



FCC CFR47 PART 15 SUBPART C CERTIFICATION

TEST REPORT

FOR

ORION 1200B CNFG 802.11G RADIO MOD, PROFESSIONAL

MODEL NUMBER: AIR-MP21G-A-K9-B-P

FCC ID: LDK102052P

REPORT NUMBER: 03U2409-2

ISSUE DATE: DECEMBER 29, 2003

Prepared for CISCO SYSTEMS, INC. 170 WEST TASMAN SAN JOSE, CA 95134 USA

Prepared by

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1. TEST RESULT CERTIFICATION

COMPANY NAME:	CISCO SYSTEMS, INC. 170 WEST TASMAN SAN JOSE, CA 95134, USA
EUT DESCRIPTION:	Orion 1200B Cnfg 802.11g Radio Mod, Professional
MODEL:	AIR-MP21G-A-K9-B-P
DATE TESTED:	AUGUST 20 – DECEMBER 2, 2003

APPLICABLE STANDARDS					
STANDARD	TEST RESULTS				
FCC PART 15 SUBPART 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: This document reports conditions under which testing was conducted and results of tests performed. 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.

Approved & Released For CCS By:

Tested By:

MA

MIKE HECKROTTE CHIEF ENGINEER COMPLIANCE CERTIFICATION SERVICES

YAN ZHENG EMC ENGINEER COMPLIANCE CERTIFICATION SERVICES

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2. EUT DESCRIPTION

The EUT is an 802.11b/g radio module with a MiniPCI interface. It operates in the 2400 - 2483.5 MHz band. The transmitter has a maximum peak conducted output power as follows:

Frequency Band	Mode	Output Power	Output Power
(MHz)		(dBm)	(mW)
2412 - 2462	802.11b	23.47	222.33
2412 - 2462	802.11g	18.14	65.16

This module is intended to be professionally installed, and to be used with the following antennas:

Antenna Type	Model Number	Operational Mode	Gain (dBi)
Dish	AIR-ANT3338	Point-to-Point	21
Sector	Mfg. by Cushcraft	Point-to-Point	15
Patch Array	Mfg. by Cisco	Point-to-Point	13.5
Yagi	AIR-ANT1949	Point-to-Point	13.5
Omni	AIR-ANT24120	Omnidirectional	12
Yagi	AIR-ANT2410Y-R	Point-to-Point	10
Patch	AIR-ANT3549	Point-to-Point	8.5
Patch	AIR-ANT2012	Point-to-Point	6.5
Patch	AIR-ANT1729	Point-to-Point	6.0
Omni	AIR-ANT2506	Omnidirectional	5
Omni	AIR-ANT3213	Omnidirectional	5
Omni	AIR-ANT1728	Omnidirectional	5
Omni	Maxrad MUF24005	Omnidirectional	5
Omni	Maxrad MAXC24505	Omnidirectional	5
Omni	AIR-ANT3551	Omnidirectional	2.2
Omni	AIR-ANT5959	Omnidirectional	2.0
Dipole	AIR-ANT4941	Omnidirectional	2.2
Two Dipoles	AIR-ANT4941	Omnidirectional	2.2
(Tx and Rx Diversity)			

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The maximum Antenna Gain that may be used with each discrete power setting is listed below.

Power Setting in 802.11b Mode	Maximum Antenna Gain
(mW)	(dBi)
100	13.5
50	15
20	21

Power Setting in 802.11g Mode (mW)	Maximum Antenna Gain (dBi)
30	13.5
20	15
10	21

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3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4/2001, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

4. 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>.



No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.

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5. CALIBRATION AND UNCERTAINTY

5.1. 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.

5.2. 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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5.3. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST							
Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date			
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	2/4/2004			
Antenna, Horn, 18 ~ 26 GHz	ARA	MWH-2640/B	1029	12/3/2004			
Amplifier 1-26GHz	MITEQ	NSP2600-SP	924341	4/25/2004			
Spectrum Analyzer	Agilent	E4446A	US42510266	7/23/2004			
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	11/21/2004			
RF Filter Section	HP	85420E	3705A00256	11/21/2004			
Antenna, Bicon/Log, 25 ~ 2000 MHz	ARA	LPB-2520/A	1185	3/6/2004			
LISN, 10 kHz ~ 30 MHz	FCC	50/250-25-2	114	10/13/2004			
Line Filter	Lindgren	LMF-3489	497	CNR			
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	10/13/2004			
EMI Test Receiver	R & S	ESHS 20	827129/006	7/17/2004			
Peak / Average Power Sensor	Agilent	E9327A	US40440755	11/7/2004			
Power Meter	Agilent	E4416A	GB41291160	11/7/2004			
Band Reject 2.4GHz	Micro-Tronics	BRM50702	003	N.C.R.			
DC Power Supply	HP	6325A	2450A-08312	N.C.R.			
DC Power Supply	HP	E3610A	KR24104150	N.C.R.			

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6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

Device Type Manufacturer		Model Number	Serial Number	FCC ID
Laptop	IBM	2647	78-B3952	DoC
Power Adapter	IBM	02K6665	11502K66657A2U81385RR	DoC
Power Supply 1	HP	E3610A	LR85750C	N/A
Power Supply 2	KRM	AEEC-350	9712154746	N/A

I/O CABLES

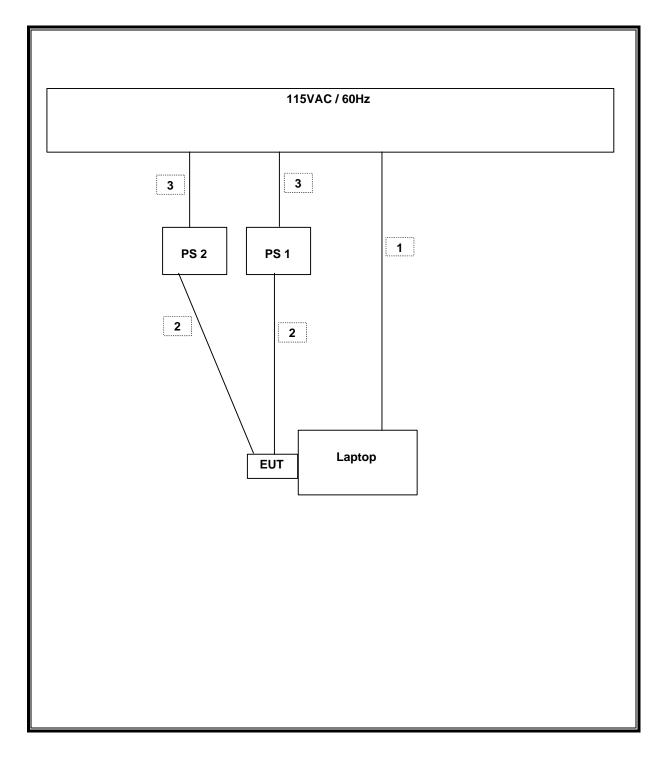
Cable			Connector	Type of	Cable	Data		
No	Port	Port	Туре	Cable	Length	Traffic	Bundled	Remark
1	AC	1	US 115V	Un-shielded	2m	No	No	Integrated with Adapter
2	DC	2	DC	Un-shielded	1m	No	No	N/A
3	AC	2	US115	Un-shielded	1m	No	No	N/A

TEST SETUP

The EUT is 802.11b/g mini PCI radio. It was connected to a laptop via a cardbus-to-miniPCI adapter / extension board during the tests. Power was furnished by two external power supplies, set to 3.3 VDC and 5 VDC, respectively. Test software exercised the radio card.

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SETUP DIAGRAM



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7. APPLICABLE LIMITS AND TEST RESULTS

7.1. 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 100 kHz. The sweep time is coupled.

<u>RESULTS</u>

No non-compliance noted:

802.11b Mode

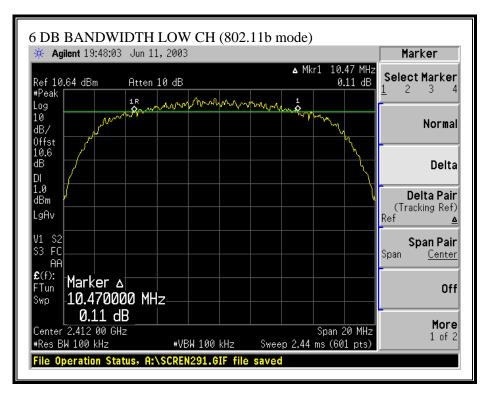
Channel	Frequency 6 dB Bandwidth		Minimum Limit	Margin
	(MHz)	(kHz)	(kHz)	(kHz)
Low	2412	10470	500	9970
Middle	2437	11370	500	10870
High	2462	11930	500	11430

802.11g Mode

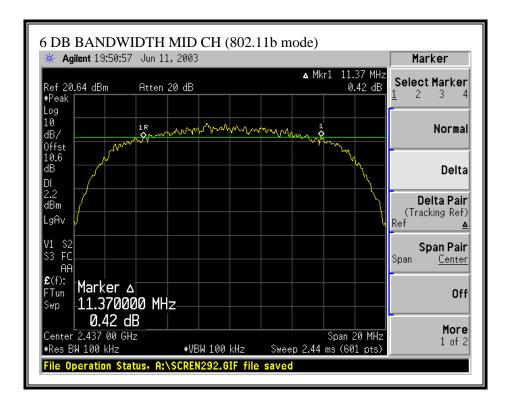
Channel	Frequency	6 dB Bandwidth	Minimum Limit	Margin
	(MHz)	(kHz)	(kHz)	(kHz)
Low	2412	16430	500	15930
Middle	2437	16400	500	15900
High	2462	16430	500	15930

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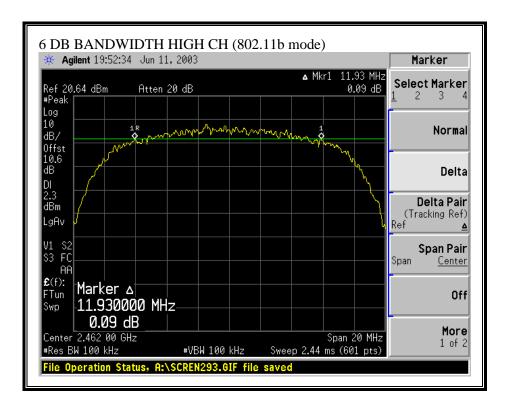
6 DB BANDWIDTH (802.11b MODE)



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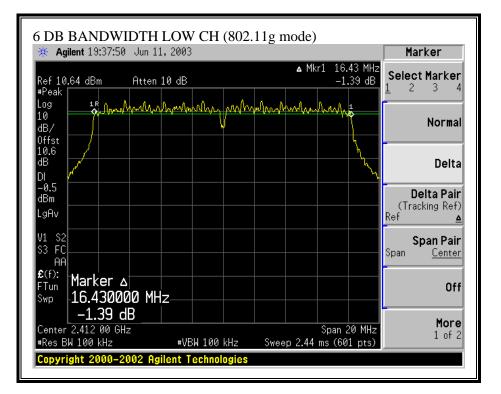


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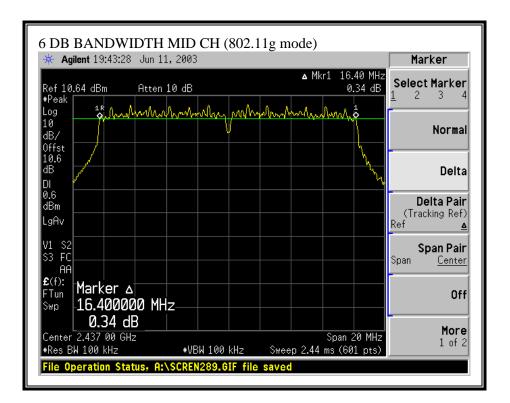


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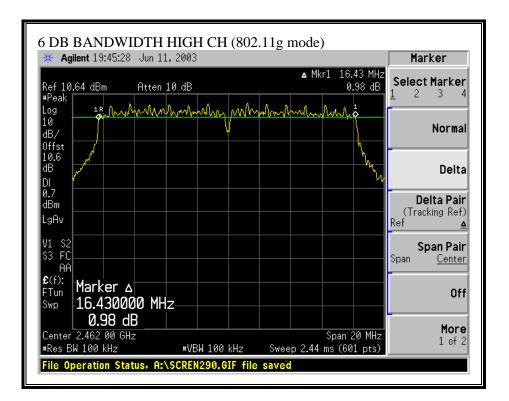
6 DB BANDWIDTH (802.11g MODE)



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7.2. 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:

802.11b Mode

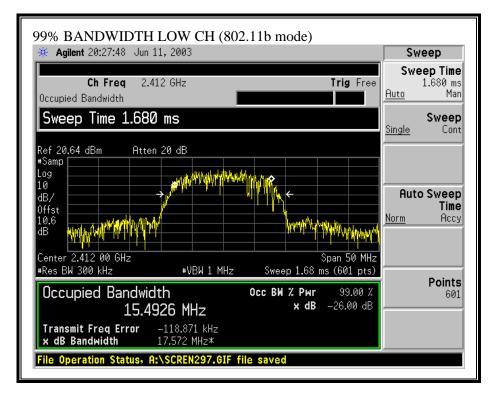
Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	2412	15.4926
Middle	2437	15.0364
High	2462	15.2277

802.11g Mode

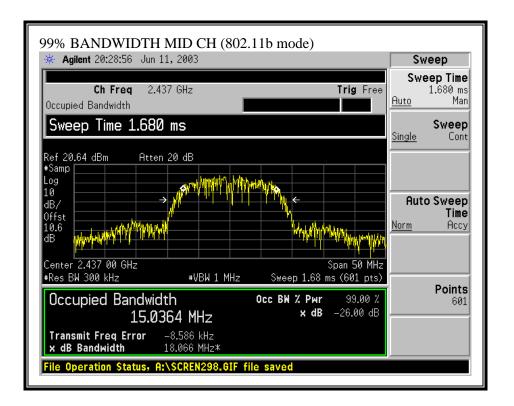
Channel	Frequency	99% Bandwidth	
	(MHz)	(MHz)	
Low	2412	16.3025	
Middle	2437	16.3495	
High	2462	16.1143	

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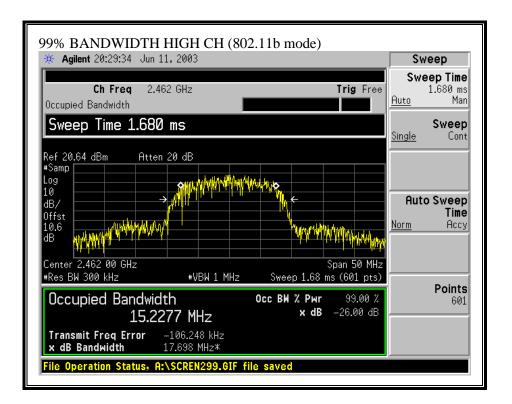
99% BANDWIDTH (802.11b MODE)



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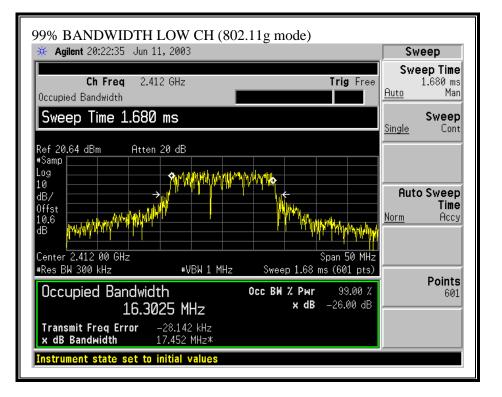


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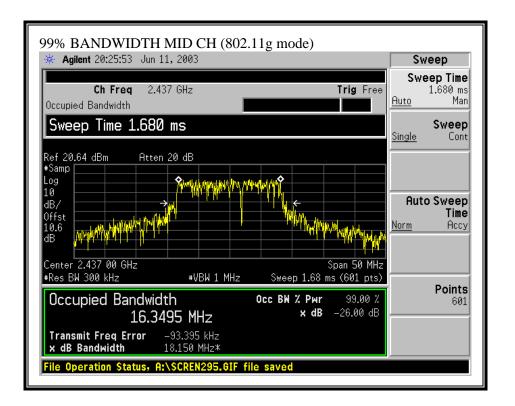


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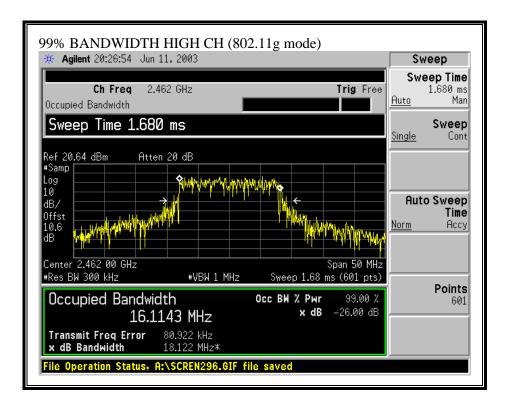
99% BANDWIDTH (802.11g MODE)



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7.3. PEAK OUTPUT POWER FOR ANTENNAS UP TO 13.5 dBi GAIN

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.

The maximum antenna gain is 12 dBi for omnidirectional operation, therefore the omnidirectional limitation is 24 dBm.

The maximum antenna gain is 13.5 dBi for point-to-point operation, therefore the point-to-point limitation is $30-\{(13.5-6)\div 3\}=27.5$ dBm.

The lowest of these two limitation values will apply, therefore the peak power limit is 24 dBm.

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 power settings for antennas up to 13.5 dBi gain are 100mW for b mode and 30mW for g mode.

No non-compliance noted:

802.11b Mode

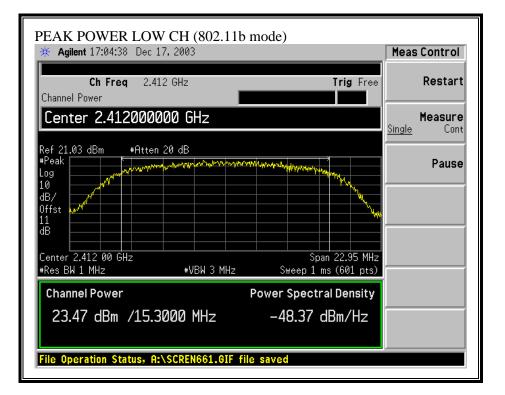
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	23.47	24	-0.53
Middle	2437	23.31	24	-0.69
High	2462	23.23	24	-0.77

802.11g Mode

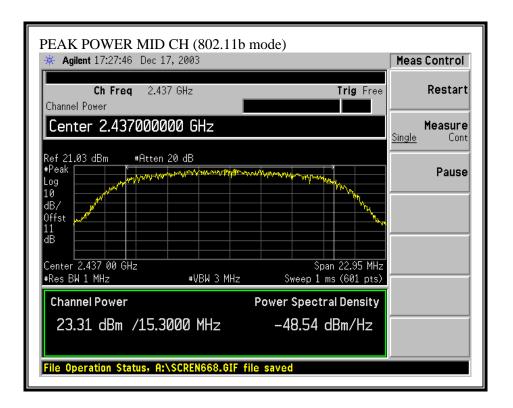
Channel	Frequency	Peak Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	18.33	24	-5.67
Middle	2437	18.14	24	-5.86
High	2462	18.23	24	-5.77

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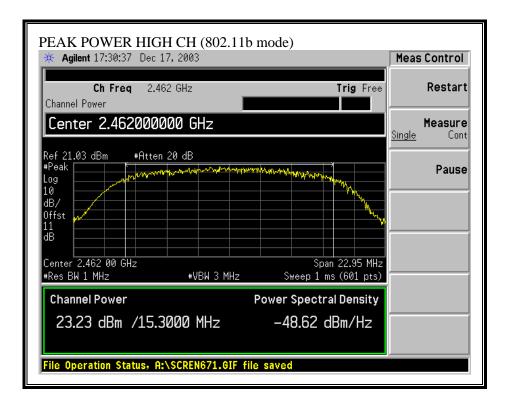
OUTPUT POWER (802.11b MODE)



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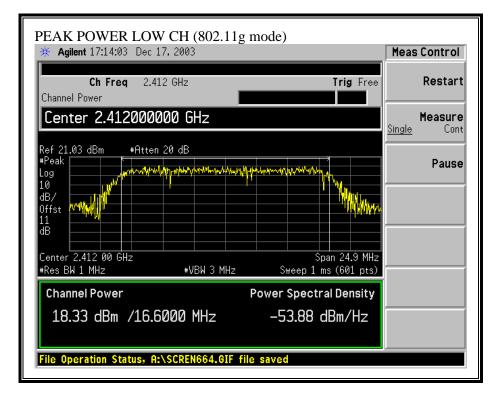


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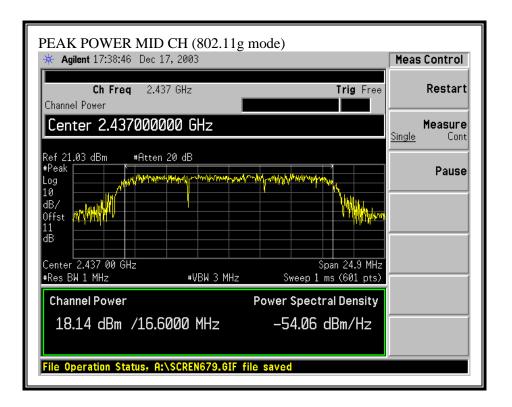


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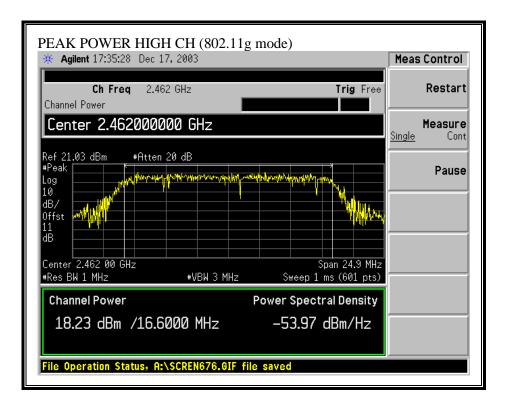
OUTPUT POWER (802.11g MODE)



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7.4. PEAK OUTPUT POWER FOR 15 dBi SECTOR ANTENNA

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.

The antenna gain is 15 dBi with point-to-point operation, therefore the limit is $30-\{(15-6)\div 3\}=27$ dBm.

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 power settings for the 15 dBi Sector Antenna are 50mW for b mode and 20mW for g mode.

No non-compliance noted:

802.11b Mode

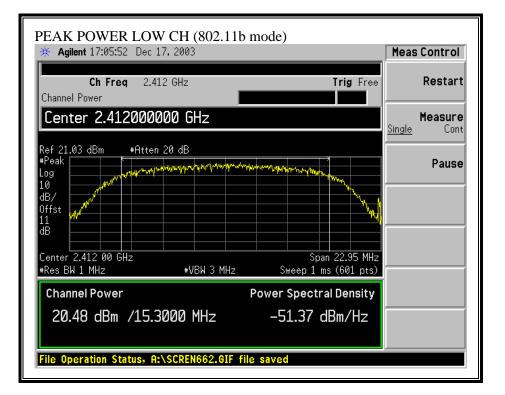
Channel	Frequency	Peak Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	20.48	27	-6.52
Middle	2437	20.44	27	-6.56
High	2462	20.39	27	-6.61

802.11g Mode

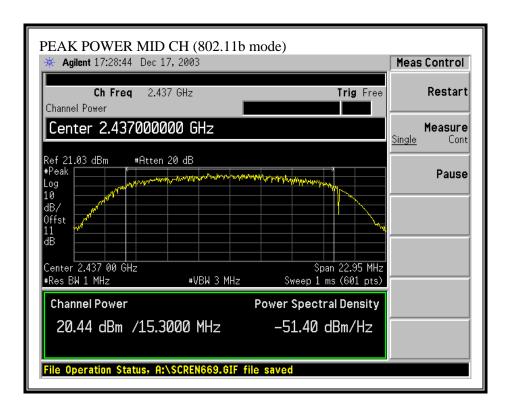
Channel	Frequency	Peak Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	16.49	27	-10.51
Middle	2437	16.76	27	-10.24
High	2462	16.69	27	-10.31

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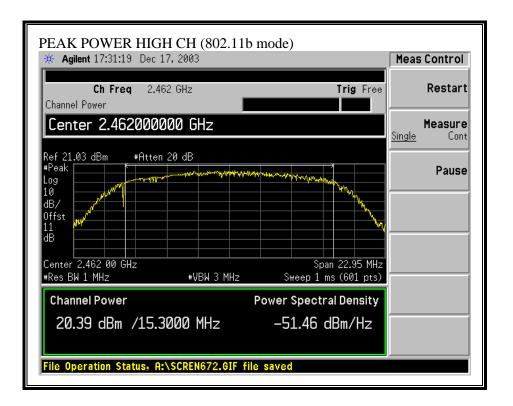
OUTPUT POWER (802.11b MODE)



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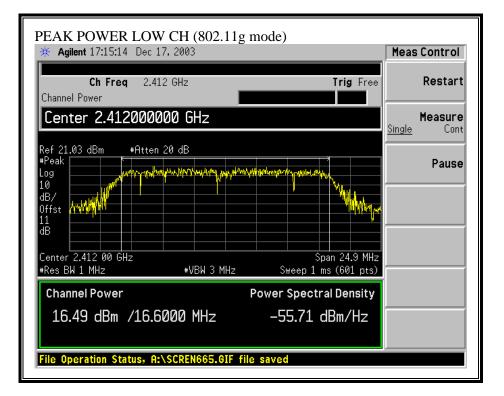


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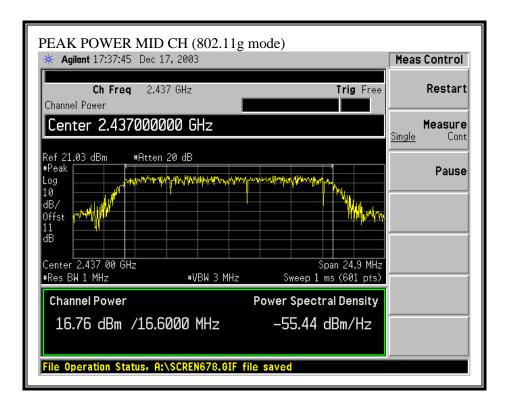


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OUTPUT POWER (802.11g MODE)



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* Agilent 17:34:33 Dec	17, 2003		Meas Control
Ch Freq 2.4	62 GHz	Trig Fre	e Restart
Channel Power			-
Center 2.462000	000 GHz		Measure Single Cont
Ref 21.03 dBm #Atte	n 20 dB		
#Peak			Pause
Log division	Warner and a second	here and the will have a first of the second s	
dB/			
Offst			4/4 ₄
dB			
Center 2.462 00 GHz #Res BW 1 MHz	₩VBW 3 MHz	Span 24.9 MH Sweep 1 ms (601 pts	
Channel Power		ower Spectral Density	
16.69 dBm /16.	5000 MHz	-55.51 dBm/Hz	

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7.5. PEAK OUTPUT POWER FOR 21dBi DISH ANTENNA

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.

Since the antenna gain is 21 dBi with point-to-point operation, therefore the limit is $30-\{(21-6)\div 3\}=25$ dBm.

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 power settings for the 21 dBi Dish Antenna are 20 mW for b mode and 10 mW for g mode.

No non-compliance noted:

802.11b Mode

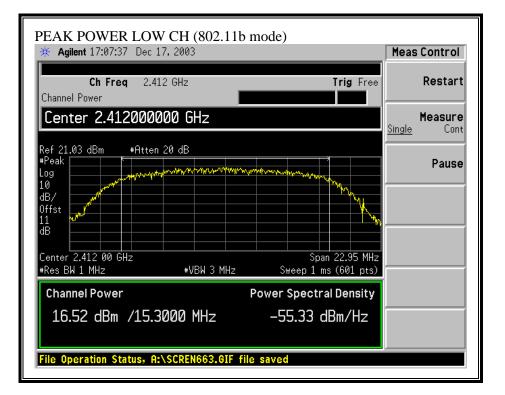
Channel	Frequency	Peak Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	16.52	25	-8.48
Middle	2437	16.51	25	-8.49
High	2462	16.33	25	-8.67

802.11g Mode

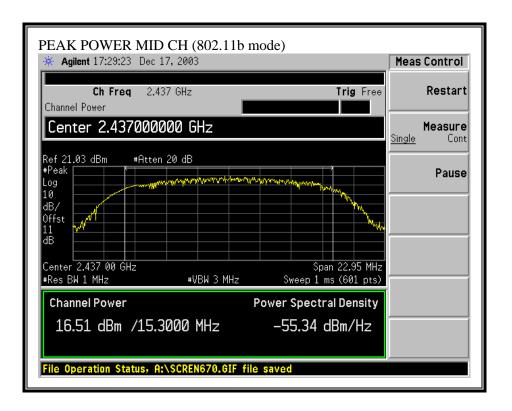
Channel	Frequency	Peak Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	13.45	25	-11.55
Middle	2437	13.93	25	-11.07
High	2462	13.86	25	-11.14

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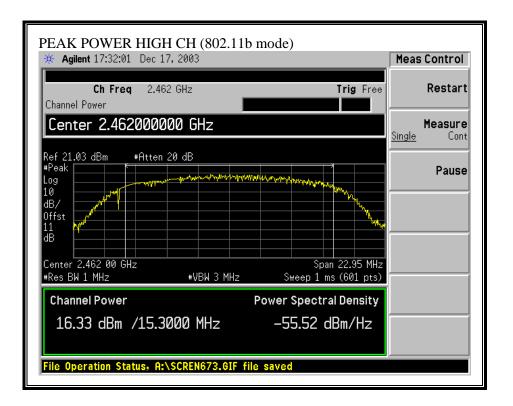
OUTPUT POWER (802.11b MODE)



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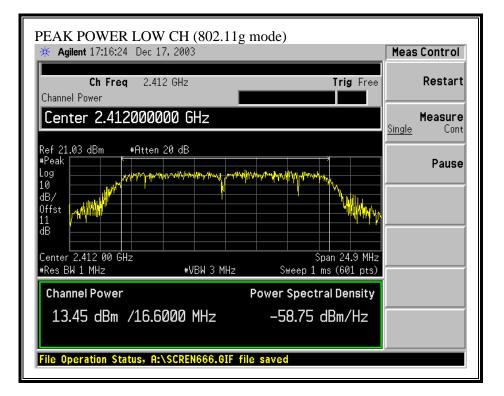


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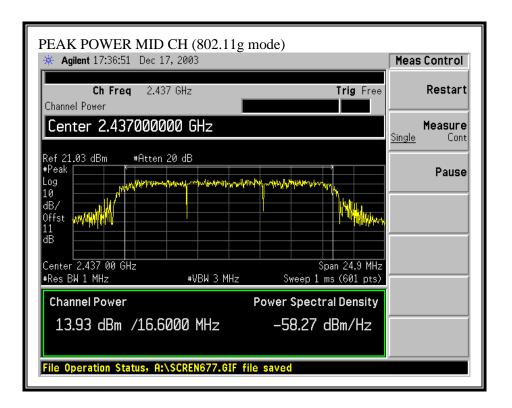


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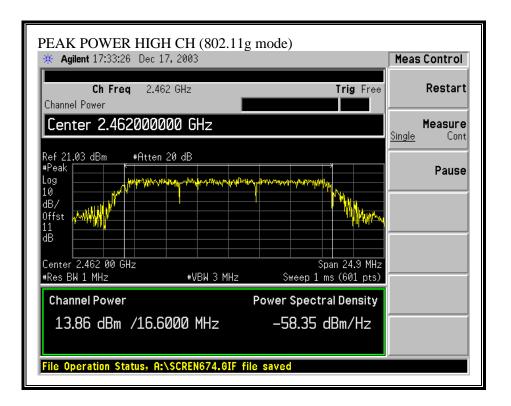
OUTPUT POWER (802.11g MODE)



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7.6. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

\$1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
(A) Limi	ts for Occupational	/Controlled Exposur	es	
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f2)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits fo	or General Populati	on/Uncontrolled Exp	osure	
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	31

TABLE 1-LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

TABLE 1-LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)-Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
30-300	27.5	0.073	0.2	30
300–1500			f/1500 1.0	30 30

f = frequency in MHz

* = Plane-wave equivalent power density
 * = Plane-wave equivalent power density
 NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occu-

pational/controlled limits apply provided he or she is made aware of the potential for exposure. NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be ex-posed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

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CALCULATIONS

Given

 $E = \sqrt{(30 * P * G)} / d$

and

 $S = E^{2}/3770$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

 $d = \sqrt{((30 * P * G) / (3770 * S))}$

Changing to units of Power to mW and Distance to cm, using:

P(mW) = P(W) / 1000 and d(cm) = 100 * d(m)

yields

 $d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$ $d = 0.282 * \sqrt{(P * G / S)}$

where

d = distance in cm P = Power in mW G = Numeric antenna gain S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and G (numeric) = 10 ^ (G (dBi) / 10) yields $d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S}$ Equation (1) where d = MPE distance in cm P = Power in dBm G = Antenna Gain in dBi $S = Power Density Limit in mW/cm^2$

Equation (1) and the measured peak power is used to calculate the MPE distance.

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LIMITS

From §1.1310 Table 1 (B), S = 1.0 mW/cm^2

RESULTS

No non-compliance noted:

Mode	Power Density	Output	Antenna	MPE
	Limit	Power	Gain	Distance
	(mW/cm^2)	(dBm)	(dBi)	(cm)
802.11b	1.0	23.47	13.50	19.90
802.11g	1.0	18.14	13.50	10.77
802.11b	1.0	20.48	15.00	16.76
802.11g	1.0	16.76	15.00	10.92
802.11b	1.0	16.52	21.00	21.20
802.11g	1.0	13.93	21.00	15.73

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

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7.7. 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:

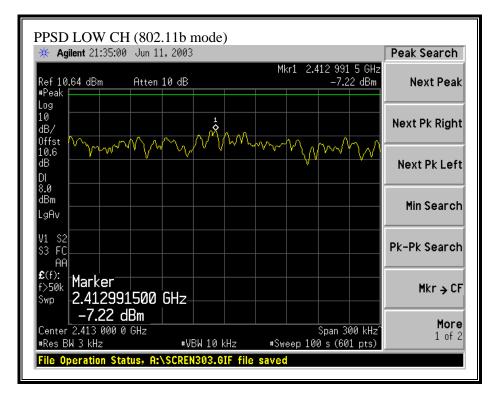
802.11b Mode

Channel	Frequency	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	-7.22	8	-15.22
Middle	2437	-5.10	8	-13.10
High	2462	-5.63	8	-13.63

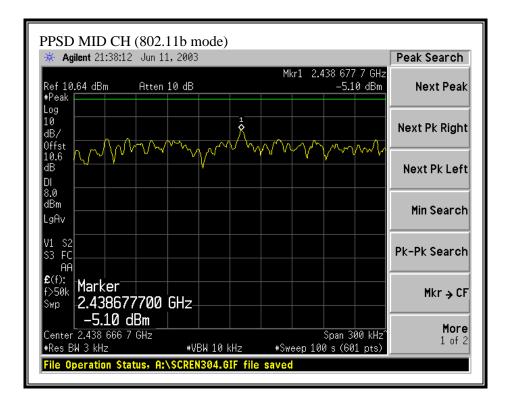
802.11g Mode

Channel	Frequency	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	-8.53	8	-16.53
Middle	2437	-7.07	8	-15.07
High	2462	-6.53	8	-14.53

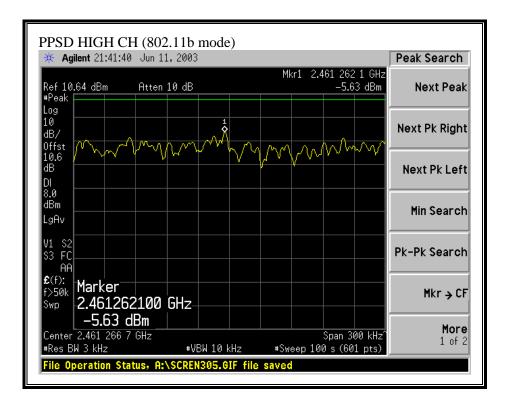
PEAK POWER SPECTRAL DENSITY (802.11b MODE)



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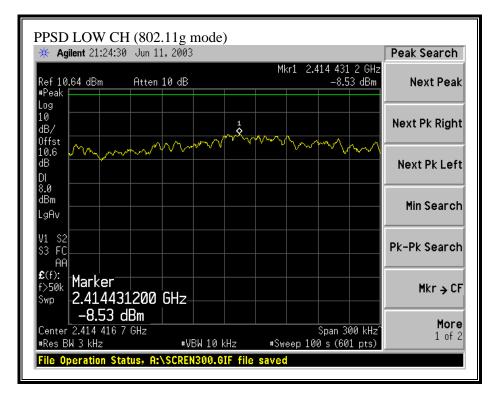


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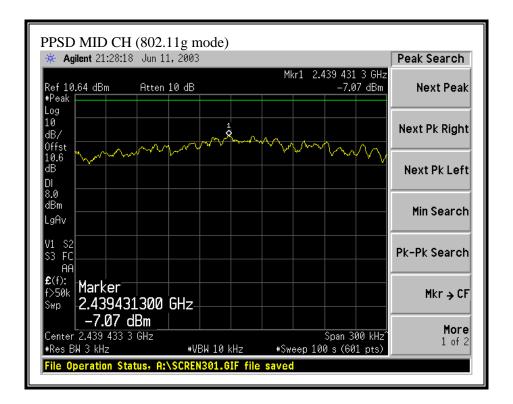


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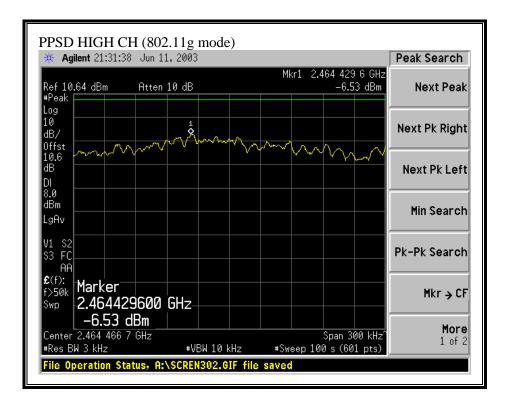
PEAK POWER SPECTRAL DENSITY (802.11g MODE)



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7.8. 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(c)).

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 100 kHz.

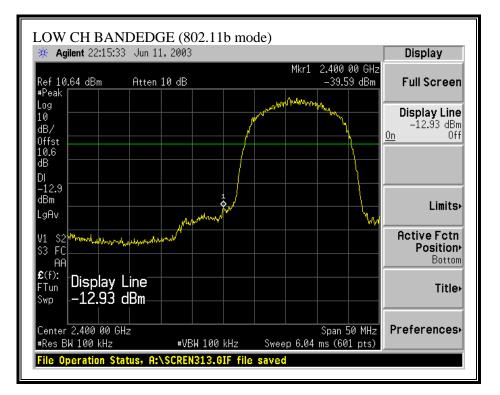
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

No non-compliance noted:

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SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE)

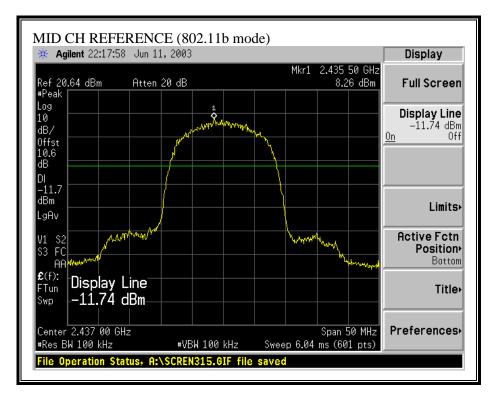


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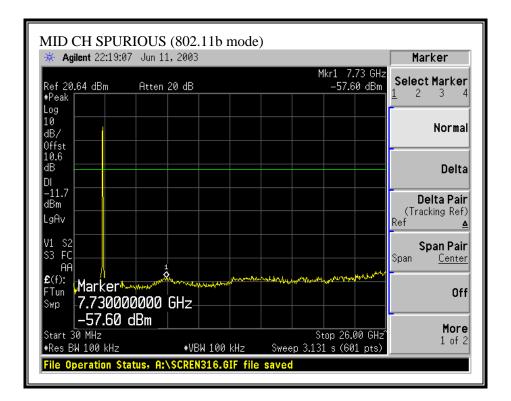
🔆 Agilent 22:16:3	5 Jun 11, 2003			Marker
Ref 10.64 dBm #Peak	Atten 10 dB		Mkr1 46 -57.85	Soloot Morizor
Log 10 dB/ 0ffst				Norma
10.6 dB DI				Delta
-12.9 dBm LgAv				Delta Pair (Tracking Ref. Ref <u>4</u>
V1 S2 1 S3 FC 🔶				Span Pair Span <u>Center</u>
£(f): FTun Swp 460.000 -57.85	1000 MHz	and the second sec	ayunda daga daga daga daga daga daga daga d	Ofi
رح./כ– Start 30 MHz #Res BW 100 kHz		00 kHz Sv	Stop 26.0 ∀eep 3.131 s (601	

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SPURIOUS EMISSIONS, MID CHANNEL (802.11b MODE)

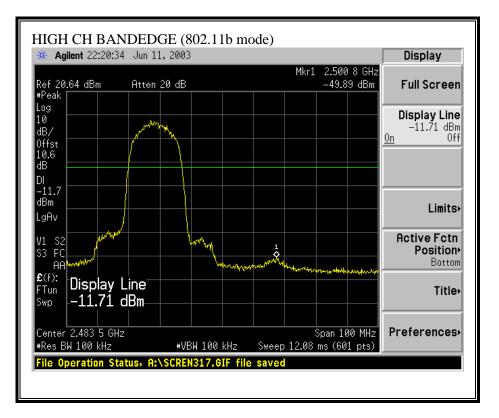


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SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE)

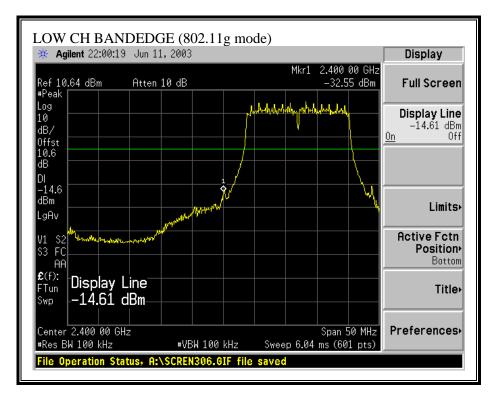


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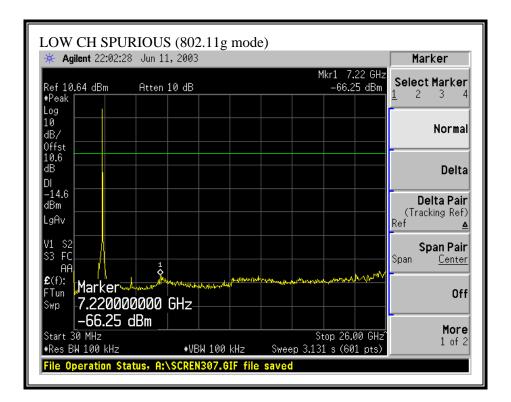
🔆 Agilent 22:22:1	4 Jun 11, 2003	;			Marker
Ref 20.64 dBm #Peak	Atten 20 dB		M	1kr1 7.60 GHz -57.00 dBm	Select Marker
Log 10 dB/ Offst					Norma
10.6 dB DI					Delta
-11.7 dBm LgAv					Delta Pair (Tracking Ref) Ref ▲
V1 S2 S3 FC AA					Span Pair Span <u>Center</u>
£(f): FTun Marker™ Swp -7.60000 -57.00	10000 GHz-	hay have a second se	han an a	hadronan and and and and and and and and and	Off
Start 30 MHz #Res BW 100 kHz		⊥ 3W 100 kHz		top 26.00 GHz^ 1 s (601 pts)	More 1 of 2

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SPURIOUS EMISSIONS, LOW CHANNEL (802.11g MODE)

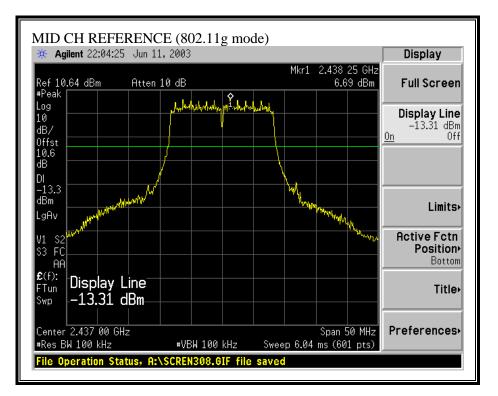


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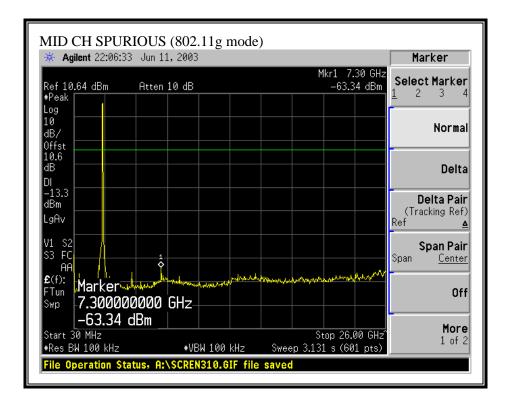


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SPURIOUS EMISSIONS, MID CHANNEL (802.11g MODE)

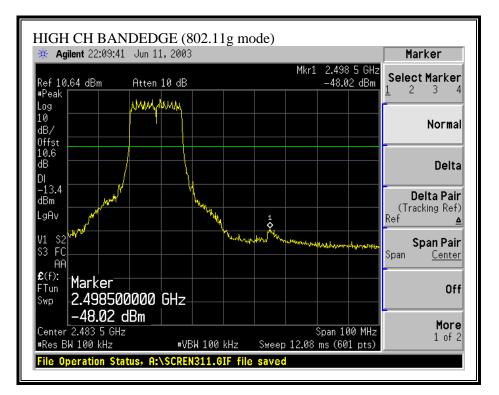


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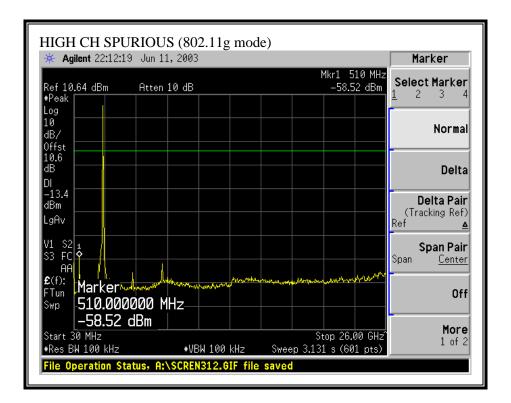


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SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g MODE)



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7.9. RADIATED EMISSIONS

7.9.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

<u>LIMITS</u>

\$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
¹ 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	(²)
13.36 - 13.41			

 1 Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz. 2 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.

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.

RESULTS

No non-compliance noted:

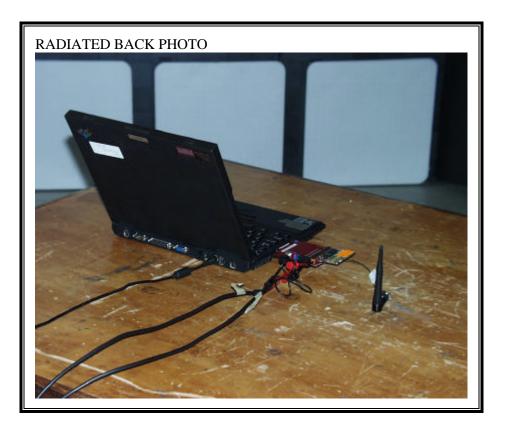
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7.9.2. RADIATED EMISSIONS WITH 2.2 dBi DIPOLE ANTENNA

RADIATED RF MEASUREMENT SETUP

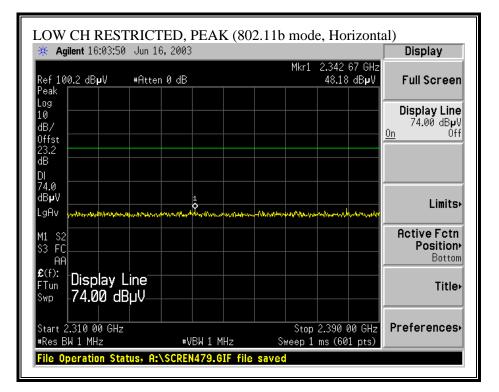


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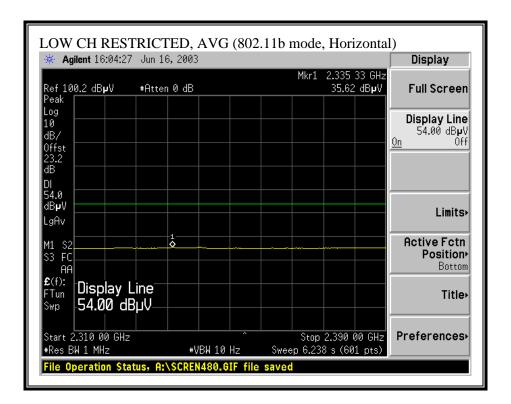


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RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)

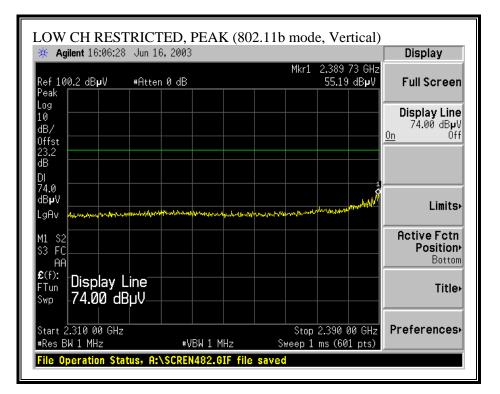


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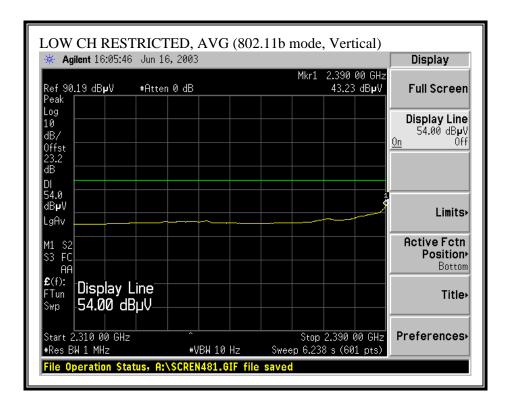


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RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)

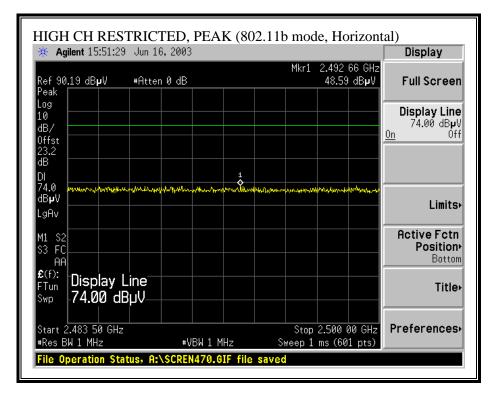


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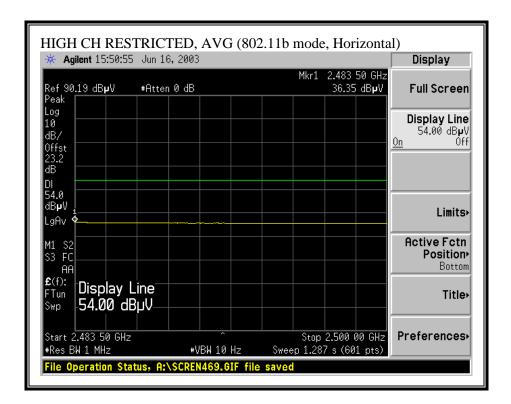


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RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)

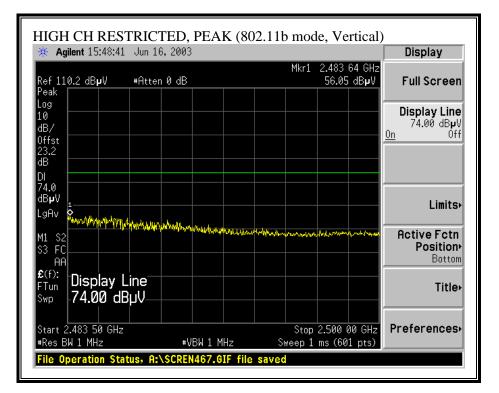


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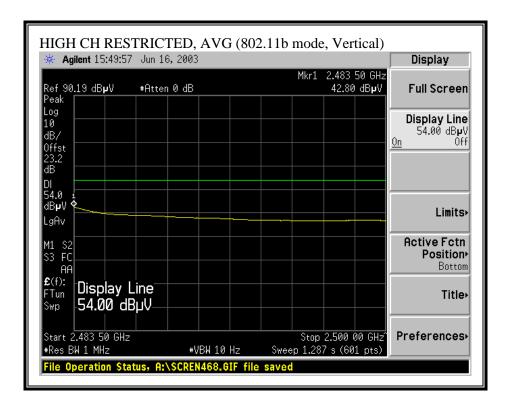


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RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)



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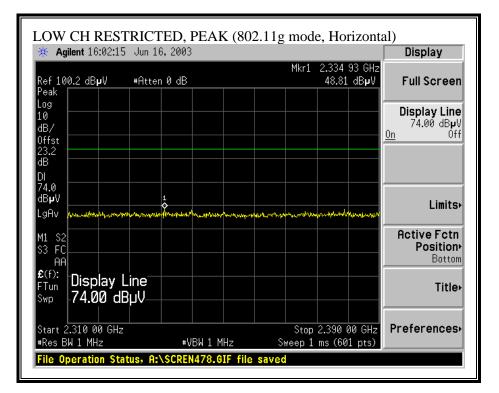
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HARMONICS AND SPURIOUS EMISSIONS (b MODE)

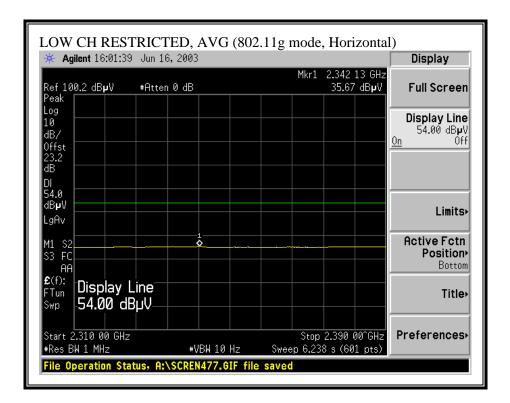
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ode Oper: Tx 1 est Equipment:	mode													
EMCO Horn 1-	-	Pre-amplife	er 1-26GH	Iz	5	Spectrum A	nalyzer			Horn > 18	GHz			
T59; S/N: 3245	@3m 🔫	T86 Miteq 9		-	Agile	ent E4446A	Analyz	er 🚽			-	-		
Hi Frequency Cab		(4 ~ 6 ft)	▼ (12 ft)				1 MHz	Measureme Resolution B Video Bandw	andwidth		leasuremen lution Bandw Bandwidth			
f Dist	Read Pk	Read Avg.	AF	CL	Amp	D Corr	HPF	Peak	Avg dBuV/m	Pk Lim	Avg Lim	Pk Mar	Avg Mar	Notes
GHz feet	dBuV	dBuV	dB/m	dB	dB Tx at 2.41	dB 2GHz		ави у/т	ави у/т	dBuV/m	dBuV/m	dB	dB	
<u>824 9.8</u>	61.3	49.3	33.1	3.1	-45.6	0.0	1.0	52.9	40.9	74.0	54.0	-21.1	-13.1	V
324 9.8	54.6	42.9	33.1	3.1	-45.6	0.0 fx at 2.4370	1.0 Hz	46.2	34.5	74.0	54.0	-27.8	-19.5	Н
374 9.8	56.7	48.2	33.1	3.2	-45.6	0.0	1.0	48.3	39.8	74.0	54.0	-25.7	-14.2	v
311 9.8	51.7	39.8	36.0	4.1	-46.6	0.0	1.0	46.2	34.3	74.0	54.0	-27.8	-19.7	V
<u>874 9.8</u>	52.9	42.5	33.1	3.2	-45.6	0.0	1.0	44.5	34.1	74.0	54.0	-29.5	-19.9	H
311 9.8	49.1	39.9	36.0	4.1	-46.6	0.0 Tx at 2.620	1.0 Hz	43.5	34.4	74.0	54.0	-30.5	-19.6	Н
924 9.8	59.4	52.4	33.1	3.2	-45.7	0.0	1.0	51.0	44.0	74.0	54.0	-23.0	-10.0	v
386 9.8	54.8	39.7	36.1	4.1	-46.5	0.0	1.0	49.4	34.3	74.0	54.0	-24.6	-19.7	v
924 9.8	54.3	42.3	33.1	3.2	-45.7	0.0	1.0	45.9	33.9	74.0	54.0	-28.1	-20.1	Н
386 9.8	49.1	39.7	36.1	4.1	-46.5	0.0	1.0	43.7	34.4	74.0	54.0	-30.3	-19.6	Н
	Measureme Distance to Analyzer R Antenna Fa Cable Loss	eading actor	<i>i</i>		Amp D Corr Avg Peak HPF	Average	Correc Field S d Peal	ct to 3 mete Strength @ c Field Stre r	3 m		Pk Lim Avg Mar	Peak Field Margin vs	Field Streng I Strength L Average I Peak Limi	Limit Limit

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RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, HORIZONTAL)

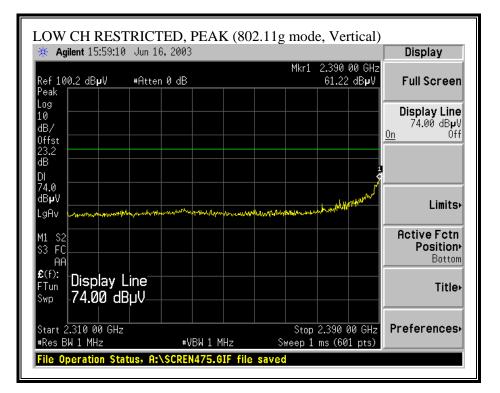


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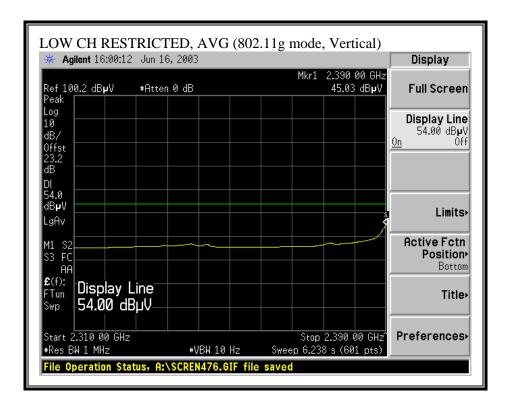


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RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, VERTICAL)

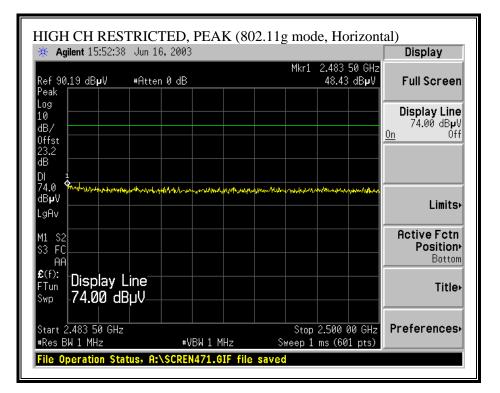


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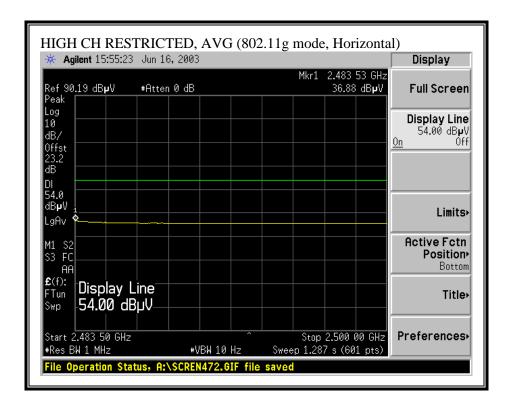


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RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, HORIZONTAL)

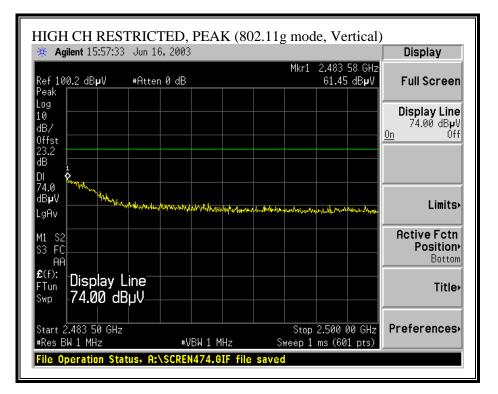


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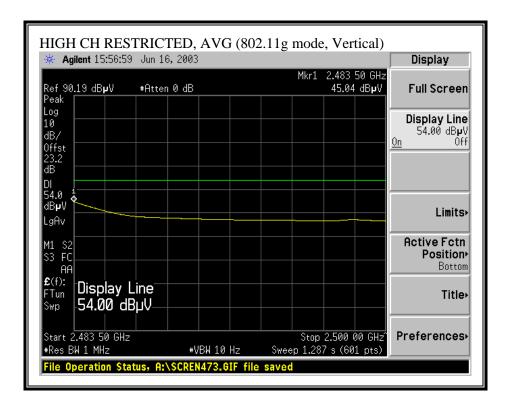


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RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, VERTICAL)



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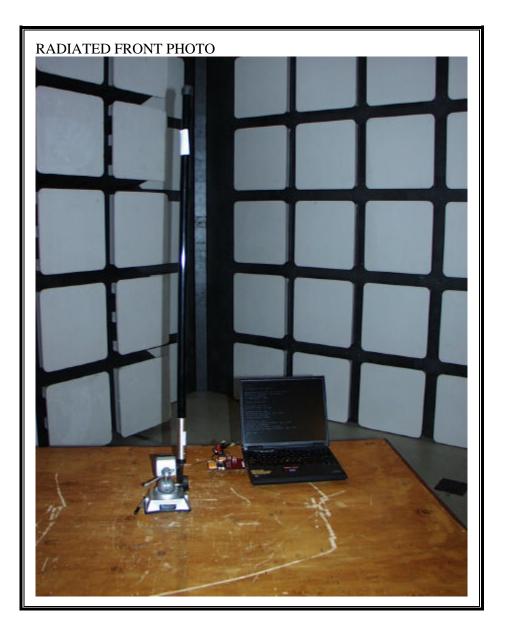
HARMONICS AND SPURIOUS EMISSIONS (g MODE)

est Equipment: ENCO Horn 1-18GHz Pre-amplifer 1-26GHz Spectrum Analyzer Horn > 18GHz T TB6 Miteq 924341 Spectrum Analyzer Horn > 18GHz T TB6 Miteq 924341 Spectrum Analyzer Horn > 18GHz T TB6 Miteq 924341 Colspan="2" Peak Measurements: Colspan= Weasurements: Average Measurements: Average Measurements: Colspan= Weasurements: Average Measurements: Teak Measurements: Average Measurements: T Mite video Bandwidth T Average Measurements: T Average Measurements: T Mite video Bandwidth Mite video Bandwidth T T Average Measurements: T Mite video Bandwidth Mite video Bandwidth T <th< th=""><th>roject # ompany UT Des</th><th>r: Ben I : 03U24 y: CISC crip.:W</th><th>)u 09 O</th><th>Services, Mo and 2.2 dBi Di</th><th></th><th>-</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></th<>	roject # ompany UT Des	r: Ben I : 03U24 y: CISC crip.:W)u 09 O	Services, Mo and 2.2 dBi Di		-										
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Read Pk Read Avg AF CL Ample Fedded I MER solution Bandwidth I MER solution Bandwidth <th>Aode Op</th> <th>er: Tx I</th> <th>node</th> <th></th>	Aode Op	er: Tx I	node													
Read Pk Read Avg AF CL Ample Fedded I MER solution Bandwidth I MER solution Bandwidth <th>fest Equ</th> <th>ipment:</th> <th></th>	fest Equ	ipment:														
T59; S/N: 3245 @ 3m T86 Miteq 924341 Agilent E4446A Analyzer Agilent E4446A Analyzer Image: Total Strength Limit Peak Measurements: 1 MHz Resolution Bandwidth 1MHz Video Bandwidth 1MHz Video Bandwidth 1MHz Video Bandwidth Calles Calles Argilent E4446A Analyzer Image: Calles Calles Calles Argilent E4446A Analyzer Image: Calles Calles Argilent E4446A Analyzer	FMCO	Horn 1	ISCH-	Pro omplifo		6	s	pectrum A	nalyzer			¥7	CII-			
$ \begin{array}{c c} \hline Frequency Cables \\ \hline $							Agile	nt E4446A	Analyz	er _		norii > 1a	GHZ			
Image: Preak integration of the problem of the preak integration of the preak integraterized intheprecement integration of the preak integra	157,57	11. 5245	e Shi	roomacq	24341											
f Dist Read Pk Read Avg. dBuV AF CL Amp D Corr HPF Peak Avg Pk Lim Avg Lim Pk Mar Avg Mar Notes GHz feet dBuV dBuV dB dB dB dB dBuV/m dBuV/m dBuV/m dBuV/m dB dB main Notes 284 9.8 53.3 48.4 33.1 3.1 45.6 0.0 1.0 42.3 32.2 74.0 54.0 -31.7 -21.8 H				-			1									
GHz feet dBuV dBv/ dB dB dB dB dBuV/m dBuV/m dBuV/m dB dB dB 824 9.8 53.8 48.4 33.1 3.1 45.6 0.0 1.0 45.4 40.0 74.0 54.0 -28.6 -14.0 V 824 9.8 50.7 40.6 33.1 3.1 45.6 0.0 1.0 42.3 32.2 74.0 54.0 -31.7 -21.8 H 824 9.8 60.7 40.6 33.1 3.1 45.6 0.0 1.0 42.3 32.2 74.0 54.0 -31.7 -21.8 H 874 9.8 48.6 39.3 36.0 4.1 46.6 0.0 1.0 39.6 29.2 74.0 54.0 -30.9 -20.2 V .874 9.8 48.0 38.0 33.1 3.2 -45.6 0.0 1.0 43.5 34.1 74.0 </th <th>12 (2</th> <th>II)</th> <th> ✓ (2 ~ 3 ft) </th> <th>(4 ~ 6 ft)</th> <th>✔ (12 ft)</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>udth</th> <th></th> <th></th>	12 (2	II)	 ✓ (2 ~ 3 ft) 	(4 ~ 6 ft)	✔ (12 ft)									udth		
GHz feet dBuV dBv/ dB dB dB dB dBuV/m dBuV/m dBuV/m dB dB dB 824 9.8 53.8 48.4 33.1 3.1 45.6 0.0 1.0 45.4 40.0 74.0 54.0 -28.6 -14.0 V 824 9.8 50.7 40.6 33.1 3.1 45.6 0.0 1.0 42.3 32.2 74.0 54.0 -31.7 -21.8 H 824 9.8 60.7 40.6 33.1 3.1 45.6 0.0 1.0 33.0 74.0 54.0 -31.7 -21.8 H 74 9.8 47.4 37.6 33.1 3.2 -45.6 0.0 1.0 39.6 29.2 74.0 54.0 -30.9 -20.2 V 311 9.8 48.1 39.6 36.0 4.1 -46.6 0.0 1.0 43.2 34.1 74.0 54.0 <th></th>																
Image: Signed problem Tx at 2.412GHz Image: Signed problem Tx at 2.412GHz Image: Signed problem 824 9.8 53.8 48.4 33.1 3.1 45.6 0.0 1.0 42.3 32.2 74.0 54.0 -28.6 -14.0 V 824 9.8 50.7 40.6 33.1 3.1 45.6 0.0 1.0 42.3 32.2 74.0 54.0 -33.7 -21.8 H 874 9.8 47.4 37.6 33.1 3.2 45.6 0.0 1.0 43.1 33.8 74.0 54.0 -30.9 -24.8 V 311 9.8 48.6 39.3 36.0 4.1 46.6 0.0 1.0 43.1 33.6 24.0 -24.8 V 311 9.8 48.1 39.6 36.0 4.1 46.6 0.0 1.0 43.1 74.0 54.0 -34.4 24.4 H 311 9.8 48.1 39									HPF							Notes
324 9.8 53.8 48.4 33.1 3.1 445.6 0.0 1.0 45.4 40.0 74.0 54.0 -28.6 -14.0 V .824 9.8 50.7 40.6 33.1 3.1 -45.6 0.0 1.0 42.3 32.2 74.0 54.0 -31.7 -21.8 H .824 9.8 47.4 37.6 33.1 3.2 -45.6 0.0 1.0 42.3 32.2 74.0 54.0 -31.7 -21.8 H .874 9.8 48.6 39.3 36.0 31.1 3.2 -45.6 0.0 1.0 43.1 33.8 74.0 54.0 -30.9 20.2 V .874 9.8 48.0 38.0 33.1 3.2 -45.6 0.0 1.0 43.1 33.8 74.0 54.0 -31.5 -19.9 H .311 9.8 48.1 39.6 36.0 4.1 -46.6 0.0	GHz	teet	dBuV	dBuV	dB/m	dB				dBuV/m	dBuV/m	dBuV/m	dBuV/m	đB	dB	
Image: State of the s	.824						-45.6	0.0								
874 9.8 47.4 37.6 33.1 3.2 -45.6 0.0 1.0 39.0 29.2 74.0 54.0 -35.0 -24.8 V 311 9.8 48.6 39.3 36.0 4.1 -46.6 0.0 1.0 43.1 33.8 74.0 54.0 -35.0 -24.8 V 874 9.8 48.0 38.0 33.1 3.2 -45.6 0.0 1.0 39.6 29.6 74.0 54.0 -30.9 -20.2 V 311 9.8 48.1 39.6 36.0 4.1 -46.6 0.0 1.0 39.6 29.6 74.0 54.0 -31.5 -19.9 H	.824	9.8	50.7	40.6	33.1	3.1				42.3	32.2	74.0	54.0	-31.7	-21.8	Н
311 9.8 48.6 39.3 36.0 4.1 -46.6 0.0 1.0 43.1 33.8 74.0 54.0 -30.9 -20.2 V 874 9.8 48.0 38.0 33.1 3.2 -45.6 0.0 1.0 43.1 33.8 74.0 54.0 -30.9 -20.2 V 874 9.8 48.1 39.6 36.0 4.1 -46.6 0.0 1.0 49.6 29.6 74.0 54.0 -31.5 -19.9 H 9.8 48.1 39.6 56.6 55.8 33.1 3.2 -45.7 0.0 1.0 42.5 34.0 74.0 54.0 -22.8 -6.6 V 9.8 59.6 55.8 33.1 3.2 -45.7 0.0 1.0 45.5 34.0 74.0 54.0 -22.8 -6.6 V 9.8 54.3 46.8 33.1 3.2 -45.7 0.0 1.0 45.9 38.4 74.0 54.0 -28.5 -20.0 V .924 9.8	.874	9.8	47.4	37.6	33.1	3.2				39.0	29.2	74.0	54.0	-35.0	-24.8	v
311 9.8 48.1 39.6 36.0 4.1 -46.6 0.0 1.0 42.5 34.1 74.0 54.0 -31.5 -19.9 H 924 9.8 59.6 55.8 33.1 3.2 -45.7 0.0 1.0 51.2 47.4 74.0 54.0 -31.5 -19.9 H 924 9.8 59.6 55.8 33.1 3.2 -45.7 0.0 1.0 51.2 47.4 74.0 54.0 -22.8 -6.6 V 386 9.8 50.9 39.4 36.1 4.1 -46.5 0.0 1.0 45.5 34.0 74.0 54.0 -22.8 -6.6 V 924 9.8 54.3 46.8 33.1 3.2 -45.7 0.0 1.0 45.9 38.4 74.0 54.0 -28.1 -15.6 H 386 9.8 48.7 38.9 36.1 4.1 -46.5 0.0 1.0 43.3 33.5 74.0 54.0 -30.7 -20.5 H -10.0 10.0	.311	9.8	48.6	39.3	36.0	4.1	-46.6	0.0	1.0	43.1	33.8	74.0	54.0	-30.9	-20.2	v
y24 9.8 59.6 55.8 33.1 3.2 45.7 0.0 1.0 51.2 47.4 74.0 54.0 -22.8 -6.6 V 386 9.8 50.9 39.4 36.1 4.1 -46.5 0.0 1.0 45.5 34.0 74.0 54.0 -22.8 -6.6 V .924 9.8 54.3 46.8 33.1 3.2 -45.7 0.0 1.0 45.5 34.0 74.0 54.0 -28.5 -20.0 V .924 9.8 54.3 46.8 33.1 3.2 -45.7 0.0 1.0 45.9 38.4 74.0 54.0 -28.5 -20.0 V .386 9.8 48.7 38.9 36.1 4.1 -46.5 0.0 1.0 43.3 33.5 74.0 54.0 -28.1 -15.6 H .386 9.8 48.7 38.9 36.1 4.1 74.65 0.0 1.0 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>																
924 9.8 59.6 55.8 33.1 3.2 -45.7 0.0 1.0 51.2 47.4 74.0 54.0 -22.8 -6.6 V 386 9.8 50.9 39.4 36.1 4.1 -46.5 0.0 1.0 45.5 34.0 74.0 54.0 -22.8 -6.6 V 386 9.8 54.3 46.6 33.1 3.2 -45.7 0.0 1.0 45.9 38.4 74.0 54.0 -28.1 -15.6 H 386 9.8 48.7 38.9 36.1 4.1 -46.5 0.0 1.0 43.3 33.5 74.0 54.0 -28.1 -15.6 H 386 9.8 48.7 38.9 36.1 4.1 -46.5 0.0 1.0 43.3 33.5 74.0 54.0 -28.1 -15.6 H 386 9.8 48.7 38.9 36.1 4.1 -46.5 0.0 1.0 4	.311	9.8	48.1	39.6	36.0	4.1				42.5	34.1	74.0	54.0	-31.5	-19.9	Н
924 9.8 54.3 46.8 33.1 3.2 -45.7 0.0 1.0 45.9 38.4 74.0 54.0 -28.1 -15.6 H .386 9.8 48.7 38.9 36.1 4.1 -46.5 0.0 1.0 43.3 33.5 74.0 54.0 -28.1 -15.6 H f Measurement Frequency Amp Preamp Gain Avg Lim Average Field Strength Limit Dist Distance to Antenna D Corr Distance Correct to 3 meters Pk Lim Peak Field Strength Limit AF Antenna Factor Peak Calculated Peak Field Strength @ 3 m Avg Mar Margin vs. Average Limit	.924						-45.7	0.0	1.0							
386 9.8 48.7 38.9 36.1 4.1 46.5 0.0 1.0 43.3 33.5 74.0 54.0 -30.7 -20.5 H f Measurement Frequency Dist Margin vs. Average Amp Preamp Gain Avg Lim Average Field Strength Limit f Measurement Frequency Dist D Corr Distance to Antenna D Corr Distance Correct to 3 meters Pk Lim Peak Field Strength Limit Read Analyzer Reading AF Antenna Factor Peak Calculated Peak Field Strength Pk Mar Margin vs. Average Limit	.386															
f Measurement Frequency Amp Preamp Gain Avg Lim Average Field Strength Limit Dist Distance to Antenna D Corr Distance Correct to 3 meters Pk Lim Peak Field Strength Limit Read Analyzer Reading Avg Average Field Strength @ 3 m Avg Mar Margin vs. Average Limit AF Antenna Factor Peak Calculated Peak Field Strength Pk Mar Margin vs. Peak Limit																
Dist Distance to Antenna D Corr Distance Correct to 3 meters Pk Lim Peak Field Strength Limit Read Analyzer Reading Avg Average Field Strength @ 3 m Avg Mar Margin vs. Average Limit AF Antenna Factor Peak Calculated Peak Field Strength Pk Mar Margin vs. Peak Limit	.380	9.8	48.7	38.9	30.1	4.1	-46.5	0.0	1.0	43.3	33.5	74.0	54.0	-30.7	-20.5	н
DistDistance to AntennaD CorrDistance Correct to 3 metersPk LimPeak Field Strength LimitReadAnalyzer ReadingAvgAverage Field Strength @ 3 mAvg MarMargin vs. Average LimitAFAntenna FactorPeakCalculated Peak Field StrengthPk MarMargin vs. Peak Limit																·
Read Analyzer ReadingAvgAverage Field Strength @ 3 mAvg MarMargin vs. Average LimitAFAntenna FactorPeakCalculated Peak Field StrengthPk MarMargin vs. Peak Limit					/					_						
AF Antenna Factor Peak Calculated Peak Field Strength Pk Mar Margin vs. Peak Limit		Dist														
			Analyzer P	leading												
CL Cable Loss HPF High Pass Filter							Post	Calculate		c Field Stre	ngth		Pk Mar	Margin vs	. Peak Lim	ıt
		AF	Antenna Fa	actor												
		AF	Antenna Fa	actor				High Pas	s Filte	r						
		AF	Antenna Fa	actor				High Pas	s Filte	r						
		AF	Antenna Fa	actor				High Pas	s Filte	r						
		AF	Antenna Fa	actor				High Pas	s Filte	r						
		AF	Antenna Fa	actor				High Pas	s Fille	r						
		AF	Antenna Fa	actor				High Pas	s Fiite	r						
		AF	Antenna Fa	actor				High Pas	s Fiite	r						
		AF	Antenna Fa	actor				High Pas	s Fille	r						
		AF	Antenna Fa	actor				High Pas	s Fille	r						
		AF	Antenna Fa	actor				High Pas	s Fille	r						
		AF	Antenna Fa	actor				High Pas	s Fille	r						
		AF	Antenna Fa	actor				High Pas		r						
		AF	Antenna Fa	actor				High Pas		r						
		AF	Antenna Fa	actor				High Pas	s Fille	r						
		AF	Antenna Fa	actor				High Pas	s Fille	r						
		AF	Antenna Fa	actor				High Pas		r						
		AF	Antenna Fa	actor				High Pas		r						
		AF	Antenna Fa	actor				High Pas	s rite	r						
		AF	Antenna Fa	actor				High Pas	s rine:	r						
		AF	Antenna Fa	actor				High Pas	s rine:	r						
		AF	Antenna Fa	actor				High Pas	s rine:	r						

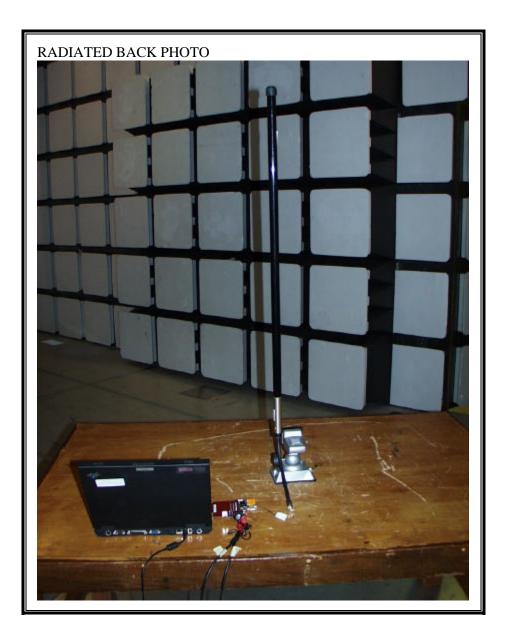
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7.9.3. RADIATED EMISSIONS WITH 12 dBi OMNI ANTENNA

RADIATED RF MEASUREMENT SETUP

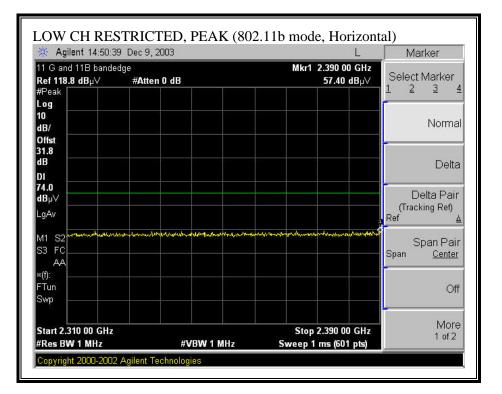


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RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)

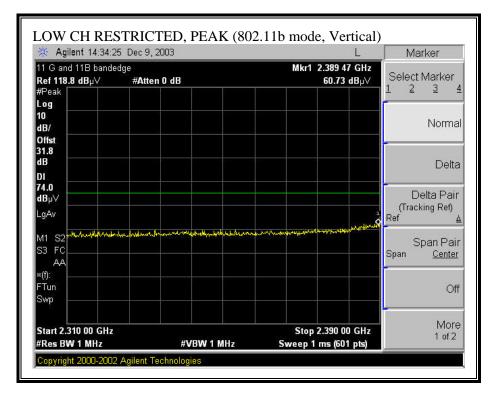


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🔆 Agilent 14:29:5	1 Dec 9, 2003	L	BW/Avg
I1 G and 11B bande Ref 108.8 dB µ∨ #Peak		Mkr1 2.389 47 GHz 45.21 dBµ∀	Res BV 1.00000000 MHz Auto <u>Ma</u>
Log 10 1B/ Offst			Video BV 10.0000000 Hz Auto <u>Ma</u>
31.8 4B DI			VBW/RB\ 1.00000
54.0 ∃Bµ∨ _gAv			Average 100 On <u>Off</u>
№1 S2 S3 FC AA ×(f): FTun			Avg/VBW Type Log-Pwr (Video) <u>Auto Ma</u>
Swp Start 2.310 00 GHz #Res BW 1 MHz	#VBW 10 H		Span/RBV 106 Auto Ma

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RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)

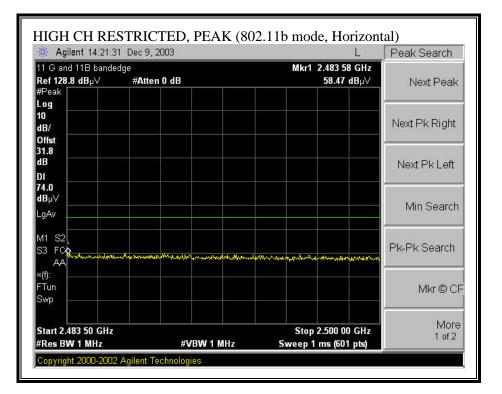


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🔆 Agilent 14:35:1	Marker			
11 G and 11B bande Ref 118.8 dB µ∨			Mkr1 2.389 47 GH 49.31 dBµ∖	Select Marker
#Peak		42		1 2 3 4
Log 10				
dB/				Normal
Offst		5		
31.8				
dB		ar ar		Delta
DI				
54.0 dBµ∀				Delta Pair
				(Tracking Ref)
LgAv				Ref <u>A</u>
w1 s2				
S3 FC				Span Pair Span Center
AA				opun <u>oenter</u>
×(f):				
FTun				Off
Swp				
				More
Start 2.310 00 GHz	#VBW 10		Stop 2.390 00 GH veep 6.238 s (601 pts)	z 1 of 2

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RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)

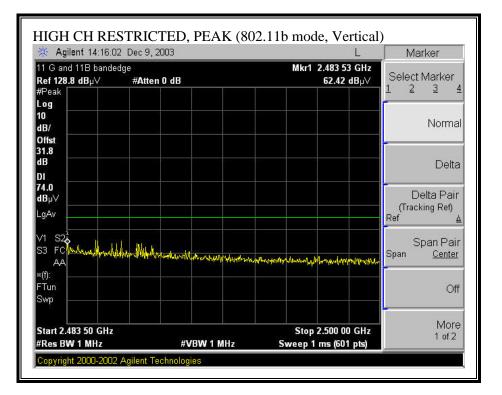


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🔆 Agilent 14:42:3	9 Dec 9, 2003	L	Peak Search	
I1 G and 11B bande Ref 118.8 dB µ∨		Mkr1 2.483 53 GHz 46.35 dBµ∨	Next Peak	
#Peak L og				
10 de la companya de			Next Pk Right	
Offst 31.8 4B				
DI			Next Pk Left	
54.0 1Βμ∨			Min Search	
_gAv				
N1 S2			Pk-Pk Search	
×(f):				
Tun Swp			Mkr © C	
Start 2.483 50 GHz		Stop 2.500 00 GHz	More	
Res BW 1 MHz	#VBW 10 H		1 of 2	

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RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)



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🔆 Agilent 14:17:5	0 Dec 9, 2003	L	Peak Search
1 G and 11B bande Ref 128.8 dB µ∨ ∕Peak		Mkr1 2.483 50 GHz 50.08 dBµ∨	Next Peak
.og IO IB/ Dffst			Next Pk Right
1.8 IB Marker			Next Pk Left
	00000 GHz		Min Search
977 50.00 V1 S2 33 FC ДА1			Pk-Pk Search
(f):			Mkr © C
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

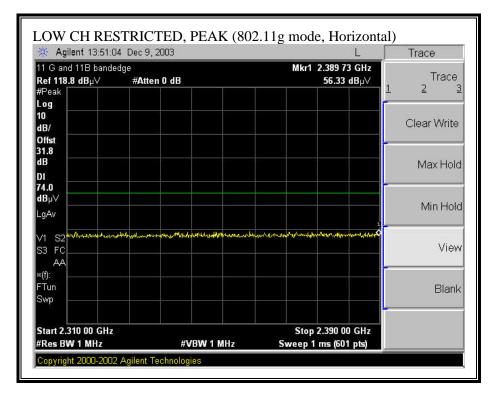
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HARMONICS AND SPURIOUS EMISSIONS (b MODE)

ompany: CIS UT Descrip.:\ UT M/N: est Target: F(WLAN Card a		nni Ante	enna										
lode Oper: Tx		UNICS												
est Equipmen	<u>.t:</u>													
EMCO Horn	1-18GHz	Pre-amplife		iz		pectrum A	· ·			Horn > 18	GHz			
T59; S/N: 3245	5 @3m 🚽	T86 Miteq 9	24341	-	Agile	nt E4446A	Analyz	er 🚽				-		
Hi Frequency Ca		(4 ~ 6 ft)	▼ (12 ft)				1 MHz	Measureme Resolution B Video Bandw	Bandwidth		leasuremen lution Bandw Bandwidth			
f Dist		Read Avg.	AF	CL	Amp	D Corr	HPF	Peak	Avg	Pk Lim	Avg Lim		Avg Mar	Notes
GHz feet	dBuV	dBuV	dB/m	dB	dB Tx at 2.41	dB 2GHz		dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	
.824 9.8	47.8	39.2	33.1	3.1	-45.6	0.0	1.0	39.4	30.8	74.0	54.0	-34.6	-23.2	v
.824 9.8	50.1	38.2	33.1	3.1	-45.6 T	0.0 x at 2.4370	1.0 Hz	41.7	29.8	74.0	54.0	-32.3	-24.2	Н
.874 9.8	45.2	35.1	33.1	3.2	-45.6	0.0	1.0	36.8	26.7	74.0	54.0	-37.2	-27.3	v
.311 9.8	39.6	31.2	36.0	4.1	-46.6	0.0	1.0	34.1	25.7	74.0	54.0	-39.9	-28.3	V
.874 9.8	48.9	37.2	33.1	3.2	-45.6	0.0	1.0	40.5	28.8	74.0	54.0	-33.5	-25.2	H
.311 9.8	40.6	30.7	36.0	4.1	-46.6	0.0 Tx at 2.620	1.0 Hz	35.1	25.2	74.0	54.0	-38.9	-28.8	Н
.924 9.8	46.4	40.4	33.1	3.2	-45.7	0.0	1.0	38.0	32.0	74.0	54.0	-36.0	-22.0	v
.386 9.8	40.4	30.0	36.1	4.1	-46.5	0.0	1.0	35.0	24.6	74.0	54.0	-39.0	-29.4	V
.924 9.8	47.4	38.6	33.1	3.2	-45.7	0.0	1.0	39.0	30.2	74.0	54.0	-35.0	-23.8	Н
.386 9.8	38.5	29.3	36.1	4.1	-46.5	0.0	1.0	33.1	23.9	74.0	54.0	-40.9	-30.1	Н
f Dist Read AF CL	Distance to	leading actor	,		D Corr Avg Peak	Average	Correc Field S ed Peak	ct to 3 mete Strength @ c Field Stre r	3 m		Pk Lim Avg Mar	Peak Field Margin vs	Field Streng 1 Strength L 2. Average I 3. Peak Limi	Limit Limit

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RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, HORIZONTAL)

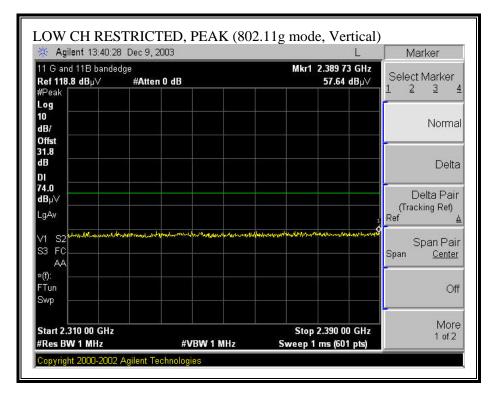


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🔆 Agilent 13:52:3	9 Dec 9, 2003	L	Marker
I1 G and 11B bande Ref 118.8 dB µ∨		Mkr1 2.389 73 GHz 45.34 dBµ∀	Coloothdorloor
#Peak L og			-
10 1B/			Norma
Offst 31.8 1B			Delta
ы I			Deita
54.0 IBµ∀			Delta Pair
_gAv			(Tracking Ref) Ref
W1 S2			Span Pair Span <u>Center</u>
*(f): =Tun			Off
Swp			
Start 2.310 00 GHz Res BW 1 MHz	#VBW 10 H	Stop 2.390 00 GHz z Sweep 6.238 s (601 pts)	More 1 of 2

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RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, VERTICAL)

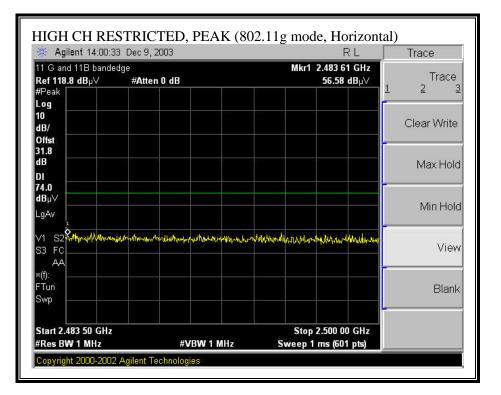


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🔆 Agilent 13:43:0	RL	Marker		
11 G and 11B bande Ref 118.8 dB µ∨		Mkr1 2.389 73 GHz 45.69 dBμ∀	Select Marker	
#Peak Log			4	
10			Norma	
dB/			Normal	
Offst 31.8				
dB			Delta	
DI				
54.0			Delta Pair	
dBµ∨	- 5 8 8		(Tracking Ref)	
LgAv			Ref <u>A</u>	
V1 S2			Span Pair	
S3 FC			Span <u>Center</u>	
AA				
×(f): FTun			Off	
Swp			- OII	
			-	
Start 2.310 00 GHz		Stop 2.390 00 GHz	More	
#Res BW 1 MHz	#VBW 10 F		1 of 2	

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RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, HORIZONTAL)

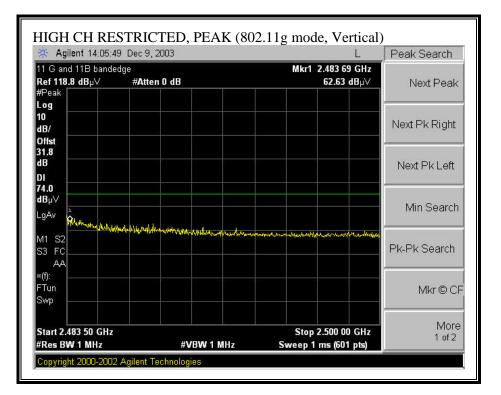


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🔆 Agilent 14:01:5	Marker				
11 G and 11B bande Ref 118.8 dB µ∨			Mkr1	Select Marker	
#Peak					1 2 3 4
Log 10					
dB/					Normal
Offst					
31.8					
dB					Delta
DI					
54.0 dBµ∀					Delta Pair
LgAv					(Tracking Ref)
LgAv					Ref <u>∆</u>
w1 s2			زهده زهدها		Spon Doir
S3 FC					Span Pair Span Center
AA		i di Milai			opun <u>oonter</u>
×(f):					
FTun					Off
Swp					
					hioro
Start 2.483 50 GHz	0.000	and the second se	Stop	2.500 00 GHz	More 1 of 2
#Res BW 1 MHz	#V	3W 10 Hz	Sweep 1.287	s (601 pts)	1 01 2

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RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, VERTICAL)



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🔆 Agilent 14:06:4	16 Dec 9, 2003			L	Peak Search
11 G and 11B bande Ref 118.8 dB µ∨			М	kr1 2.483 50 GHz 48.74 dBµ∀	Next Peak
#Peak					
Log 10					
dB/					Next Pk Right
Offst					
31.8 dB					
					Next Pk Left
DI					
dBµ∀					Min Co anala
LgAv					Min Search
W1 S21 S3 F00					Pk-Pk Search
AA					
×(f):					
FTun					Mkr © Cf
Swp					
					More
Start 2.483 50 GHz #Res BW 1 MHz		¥VBW 10 Hz		top 2.500 00 GHz 1.287 s (601 pts)	1 of 2

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HARMONICS AND SPURIOUS EMISSIONS (g MODE)

UT M/N: est Target: F	2409 SCO WLAN Card : CC 15 HARM		nni Ante	enna										
lode Oper: T est Equipmer														
EMCO Horn		Pre-amplife	er 1-26GH	İz	S	pectrum A	nalyzer			Horn > 18	GHz			
T59; S/N: 324	45 @3m 🔫	T86 Miteq 9		-	Agile	nt E4446A	Analyz	er 🚽				-		
Hi Frequency ((4 ~ 6 ft)	▼ (12 ft)				1 MHz	Measureme Resolution B Video Bandw	andwidth		leasuremen lution Bandw Bandwidth			
f Dis GHz fee		Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
					Tx at 2.412	2GHz	1.0							*7
824 9.8 824 9.8		35.3 34.5	33.1 33.1	3.1	-45.6 -45.6	0.0	1.0 1.0	35.9 35.3	26.9 26.1	74.0 74.0	54.0 54.0	-38.1 -38.7	-27.1 -27.9	V H
					Т	x at 2.4370	GHz				54.0	-38.2		v
874 9.8 311 9.8		35.8 30.9	33.1 36.0	3.2 4.1	-45.6 -46.6	0.0	1.0 1.0	35.8 37.2	27.4 25.4	74.0 74.0	54.0 54.0	-38.2	-26.6	v v
.874 9.8	3 44.5	36.3	33.1	3.2	-45.6	0.0	1.0	36.1	27.9	74.0	54.0	-37.9	-26.1	Н
311 9.8	3 42.6	30.9	36.0	4.1	-46.6	0.0	1.0	37.0	25.4	74.0	54.0	-37.0	-28.6	Н
924 9.8	47.3	41.8	33.1	3.2	-45.7	Tx at 2.620 0.0	GHz 1.0	38.9	33.4	74.0	54.0	-35.1	-20.6	v
386 9.8		30.0	36.1	4.1	-46.5	0.0	1.0	34.3	24.6	74.0	54.0	-39.7	-20.0	v
924 9.8	3 45.0	37.0	33.1	3.2	-45.7	0.0	1.0	36.6	28.6	74.0	54.0	-37.4	-25.4	Н
.386 9.8	3 40.3	29.3	36.1	4.1	-46.5	0.0	1.0	34.9	23.9	74.0	54.0	-39.1	-30.1	Н
f Dist Reac AF CL	Distance to	Reading actor	7		D Corr Avg Peak	Average	Correc Field S d Peak	et to 3 mete Strength @ c Field Stre	3 m		Pk Lim Avg Mar	Peak Field Margin vs	Field Streng I Strength L Average I A Peak Limi	Limit Limit

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7.9.4. RADIATED EMISSIONS WITH 13.5 dBi PATCH ANTENNA

RADIATED RF MEASUREMENT SETUP

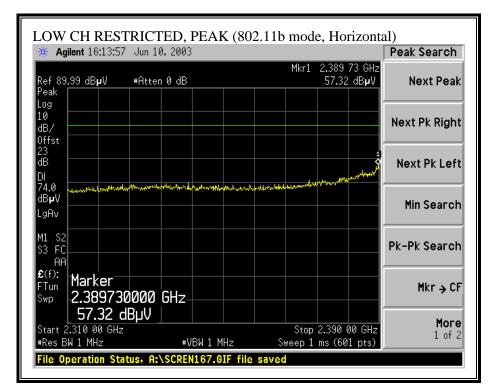


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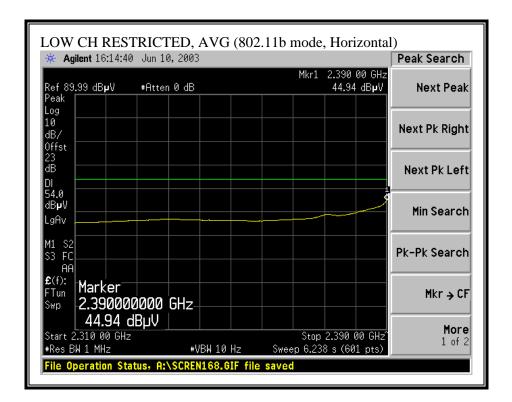


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RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)

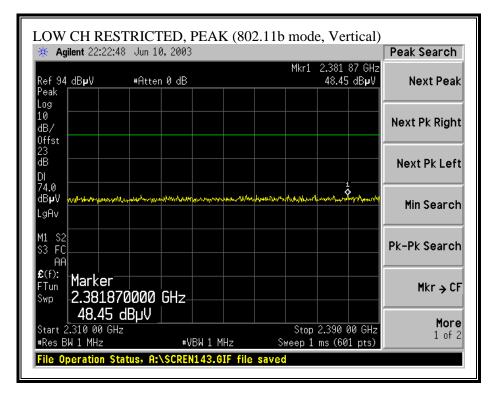


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RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)



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🔆 Agilent 22:24	:41 Jun 10, 2003				Peak Search
Ref 94 dB µ V Peak	#Atten 0 dB		Mkr1	2.383 20 36.53 dE	
Log 10 dB/ 0ffst					Next Pk Right
23 dB DI					Next Pk Left
54.0 dB µ V LgAv					Min Search
M1 S2 S3 FC AA					Pk-Pk Search
£(f): Marker FTun 2.3832 Swp 2.3853 36.53	.00000 GHz-				Mkr → CF
Start 2.310 00 G #Res BW 1 MHz	Hz	'BW 10 Hz		5 2.390 00 (38 s (601 p	

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