FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

802.11B/G MINI PCI CARD

MODEL NUMBER: PA3299U-1MPC

FCC ID: CJ6UPA3299WLP

REPORT NUMBER: 03U2196-1

ISSUE DATE: NOVEMBER 12, 2003

Prepared for
TOSHIBA CORPORATION DIGITAL MEDIA NETWORK COMPANY
2-9 SUEHIRO-CHO, OME
TOKYO, 198-8710, JAPAN

Prepared by
COMPLIANCE CERTIFICATION SERVICES
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1. TEST RESULT CERTIFICATION

COMPANY NAME: TOSHIBA CORPORATION DIGITAL MEDIA NETWORK COMPANY
2-9 SUEHIRO-CHO, OME
TOKYO, 198-8710, JAPAN

EUT DESCRIPTION: 802.11B/G MINI PCI CARD

MODEL: PA3299U-1MPC

DATE TESTED: MAY 6 - OCTOBER 21, 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:

MIKE HECKROTTE
CHIEF ENGINEER
COMPLIANCE CERTIFICATION SERVICES

Tested By:

THANH NGUYEN
EMC TECHNICIAN
COMPLIANCE CERTIFICATION SERVICES

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2. DESCRIPTION OF EUT

The EUT is an 802.11b/g WLAN mini PCI module operating in the 2.4-2.4835 GHz band, including co-location with the Toshiba PA3232U-1BTM Bluetooth radio. Both radios and their associated antennas are installed in the Toshiba Tablet PC host computer, model PPM20U-AAAA2.

All antennas have integrated coaxial cables; the gains reported below are for the antenna assembly including the coaxial cable.

The WLAN radio utilizes two identical internal film antennas for diversity. Two alternate film antenna models are available; model HTL012 has a maximum gain of 2.0 dBi and model HTL008 has a maximum gain of 0.6 dBi. Tests were performed with the highest gain HTL012 antennas.

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

Frequency Band (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	16.56	45.29
2412 - 2462	802.11g Normal	20.77	119.40
2412 - 2462	802.11g Turbo	19.11	81.47

The Bluetooth radio card has a modular approval, FCC ID: CJ6UPA3232BT. The Bluetooth radio utilizes a film antenna, model HTL004, with a maximum gain of -0.3 dBi. The Bluetooth radio card documented in this report is identical to the radio card documented in the above referenced modular approval.

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3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4/1992, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

4. FACILITIES AND ACCREDITATION

The open area test sites and conducted 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 http://www.ccsemc.com.

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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:

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 AND MEASUREMENT EQUIPMENT LIST				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due Date
EMI Test Receiver	R & S	ESHS 20	827129/006	7/17/2004
LISN, 10 kHz ~ 30 MHz	FCC	50/250-25-2	114	9/6/2004
Spectrum Analyzer	AGILENT	E4446A	US42070220	1/13/04
Pre-amplifier	MITEQ	NSP2600-SP	924341	4/25/04
Horn Antenna	EMCO	3115	6717	2/04/04
Power Meter	AGILENT	E4416A	0841291160	11/07/04
Power Sensor	Agilent	E9327A	US40440755	11/07/04
Antenna, Biconical	Eaton	94455-1	1214	3/06/04
Antenna, Log Periodic	EMCO	3146	9107-3163	3/06/04
Preamplifier	Miteq	NSP10023988	646456	4/26/04
Band Reject 2.4GHz	Micro-Tronics	BRM50702	003	N.C.R.

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6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Device Type	Manufacturer	Model	Serial Number	FCC ID
Laptop	**Toshiba**	**PPM20U-AAAA2**	**93010025**	**DoC**
AC adapter	**Toshiba**	**ADP-60RH A**	**0394336**	**DoC**

I/O CABLES

Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	**AC**	**1**	**US115**	**Unshielded**	**1.8m**	**No**
2	**DC**	**1**	**DC Jack**	**Unshielded**	**1.8m**	**No**

TEST SETUP

The EUT is installed in the host laptop.

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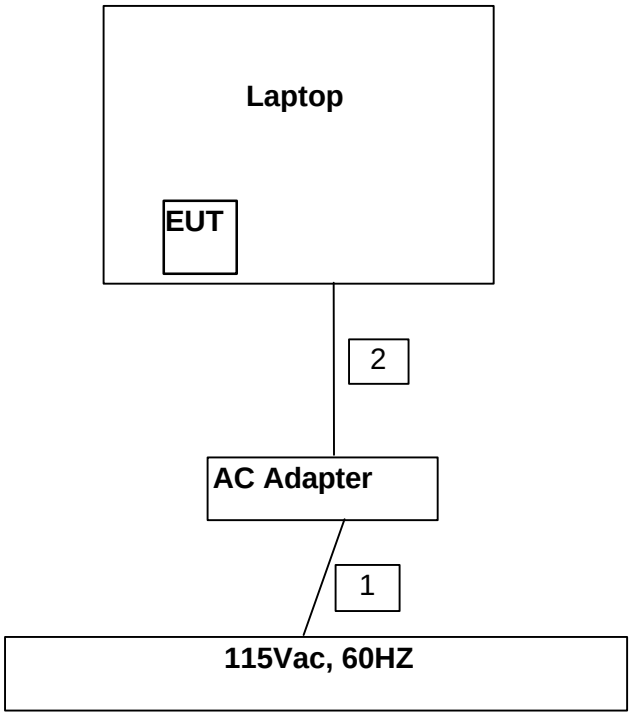
SETUP DIAGRAM



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7. APPLICABLE RULES AND TEST RESULTS

7.1. 6 dB BANDWIDTH

LIMIT

§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.

RESULTS

No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	11080	500	10580
Middle	2437	11080	500	10580
High	2462	12000	500	11500

802.11g Normal Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	16500	500	16000
Middle	2437	16500	500	16000
High	2462	16500	500	16000

802.11g Turbo Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Middle	2437	32670	500	32170

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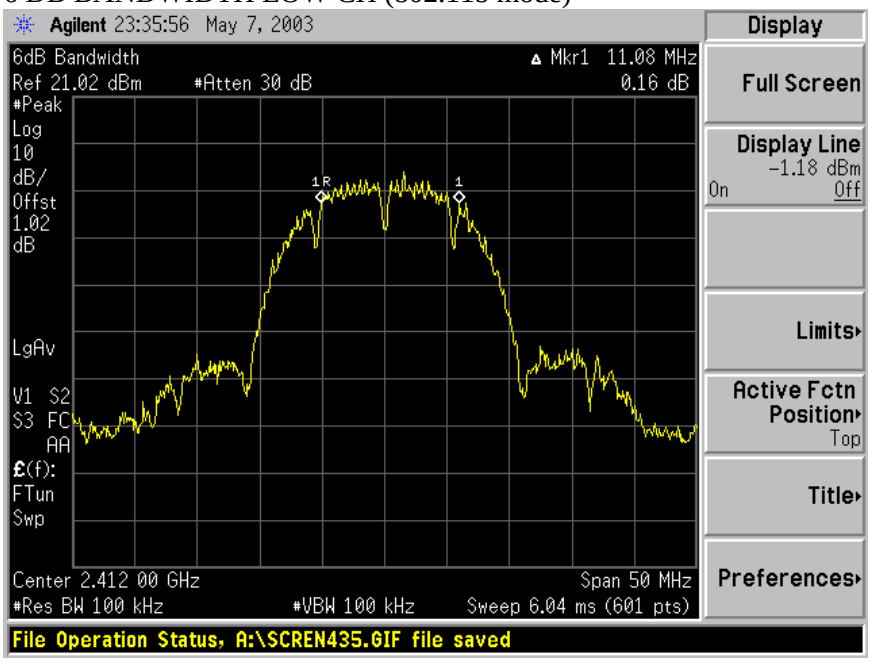
6 DB BANDWIDTH (802.11b MODE)

6 DB BANDWIDTH LOW CH (802.11b mode)



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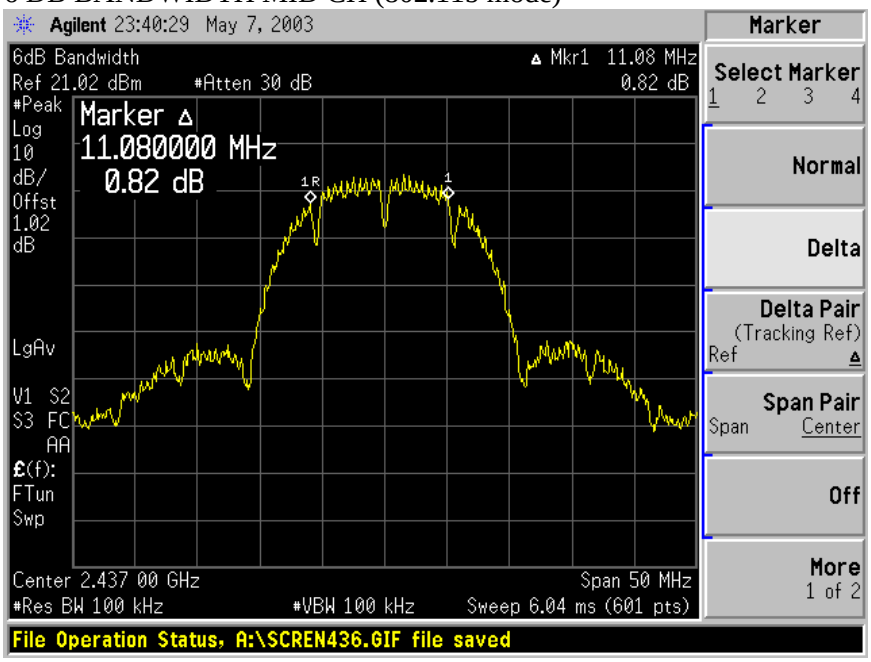
6 DB BANDWIDTH MID CH (802.11b mode)



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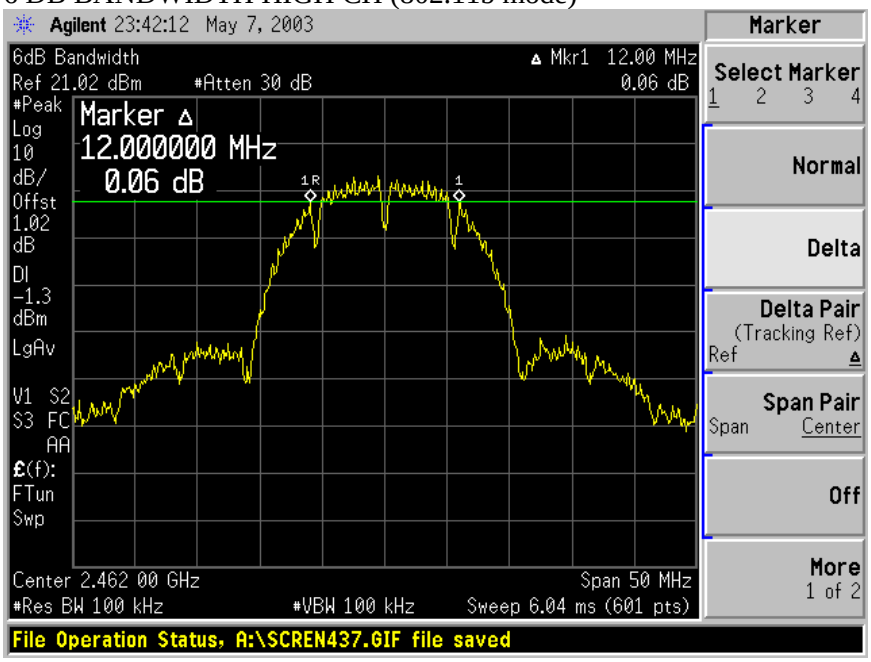
6 DB BANDWIDTH HIGH CH (802.11b mode)



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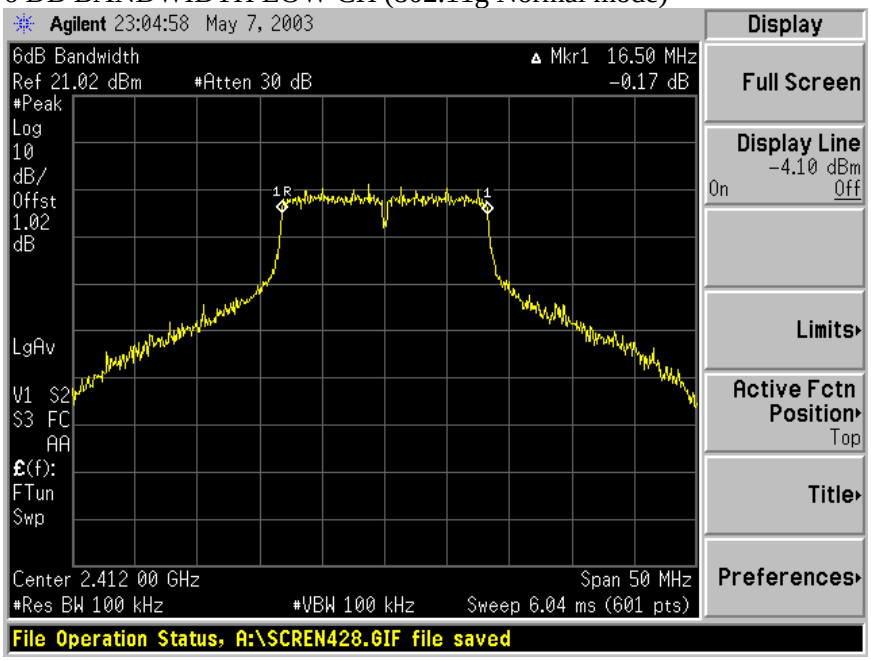
6 DB BANDWIDTH (802.11g NORMAL MODE)

6 DB BANDWIDTH LOW CH (802.11g Normal mode)



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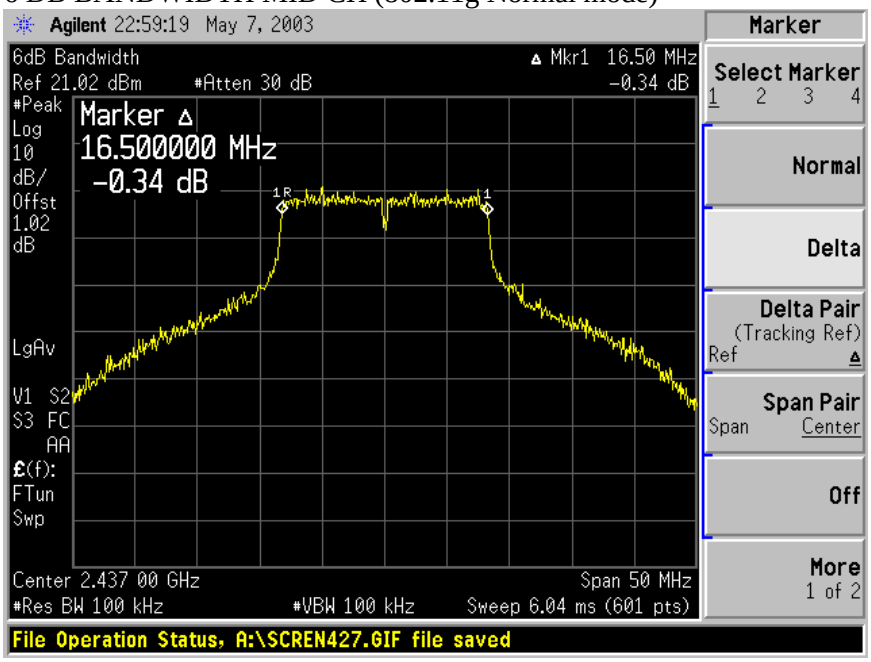
6 DB BANDWIDTH MID CH (802.11g Normal mode)



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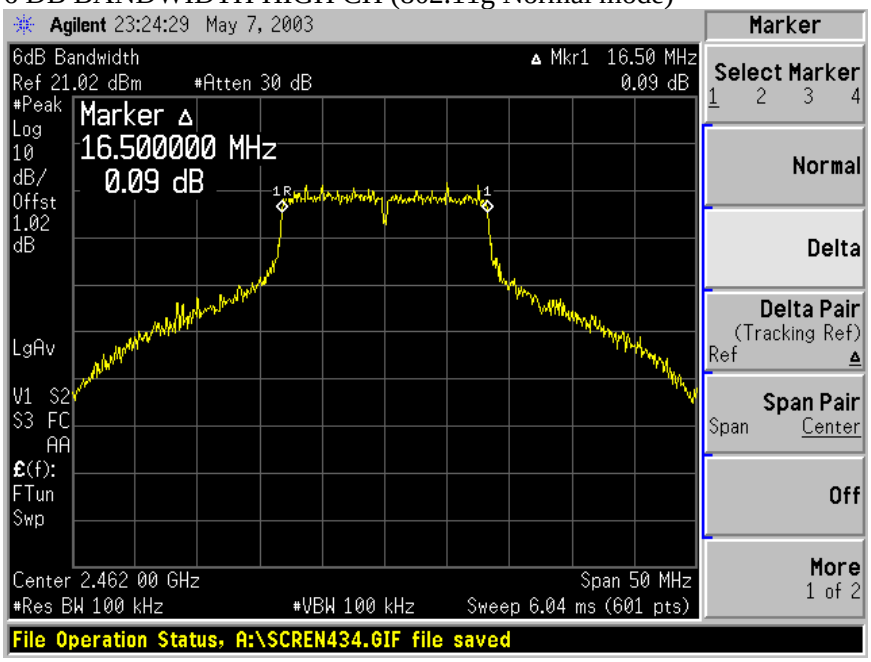
6 DB BANDWIDTH HIGH CH (802.11g Normal mode)



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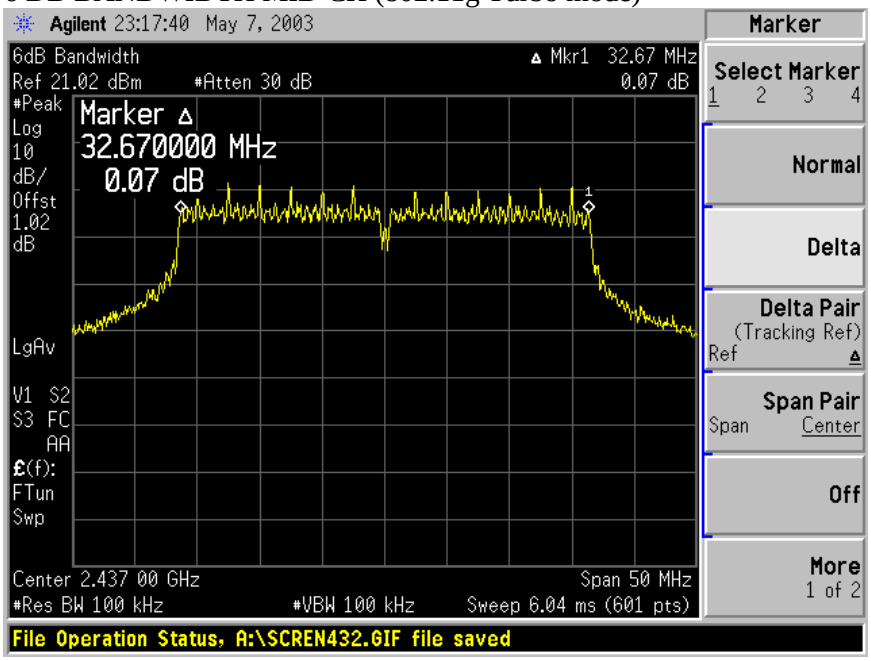
6 DB BANDWIDTH (802.11g TURBO MODE)

6 DB BANDWIDTH MID CH (802.11g Turbo mode)



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7.2. 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

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

RESULTS

No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	15.799
Middle	2437	15.844
High	2462	16.0239

802.11g Normal Mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.6046
Middle	2437	16.6322
High	2462	16.6362

802.11g Turbo Mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Middle	2437	33.3984

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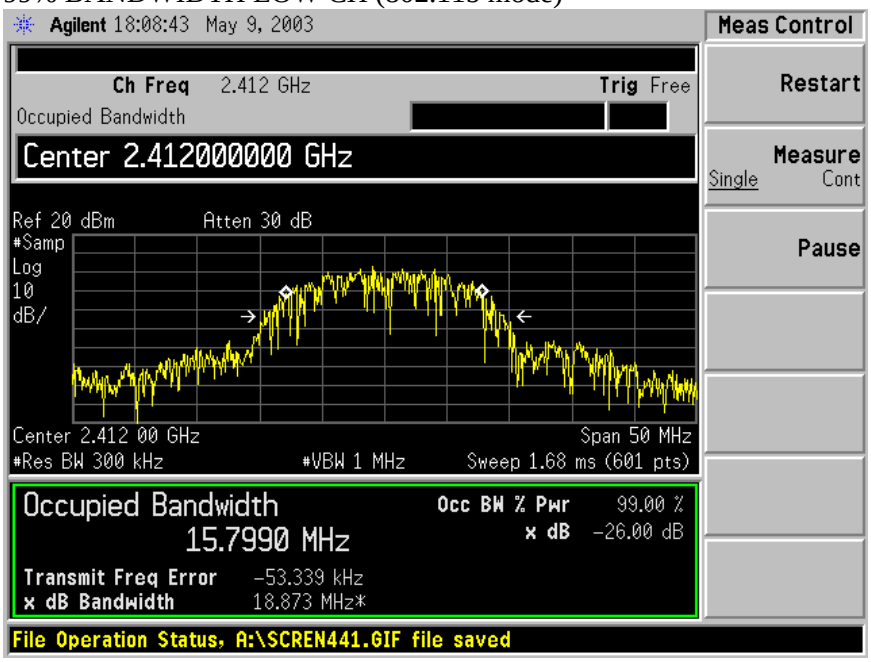
99% BANDWIDTH (802.11b MODE)

99% BANDWIDTH LOW CH (802.11b mode)



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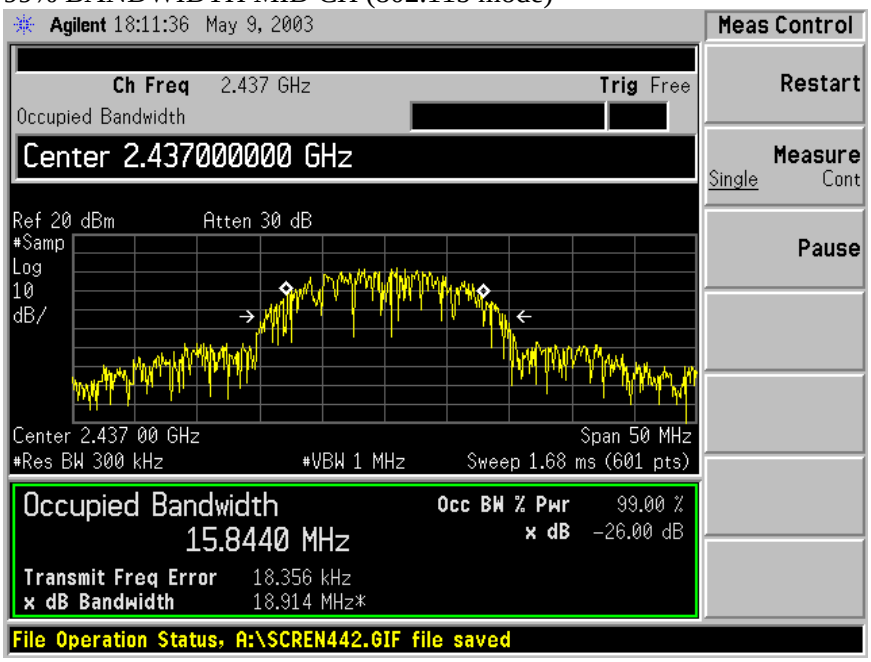
99% BANDWIDTH MID CH (802.11b mode)



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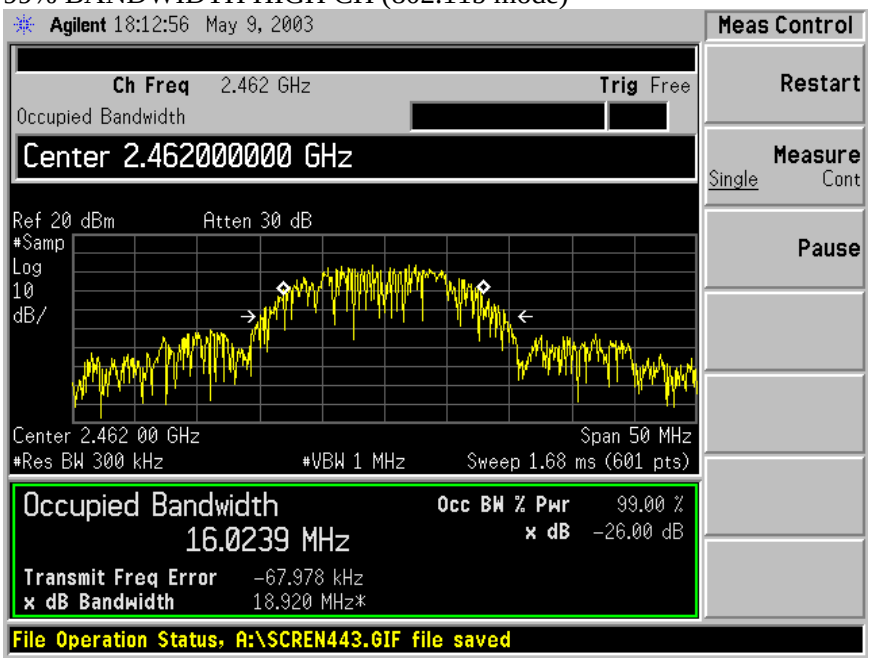
99% BANDWIDTH HIGH CH (802.11b mode)



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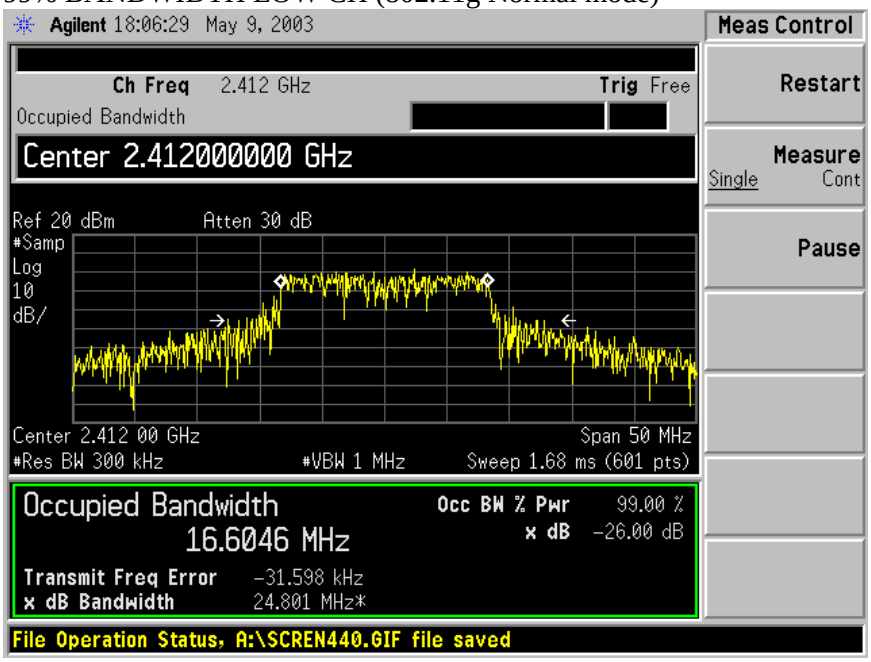
99% BANDWIDTH (802.11g NORMAL MODE)

99% BANDWIDTH LOW CH (802.11g Normal mode)



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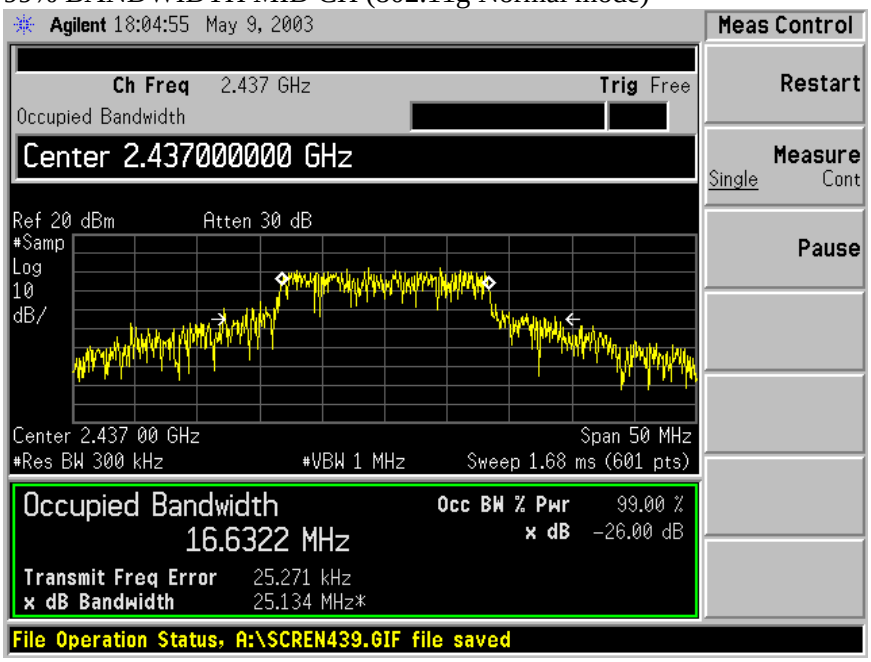
99% BANDWIDTH MID CH (802.11g Normal mode)



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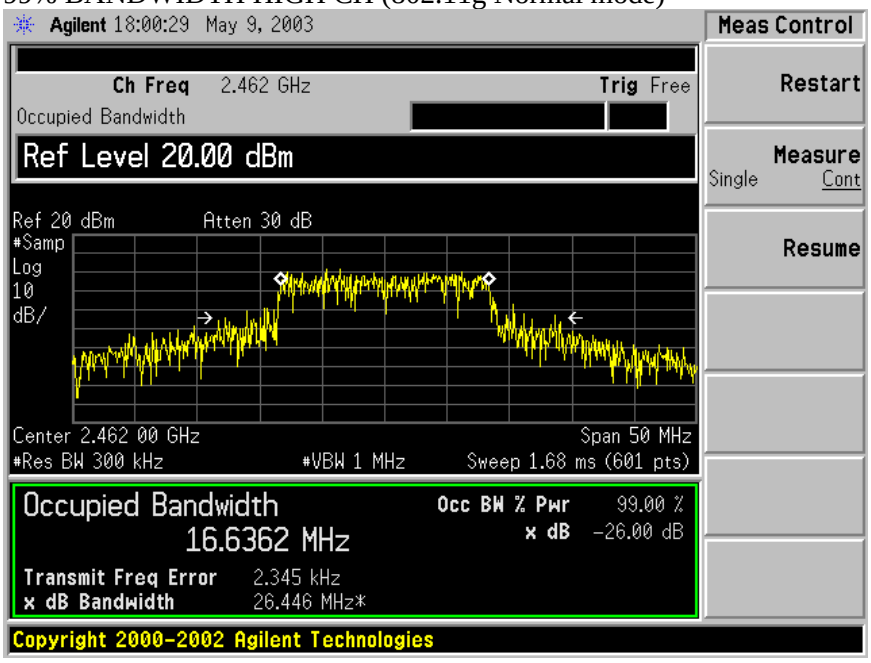
99% BANDWIDTH HIGH CH (802.11g Normal mode)



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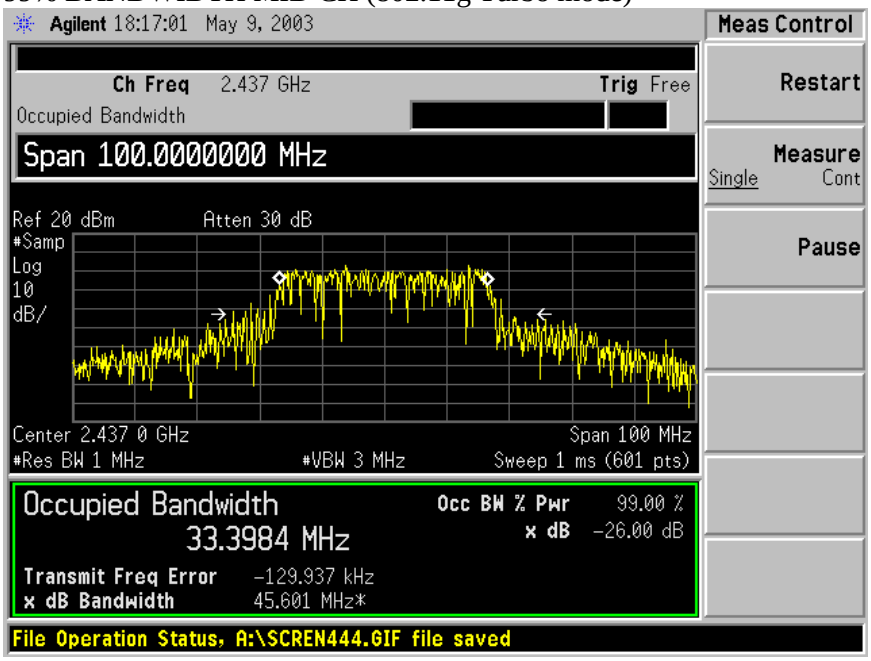
99% BANDWIDTH (802.11g TURBO MODE)

99% BANDWIDTH MID CH (802.11g Turbo mode)



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7.3. 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.

The maximum antenna gain is 4.8 dBi, therefore the limit is 30 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

No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	16.56	30	-13.44
Middle	2437	16.31	30	-13.69
High	2462	16.20	30	-13.80

802.11g Normal Mode

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	20.77	30	-9.23
Middle	2437	20.48	30	-9.52
High	2462	20.52	30	-9.48

802.11g Turbo Mode

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Middle	2437	19.11	30	-10.89

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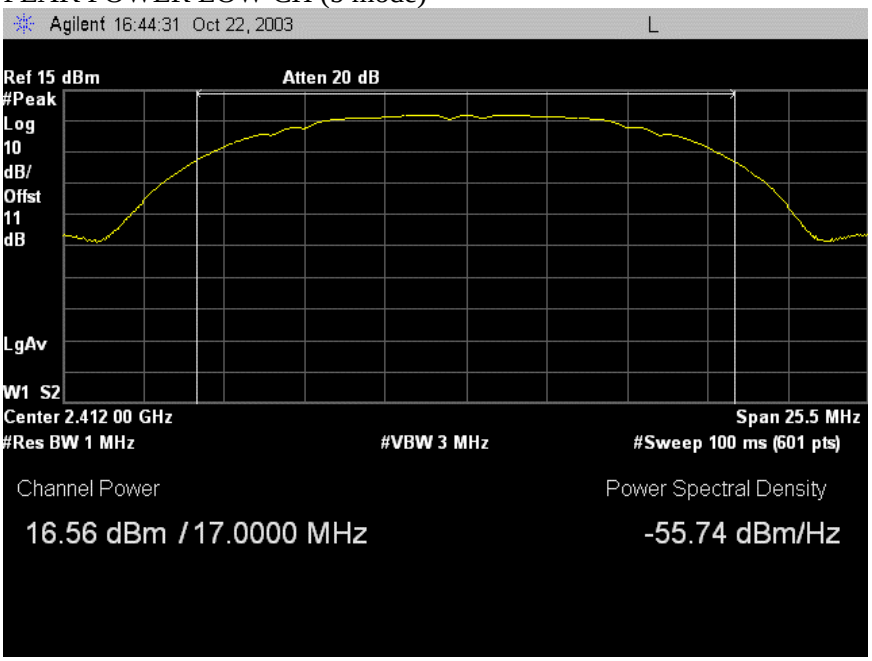
OUTPUT POWER (802.11b MODE)

PEAK POWER LOW CH (b mode)



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PEAK POWER MID CH (b mode)

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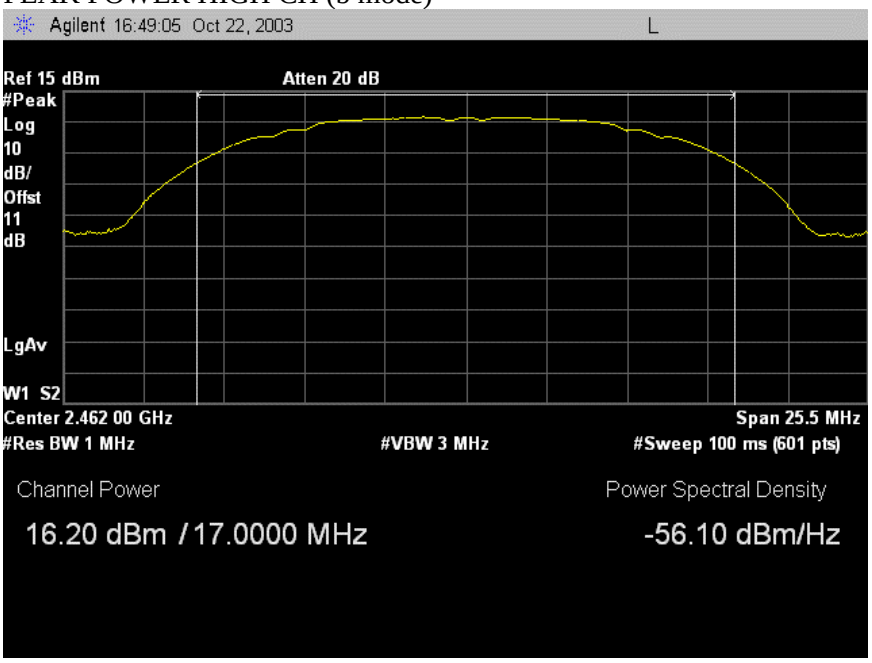
PEAK POWER HIGH CH (b mode)



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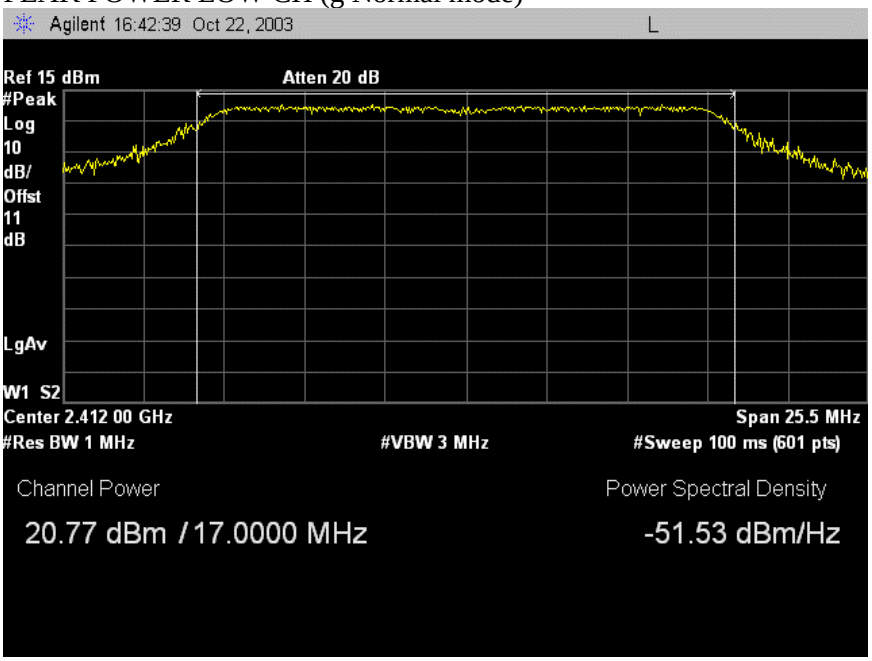
OUTPUT POWER (802.11g NORMAL MODE)

PEAK POWER LOW CH (g Normal mode)



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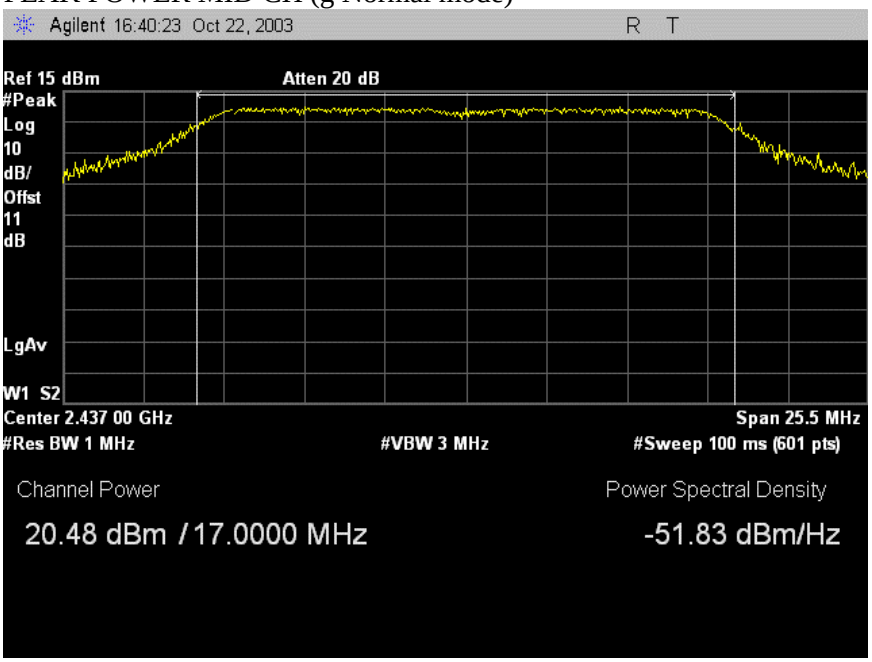
PEAK POWER MID CH (g Normal mode)



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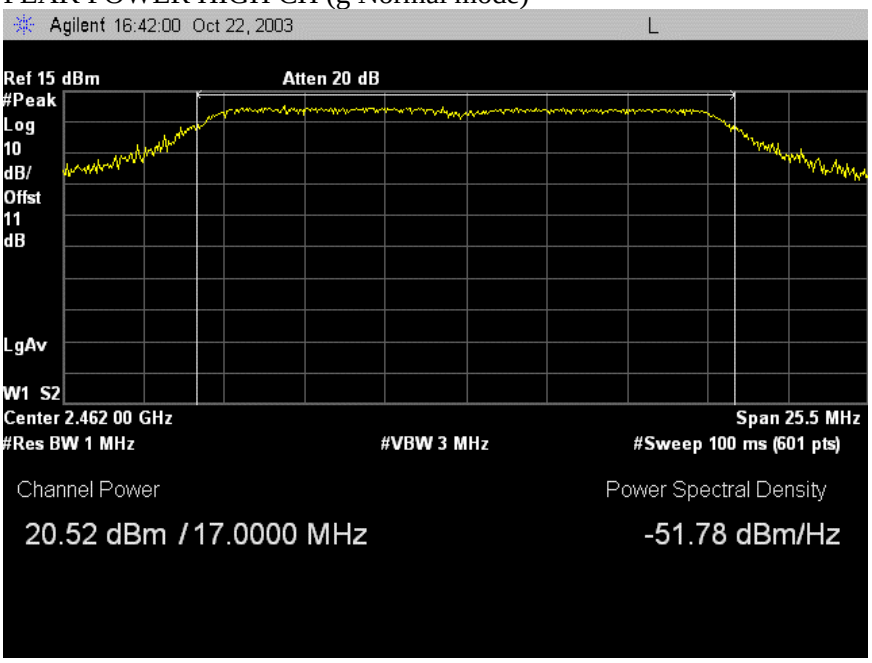
PEAK POWER HIGH CH (g Normal mode)



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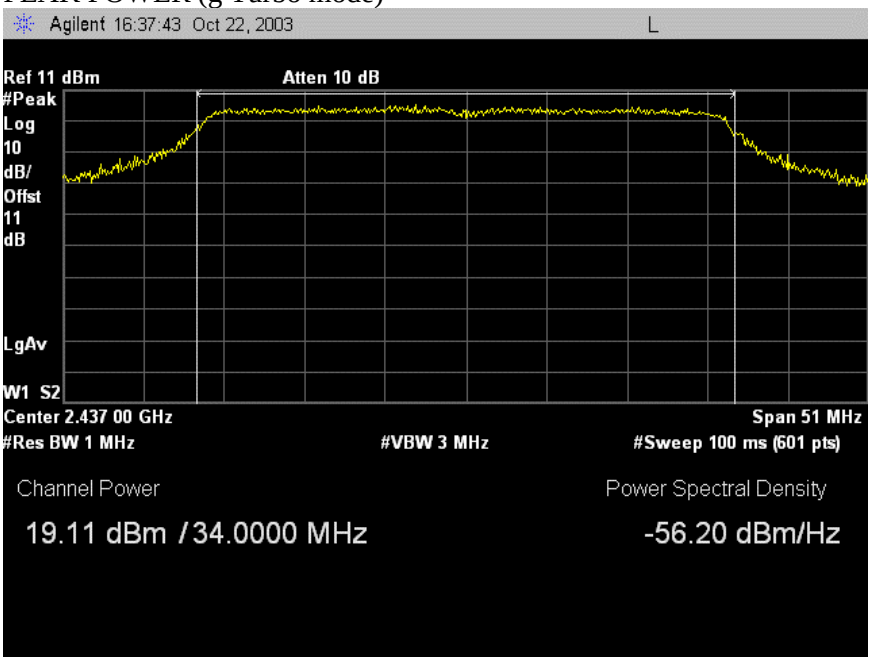
OUTPUT POWER (802.11g TURBO MODE)

PEAK POWER (g Turbo mode)



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7.4. 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 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11b Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	2412	13.90
Middle	2437	13.20
High	2462	13.60

802.11g Normal Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	2412	14.20
Middle	2437	14.20
High	2462	14.10

802.11g Turbo Mode

Channel	Frequency (MHz)	Average Power (dBm)
Middle	2437	13.70

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7.5. PEAK POWER SPECTRAL DENSITY

LIMIT

§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 >= 3KHz, 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 (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-8.80	8	-16.80
Middle	2437	-9.00	8	-17.00
High	2462	-8.10	8	-16.10

802.11g Normal Mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-9.30	8	-17.30
Middle	2437	-10.20	8	-18.20
High	2462	-9.40	8	-17.40

802.11g Turbo Mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Middle	2437	-19.70	8	-27.70

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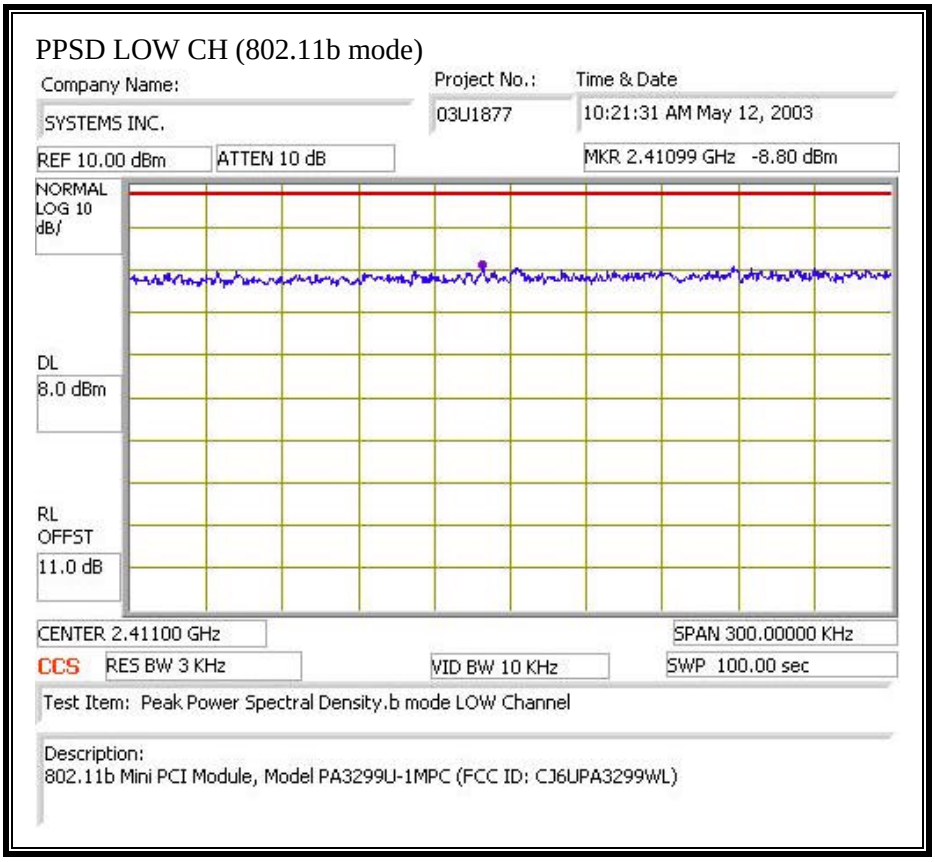
PEAK POWER SPECTRAL DENSITY (802.11b MODE)



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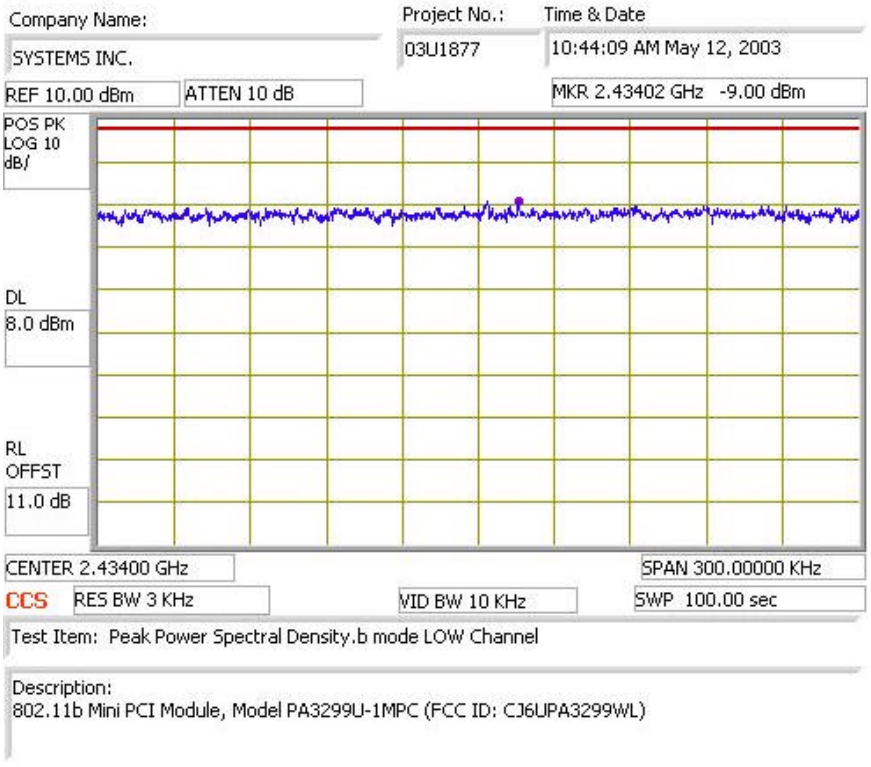
PPSD MID CH (802.11b mode)



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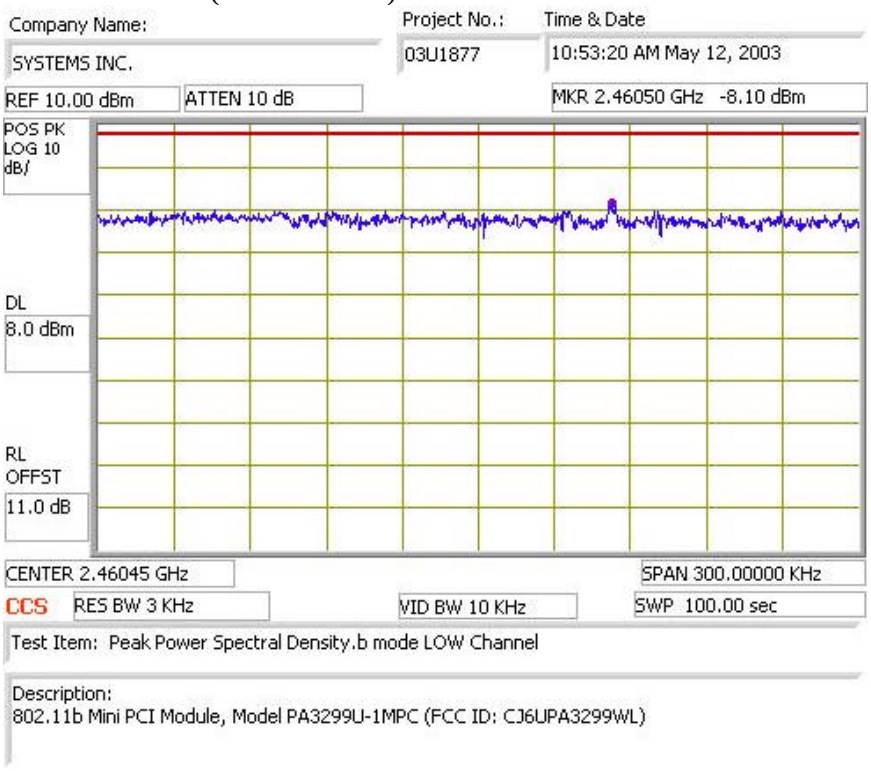
PPSD HIGH CH (802.11b mode)



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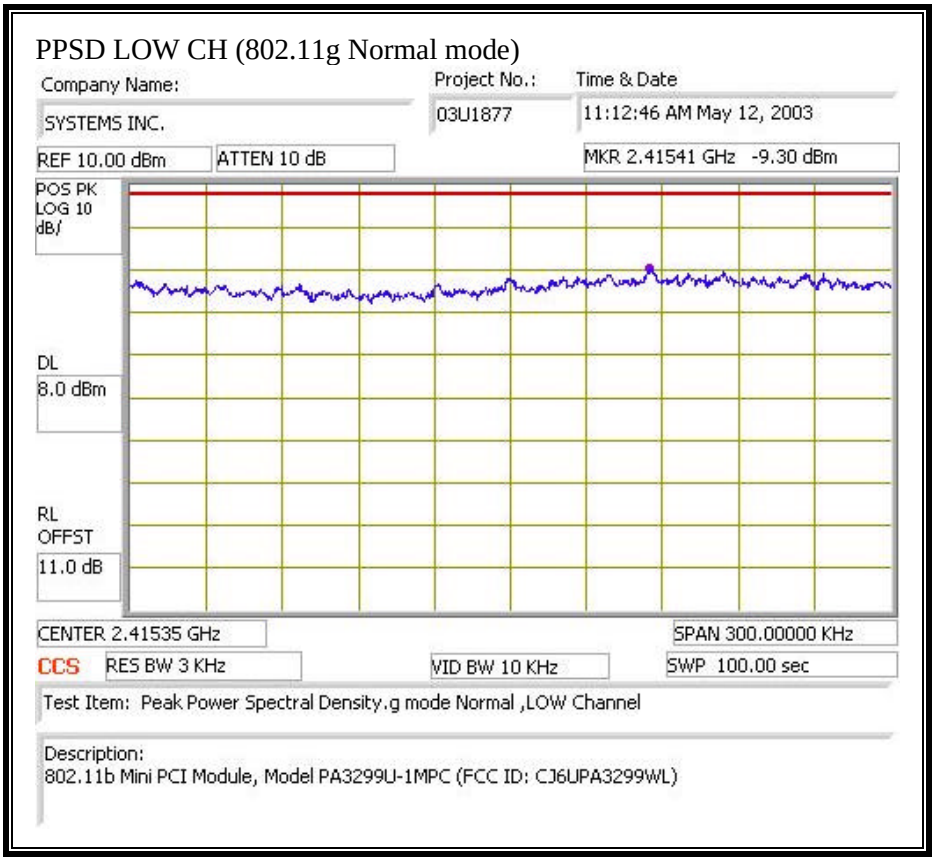
PEAK POWER SPECTRAL DENSITY (802.11g NORMAL MODE)



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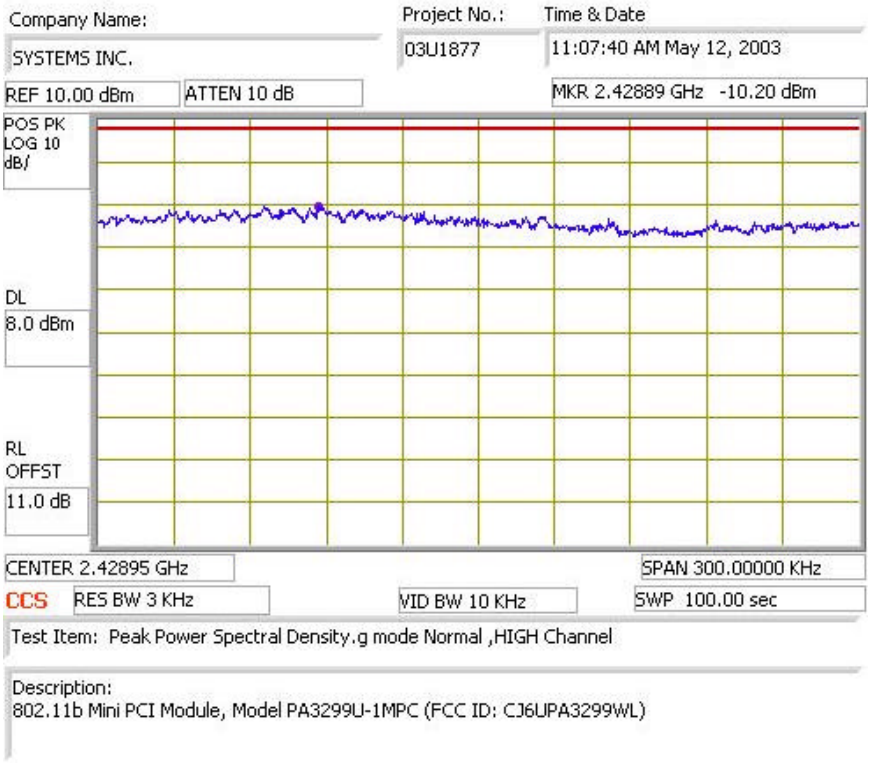
PPSD MID CH (802.11g Normal mode)



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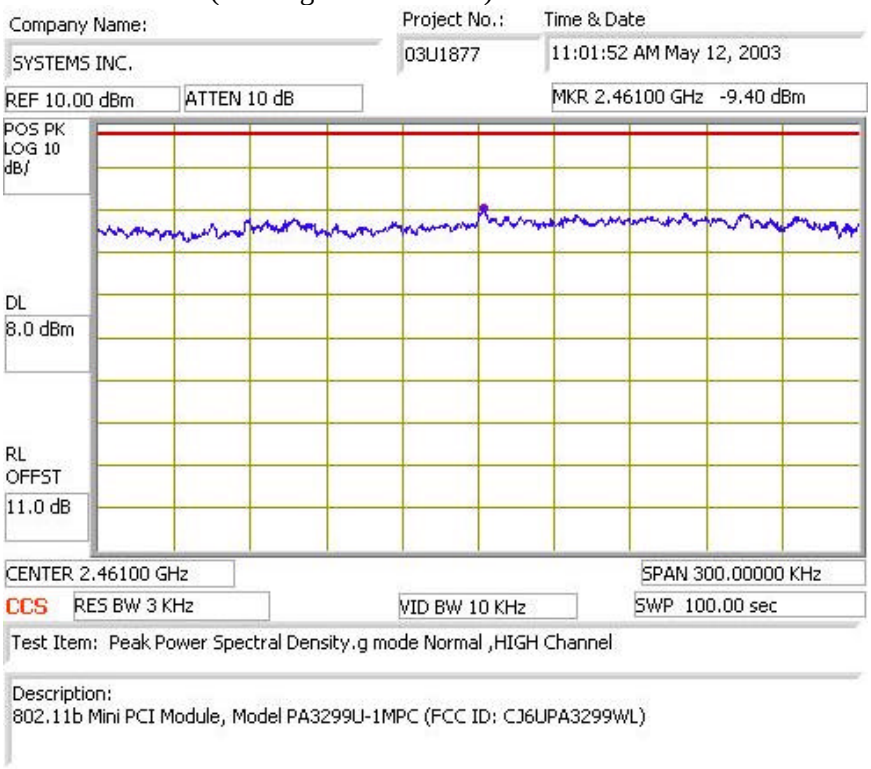
PPSD HIGH CH (802.11g Normal mode)



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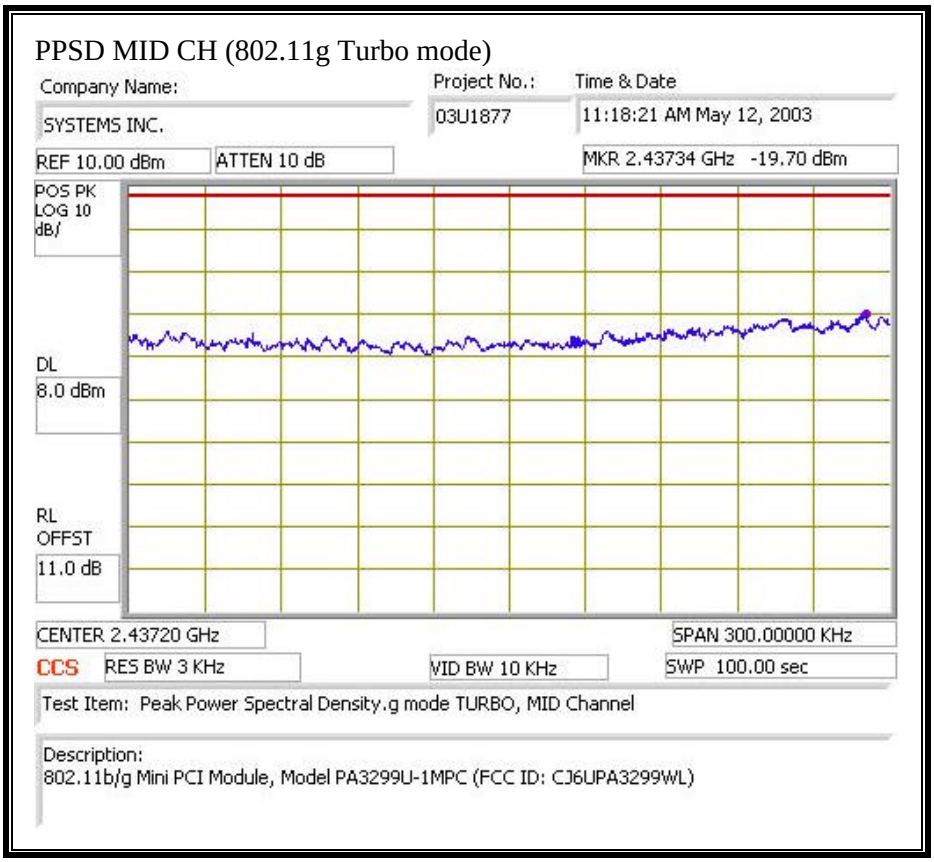
PEAK POWER SPECTRAL DENSITY (802.11g TURBO MODE)



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7.6. 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 §15.209(a) (see §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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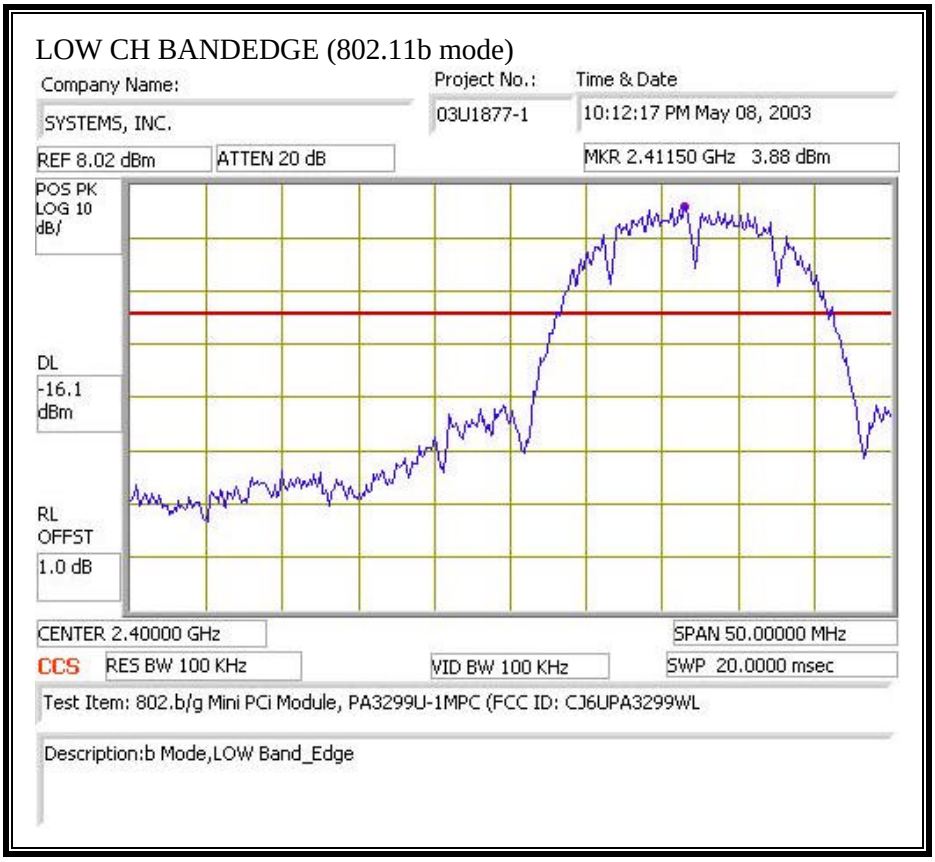
SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE)



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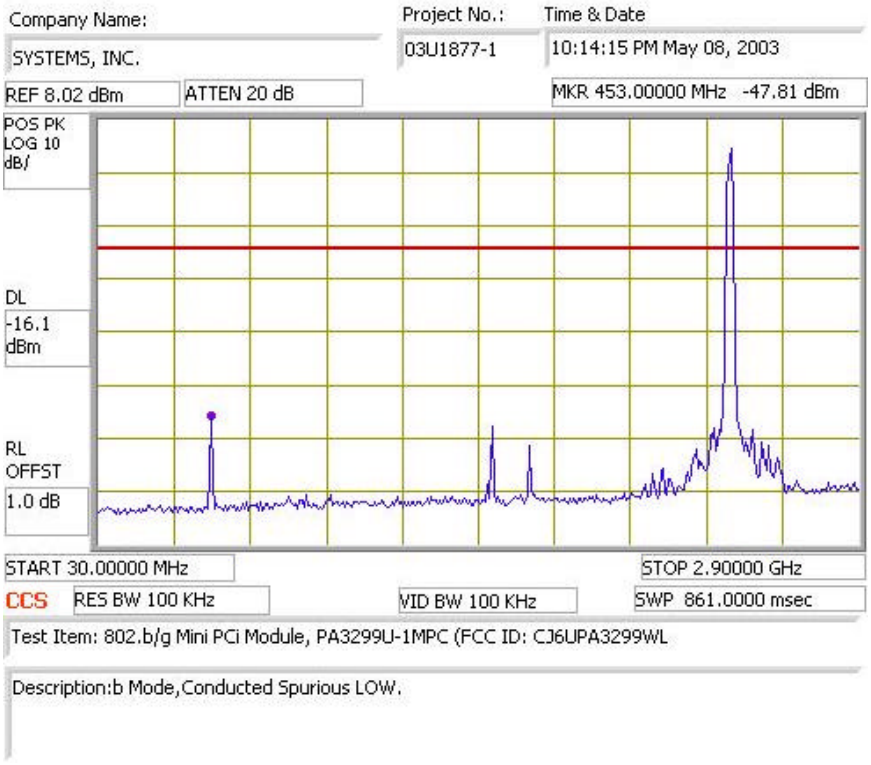
LOW CH SPURIOUS (802.11b mode)



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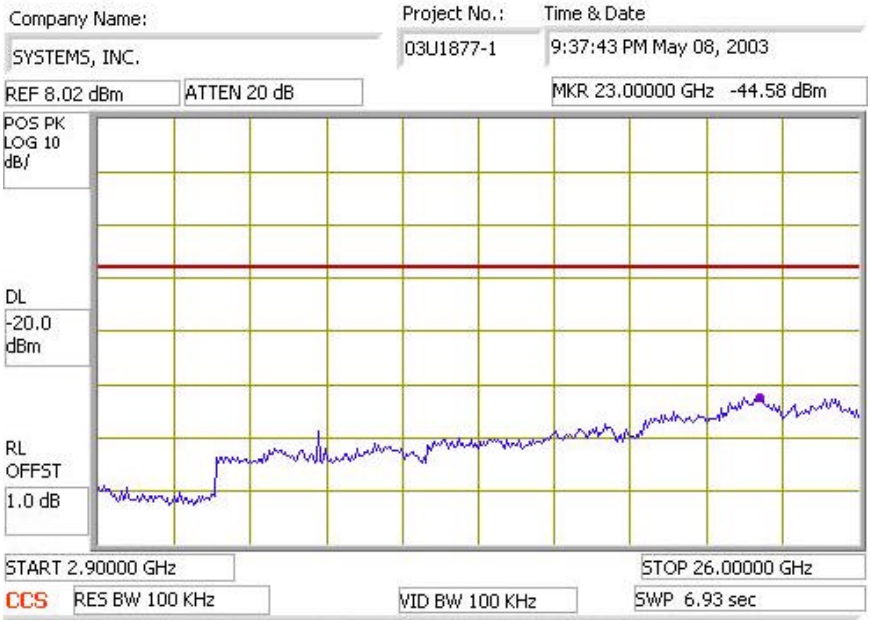
LOW CHANNEL SPURIOUS (802.11b mode)



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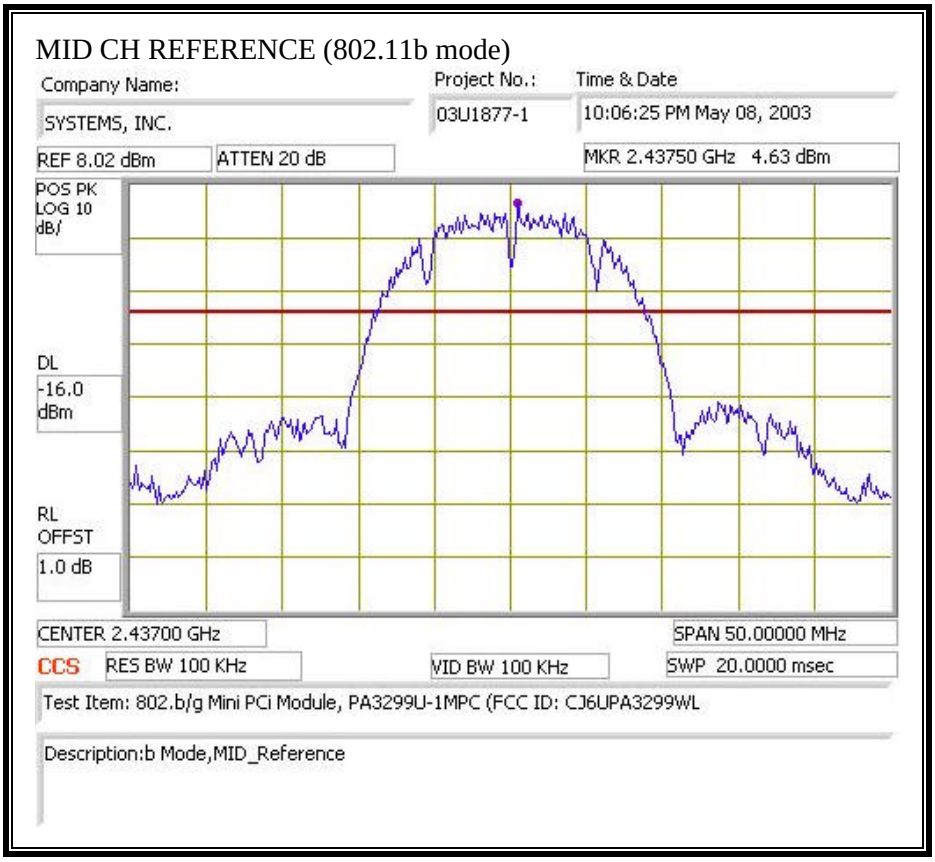
SPURIOUS EMISSIONS, MID CHANNEL (802.11b MODE)



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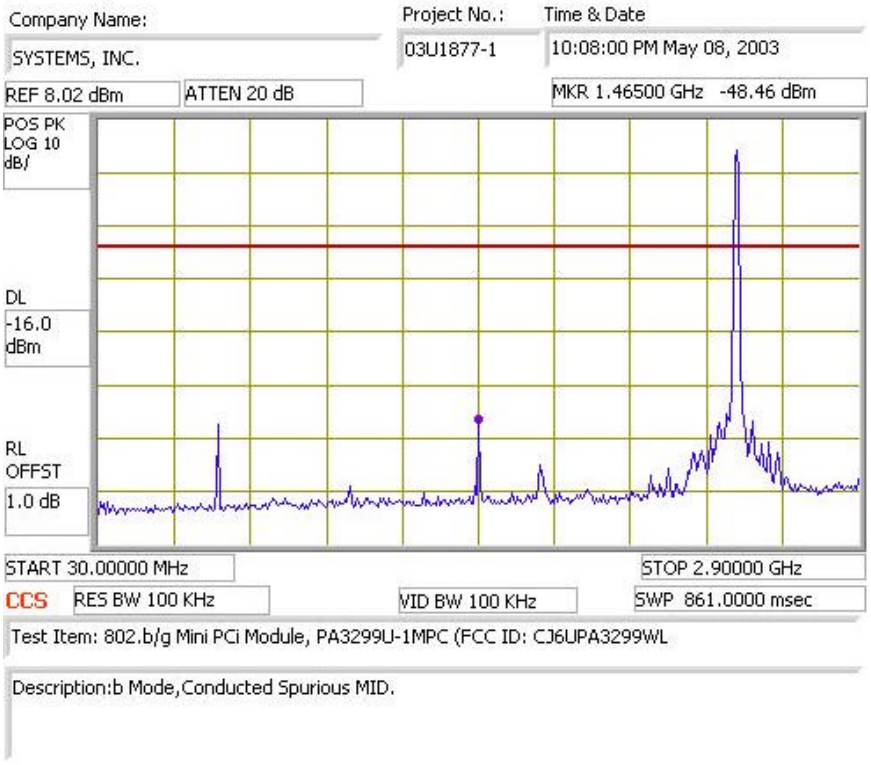
MID CH SPURIOUS (802.11b mode)



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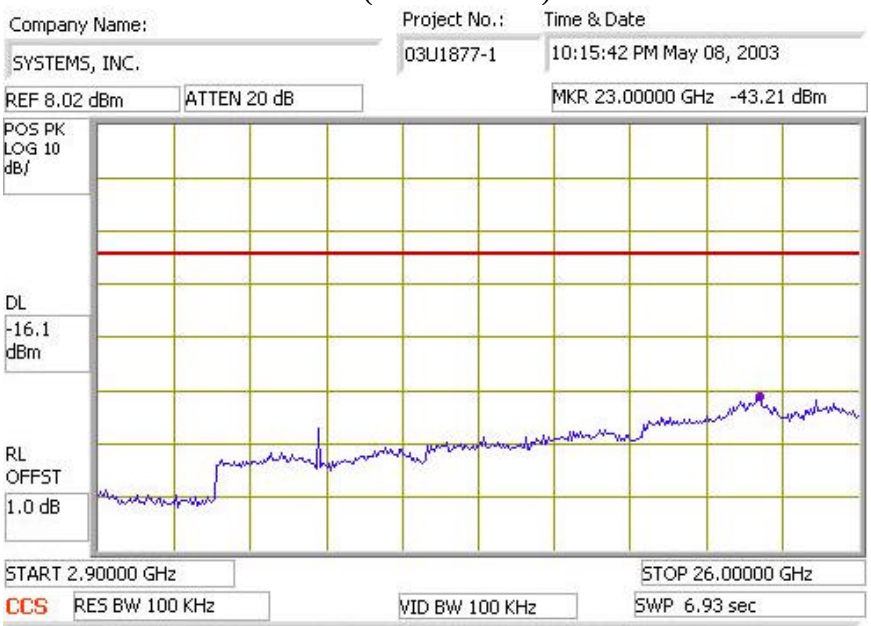
MID CHANNEL SPURIOUS (802.11b mode)



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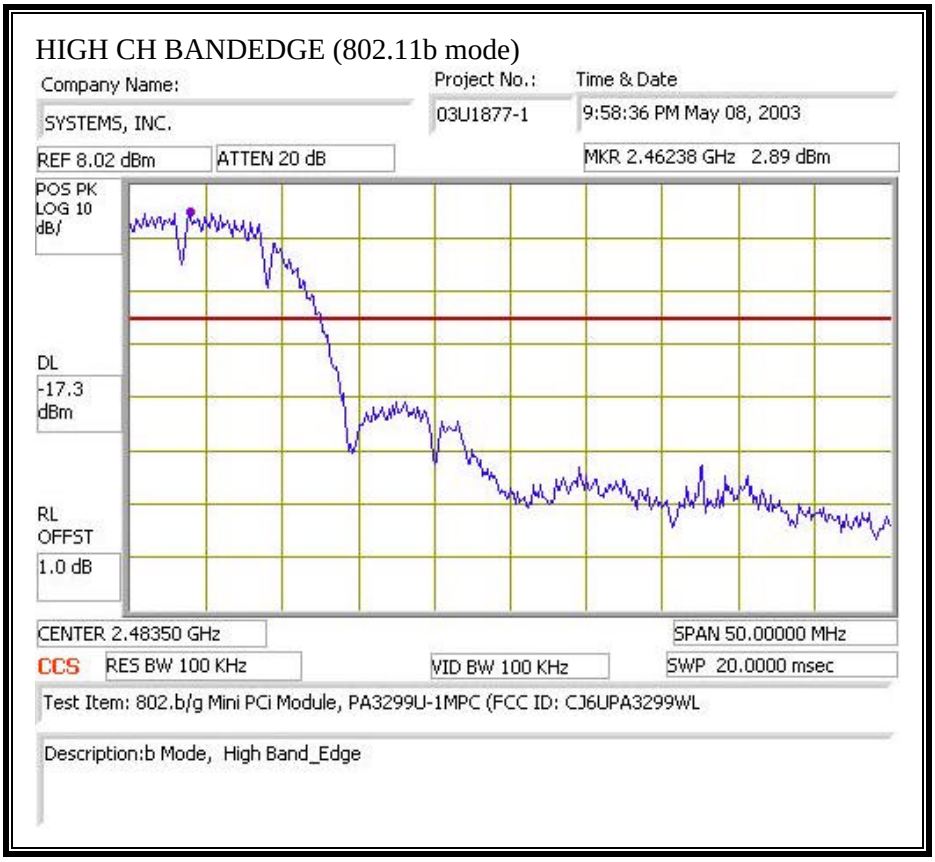
SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE)



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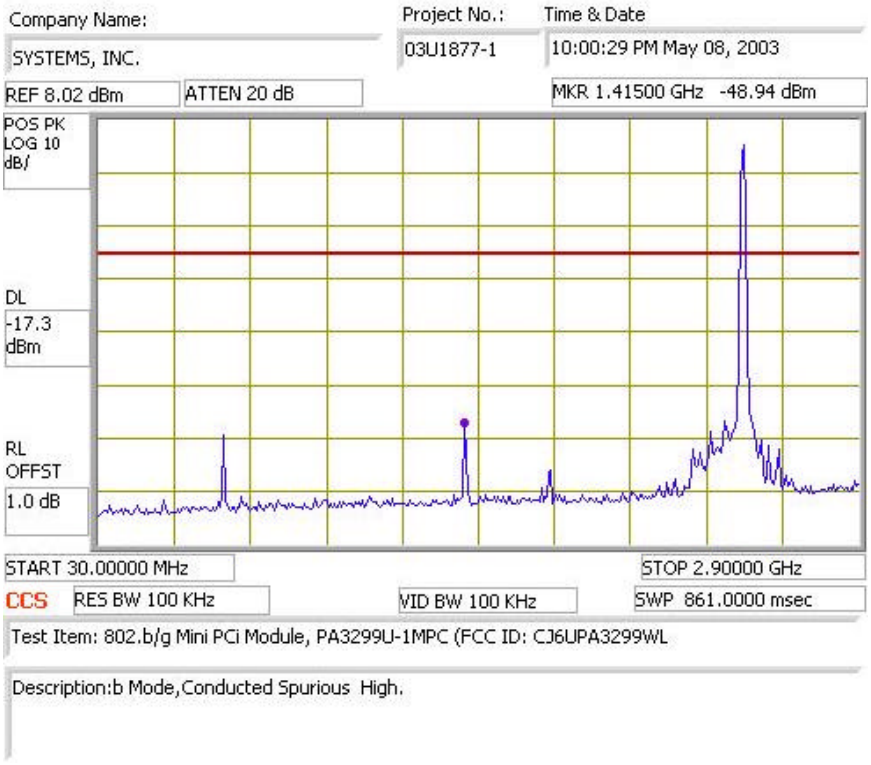
HIGH CH SPURIOUS (802.11b mode)



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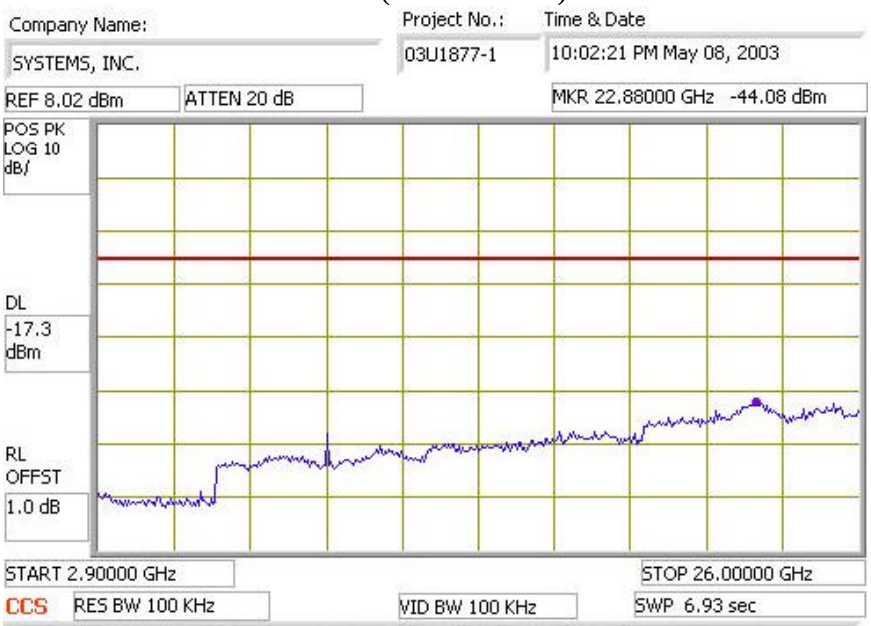
HIGH CHANNEL SPURIOUS (802.11b mode)



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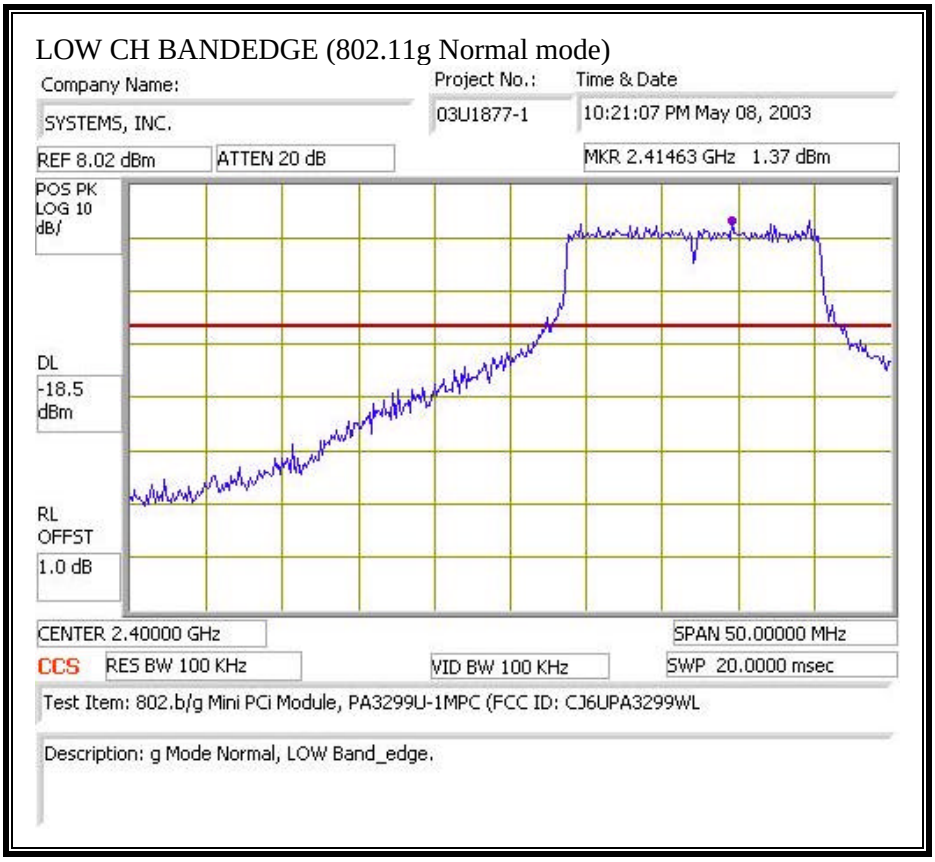
SPURIOUS EMISSIONS, LOW CHANNEL (802.11g NORMAL MODE)



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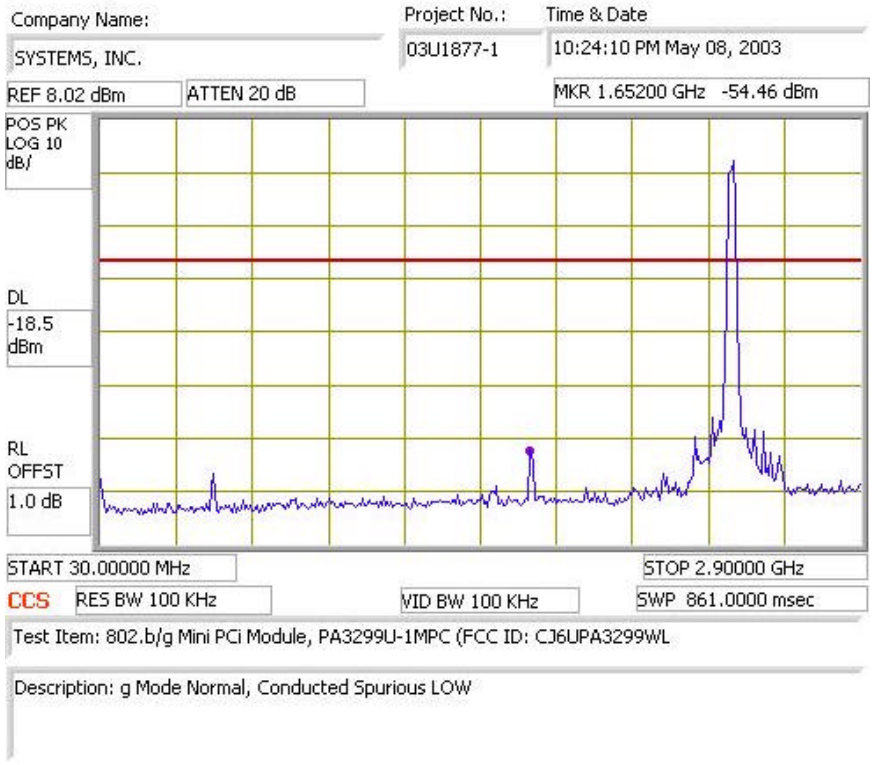
LOW CH SPURIOUS (802.11g Normal mode)



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