	Next Peak
Log 10 dB/ Offst			Next Pk Right
dB DI			Next Pk Left
54.0 dBµ∨ LgAv			Min Search
M1 S2			Pk-Pk Search
≈(f): FTun Swp			 Mkr©Cl
Start 2.483 50 GHz #Res BW 1 MHz	#VBW 10 Hz	Stop 2.500 00 GHz Sweep 1.287 s (601 pts)	More 1 of 2

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## HARMONICS AND SPURIOUS EMISSIONS (g MODE AND g TURBO MODE)

-	per: uipment:										Horn >	PCH.			
	O Horn 1 S/N: 2931			olifer 1-26 eq 646450		P	re-amplife	- 26-400	<del>v</del>		Horn >	8GHz	-		
	uency Cabl		t cable	4 foot c	able	12	foot cable		I	IPF	Reje	rt Filter		<u>Peak Measu</u> RBW=VBW	
		- 3_Dav	vid 🔻		-	12_	Yan	•	HPF_4	4.0 GHz		•		Average Me RBW=1MHz	z ; 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)
2412 Cha 4.824	3.0	47.9	36.5	33.6	4.6	-35.5	0.0	0.6	51.2	39.8	74	54	-22.8	-14.2	V
4.824	3.0	49.4	36.7	33.6	4.6	-35.5	0.0	0.6	52.7	40.0	74	54	-21.3	-14.0	Н
2417 Cha		47.2	25 7	22.6	47	25 5	0.0	0.4	50 (	20.0	74	54	22.4	15.0	v
.834 .834	3.0	47.3 47.8	35.7 36.5	33.6 33.6	4.6 4.6	-35.5 -35.5	0.0 0.0	0.6 0.6	50.6 51.1	39.0 39.8	74 74	54 54	-23.4 -22.9	-15.0 -14.2	V H
2437 Cha	nnel														
1.874	3.0	50.9	37.6	33.7	4.6	-35.5	0.0	0.6	54.3	41.0	74	54	-19.7	-13.0	V
4.874	3.0	48.2	36.9	33.7	4.6	-35.5	0.0	0.6	51.6	40.3	74	54	-22.4	-13.7	Н
2457 Cha															
4.914 7.371	3.0	56.9 51.5	41.4 40.6	33.7 35.6	4.7 5.8	-35.5 -34.8	0.0	0.6 0.6	60.4 58.7	44.9 47.8	74 74	54 54	-13.6 -15.3	-9.1 -6.2	V H
		0410		20.0	0.0		0.0	0.0	00.7						
2462 Cha 4.924	innel 3.0	53.4	39.6	33.7	4.7	-35.5	0.0	0.6	56.9	43.1	74	54	-17.1	-10.9	V
4.924	3.0		07.0	33.7	4.7	-35.5	0.0	0.6	3.5	3.5	74	54	-70.5	-50.5	Н
2437 Cha	unnel Tur	bo Mode													v
4.874	3.0	47.8	35.5	33.7	4.6	-35.5	0.0	0.6	51.2	38.9	74	54	-22.8	-15.1	Н
4.874 No furthe	3.0 er emissio	47.6 ns were detec	35.5 cted.	33.7	4.6	-35.5	0.0	0.6	51.0	38.9	74	54	-23.0	-15.1	Н
	f Dist Read AF CL	Measuremo Distance to Analyzer R Antenna Fa Cable Loss	Reading actor	у		Amp D Corr Avg Peak HPF	Average	Correc Field S ed Peal	ct to 3 mete Strength @ c Field Stre r	3 m		Pk Lim	Peak Fiel Margin vs	Field Strengtl d Strength Li s. Average Li s. Peak Limit	imit imit

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# 7.3.3. TRANSMITTER ABOVE 1 GHz FOR 5725 TO 5850 MHz BAND

#### HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

est Tar Iode Oj <u>est Equ</u>			band, Transmit	ting											
	O Horn 1	-18GHz 0 @3m _		difer 1-20 eq 64645		P	're-amplifei	26-400	GHz	T39; ARA	Horn > 1		-		
- Hi Freq	uency Cable	es	t cable	4 foot c		12	foot cable			HPF	Reje	ct Filter		<u>Peak Measur</u> RBW=VBW=	
		- 3_Da	vid <mark>-</mark>		-	12_	Yan	•	HPF_3	2.7GHz	R_001	L		<u>Average Mea</u> RBW=1MHz	<u>surements</u> ; 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)
5745 Cha 11.490	3.0	47.8	38.2	38.4	7.9	-34.3	0.0	0.8	60.6	51.0	74	54	-13.4	-3.0	V V
1.490	3.0	46.8	35.0	38.4	7.9	-34.3	0.0	0.8	59.6	47.8	74	54	-14.4	-6.2	Н
785 Cha 1.570	3.0	49.9	38.9	38.5	7.9	-34.4	0.0	0.8	62.8	51.8	74	54	-11.2	-2.2	V
1.570	3.0	45.5	35.1	38.5	7.9	-34.4	0.0	0.8	58.4	48.0	74	54	-15.6	-6.0	Н
825 Cha 1.650	3.0	51.8	38.8	38.7	8.0	-34.5	0.0	0.8	64.8	51.8	74	54	-9.2	-2.2	V
l.650 o furthe	3.0 er emissio	47.3 ns were dete	35.7 cted.	38.7	8.0	-34.5	0.0	0.8	60.3	48.7	74	54	-13.7	-5.3	Н
	f Dist Read AF CL	Measurem Distance to Analyzer F Antenna F Cable Loss	Reading actor	у		Amp D Corr Avg Peak HPF	Average	Corre Field S ed Peal	ct to 3 mete Strength @ c Field Stre r	3 m		Pk Lim Avg Mar	Peak Fiel Margin v	Field Strength d Strength Lin s. Average Lin s. Peak Limit	nit

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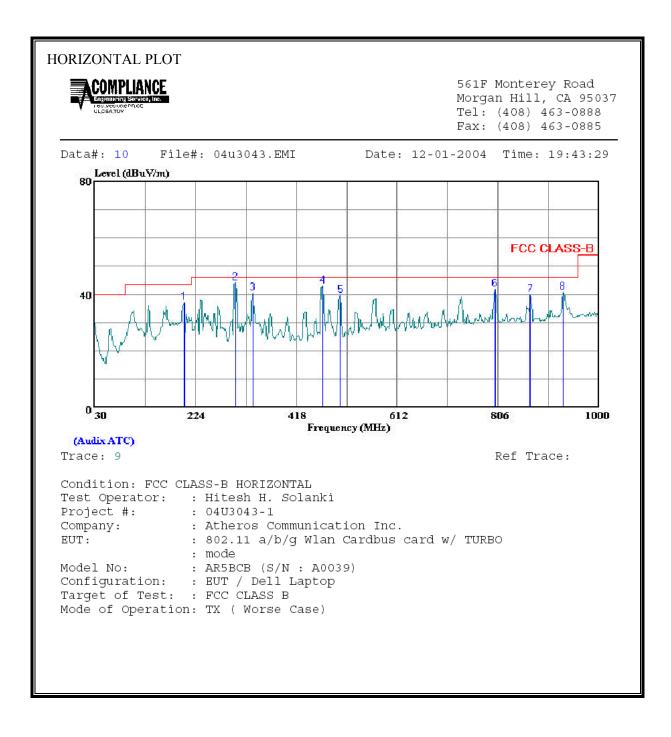
## HARMONICS AND SPURIOUS EMISSIONS (802.11a TURBO MODE)

est Eng roject # ompany UT Des UT M/M est Targ	nce Cei : : v: crip.: V: get:	rtification S David Garcia 04U3043-1 Atheros 802.11a/b/g o AR5BCB FCC 15.247	Measureme Services, Mo ardbus card with band, Turbo mo	rgan H	node	en Field	Site								
EMC0 T120; S		18GHz 0 @3m 🕌	-	lifer 1-26 eq 646456	- L	P	're-amplifer	• 26-400	GHz	T39; ARA	Horn > 1 18-26 GHz; 5		<b>-</b>		
Hi Frequency Cable			t cable id 🗨				12 foot cable		HPF HPF_2.70						<u>urements</u> 7=1MHz easurements z ; 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)
60 Char .520 .520		47.8 45.5	35.9 34.7	38.5 38.5	7.9 7.9 7.9	-34.3 -34.3	0.0	0.8	60.6 58.3	48.7 47.5	74 74	54 54	-13.4 -15.7	-5.3 -6.5	V H
05 Char .610 .610 o further	3.0 3.0	48.8 45.4 ns were detec	37.2 35.0 ted.	38.6 38.6	8.0 8.0	-34.4 -34.4	0.0	0.8	61.7 58.3	50.1 47.9	74 74	54 54	-12.3 -15.7	-3.9 -6.1	V H
	Dist Read AF	Measureme Distance to Analyzer R Antenna Fa Cable Loss	eading actor	y		Amp D Corr Avg Peak HPF	Average	Corre Field S d Peal	ct to 3 mete Strength @ k Field Stre r	3 m		Pk Lim	Peak Fiel Margin v	Field Strengt d Strength L s. Average L s. Peak Limi	imit imit

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# 7.3.4. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

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



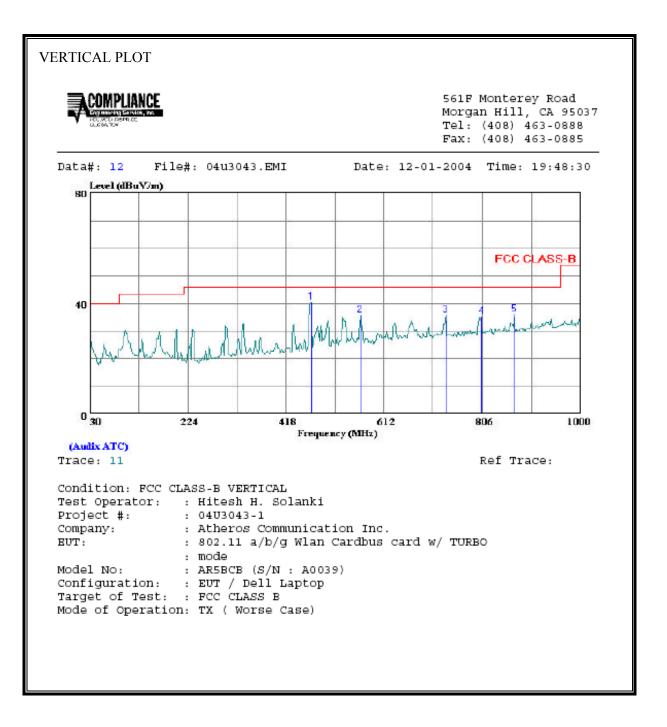
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#### REPORT NO: 04U3043-1 EUT: 802.11 a/b/g CARDBUS CARD

HORIZON	NTAL DATA						
	Freq	Remark	Read Level	Level	Factor	Limit Line	Over Limit
	MHz		dBuV	dBuV/m	dB	dBuV/m	dB
1 2 3 4 5 6 7 8	MH2 201.690 300.630 334.580 468.440 502.390 800.180 868.080 931.130	Peak Peak Peak Peak Peak Peak	49.89 54.32 50.30 50.26 46.54 44.06 41.19	37.17 44.02 40.52 42.84 39.69 41.71 39.75	-12.73 -10.30 -9.78 -7.42 -6.85 -2.35 -1.44	43.50 46.00 46.00 46.00 46.00 46.00 46.00 46.00	-6.33 -1.98 -5.48 -3.16 -6.31 -4.29 -6.25

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



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#### REPORT NO: 04U3043-1 EUT: 802.11 a/b/g CARDBUS CARD

VERTIC	CAL DATA						
	Freq	Remark	Read Level	Level	Factor	Limit Line	
	MHz		dBuV	dBuV/m	dB (	1BuV/m	dB
1 2 3 4 5	MHZ 565.440 735.190 803.090 868.080	Peak Peak Peak	47.94 41.85 38.84 37.36	40.52 35.80 35.67 35.07		46.00 46.00 46.00 46.00	-5.48 -10.20 -10.33 -10.93

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# 7.4. POWERLINE CONDUCTED EMISSIONS

# <u>LIMIT</u>

\$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  $\mu$ 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 boundary between the frequency ranges.

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

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:

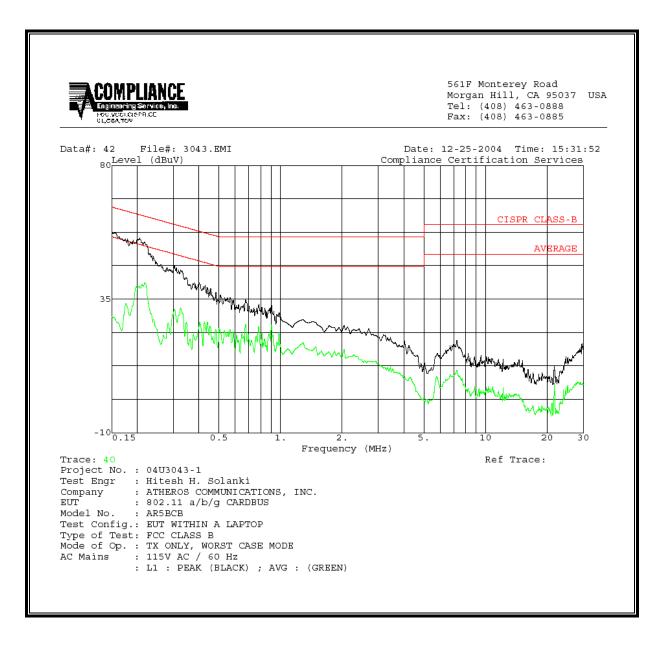
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#### **<u>6 WORST EMISSIONS</u>**

Freq.		Closs	Limit	IC_B	Mar	gin	Remark		
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.15	61.40		38.50	0.00	66.00	56.00	-4.60	-17.50	L1
0.68	37.22		30.53	0.00	56.00	46.00	-18.78	-15.47	L1
8.24	36.76		26.84	0.00	60.00	50.00	-23.24	-23.16	L1
0.15	57.38		39.81	0.00	66.00	56.00	-8.62	-16.19	L2
0.68	35.04		26.48	0.00	56.00	46.00	-20.96	-19.52	L2
7.25	21.18		10.02	0.00	60.00	50.00	-38.82	-39.98	L2
6 Worst I	Data								

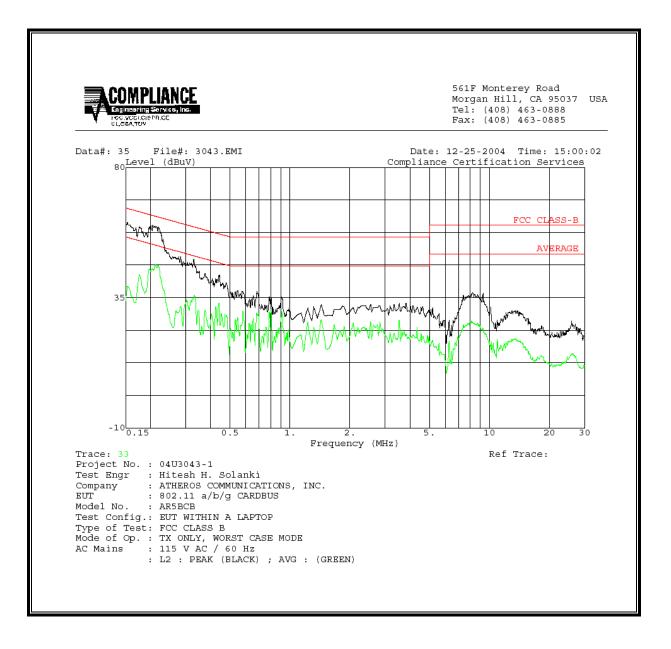
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#### LINE 1 RESULTS



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#### LINE 2 RESULTS



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