# FCC CFR47 PART 15 SUBPART C
# CERTIFICATION
# TEST REPORT

**FOR**

**EUT**

**802.11a/b/g/n PCIExpress Minicard**

**MODEL NUMBER: AR5BXB72**

**FCC ID: PPD-AR5BXB72**

**REPORT NUMBER: 06U10365-1, Revision C**

**ISSUE DATE: JUNE 26, 2006**

*Prepared for*
**ATHEROS COMMUNICATIONS, INC.**
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*Prepared by*
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**LAB CODE:200065-0**

Revision History

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| -- | 6/20/06 | Initial Issue | MH |
| B | 6/21/06 | Clarified effective antenna gain for legacy mode, revised Max Power table header and selected 6 dB BW measurements in 2.4 band, clarified transmitter activation during radiated emissions tests | MH |
| C | 6/26/06 | Added conducted spurious data with combiner. | MH |

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** ATHEROS COMMUNICATIONS, INC.
5480 Great America Parkway
Santa Clara, CA 95054, USA

**EUT DESCRIPTION:** 802.11a/b/g/n PCIExpress Minicard

**MODEL TESTED:** AR5BXB72

**SERIAL NUMBER:** XB72-060-L0416

**DATE TESTED:** JUNE 11-26, 2006

| 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**: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By: Tested By:

MIKE HECKROTTE
ENGINEERING MANAGER
COMPLIANCE CERTIFICATION SERVICES

CHIN PANG
EMC ENGINEER
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# 2. TEST METHODOLOGY

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

# 3. FACILITIES AND ACCREDITATION

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

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

# 4. CALIBRATION AND UNCERTAINTY

## 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

## 4.2. 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%.

# 5. EQUIPMENT UNDER TEST

## 5.1. DESCRIPTION OF EUT

The AR5BXB72 is designed for 802.11a/b/g/n applications using the AR541X/51XX chipset with a PCIExpress Minicard interface. It has three receive chains and two transmit chains (2x3 configuration).

The 2x3 configuration is implemented with two outside chains (Chain 0 and 2) as Tx/Rx and the middle chain (chain 1) as Rx only.

A 2x2 configuration is implemented by depopulating the middle receive chain; in this configuration the transmit chains are identical to the 2x3 configuration. The 2x2 version, when marketed, will have a unique model ID to differentiate it from the fully configured version.

## 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

2400 to 2483.5 MHz Authorized Band

| Frequency Range (MHz) | Mode | Total Output Power (dBm) | Total Output Power (mW) |
|---|---|---|---|
| 2412 - 2462 | 802.11b | 23.74 | 236.59 |
| 2412 - 2462 | 802.11g | 23.63 | 230.67 |
| 2412 - 2462 | 802.11 HT20 | 23.70 | 234.42 |
| 2422 - 2452 | 802.11 HT40 | 21.80 | 151.36 |

5725 to 5850 MHz Authorized Band

| Frequency Range (MHz) | Mode | Output Power (dBm) | Output Power (mW) |
|---|---|---|---|
| 5745 - 5825 | 802.11a | 20.22 | 105.20 |
| 5745 - 5825 | 802.11n HT20 | 20.22 | 105.20 |
| 5755 - 5815 | 802.11n HT40 | 20.20 | 104.71 |

## 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The 2x3 configuration utilizes a set of three identical PIFA antennas (maximum gain is 3.62 dBi in the 2.4 GHz band and 4.76 dBi in the 5.8 GHz band) or a set of three identical Monopole antennas (maximum gain is 1.5 dBi in the 2.4 GHz band and 4.4 dBi in the 5.8 GHz band).

Two identical antennas as otherwise described above are used in the 2x2 configuration.

## 5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed in the host support equipment during testing was AR5002, ANWI Diagnostic Kernel Drive.

The test utility software used during testing was Art Software Revision 0.3 Build #4 Art 11n

## 5.5. WORST-CASE CONFIGURATION AND MODE

The 2x3 configuration was used for all testing in this report.

The worst-case data rates are determined to be as follows for each mode, based on the investigations by measuring the avarage power, peak power and PPSD across all the data rates, bandwidths, modulations and spatial stream modes.

Thus all emissions tests were made with following data rates:

- 802.11b mode, 20 MHz Channel Bandwidth, 1 Mb/s, CCK Modulation, Spatial Stream 1.
- 802.11g mode, 20 MHz Channel Bandwidth, 9 Mb/s, OFDM Modulation, Spatial Stream 1.
- 802.11a mode, 20 MHz Channel Bandwidth, 9 Mb/s, OFDM Modulation, Spatial Stream 1.
- 802.11n HT20 mode, 20 MHz Channel Bandwidth, MCS0, 6.5 Mb/s, OFDM Modulation, Spatial Stream 1.
- 802.11n HT40 mode, 40 MHz Channel Bandwidth, MCS0, 13.5 Mb/s, OFDM Modulation, Spatial Stream 1.

The worst-case configuration for tests below 1 GHz is the mode and channel with the highest power: 802.11b mode, mid channel.

Baseline testing demonstrated that the Power Spectral Density as measured through a combiner with both chains operating simultaneously is less than the sum of the Power Spectral Density of each individual chain when added linearly.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

| PERIPHERAL SUPPORT EQUIPMENT LIST | | | | |
|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Serial Number** | **FCC ID** |
| Laptop | IBM | Thindthind R52 | L3-GR045 | DoC |
| AC Adapter | IBM | 92P1016 | 11S92P1016Z1ZAC65C71HZ | DoC |

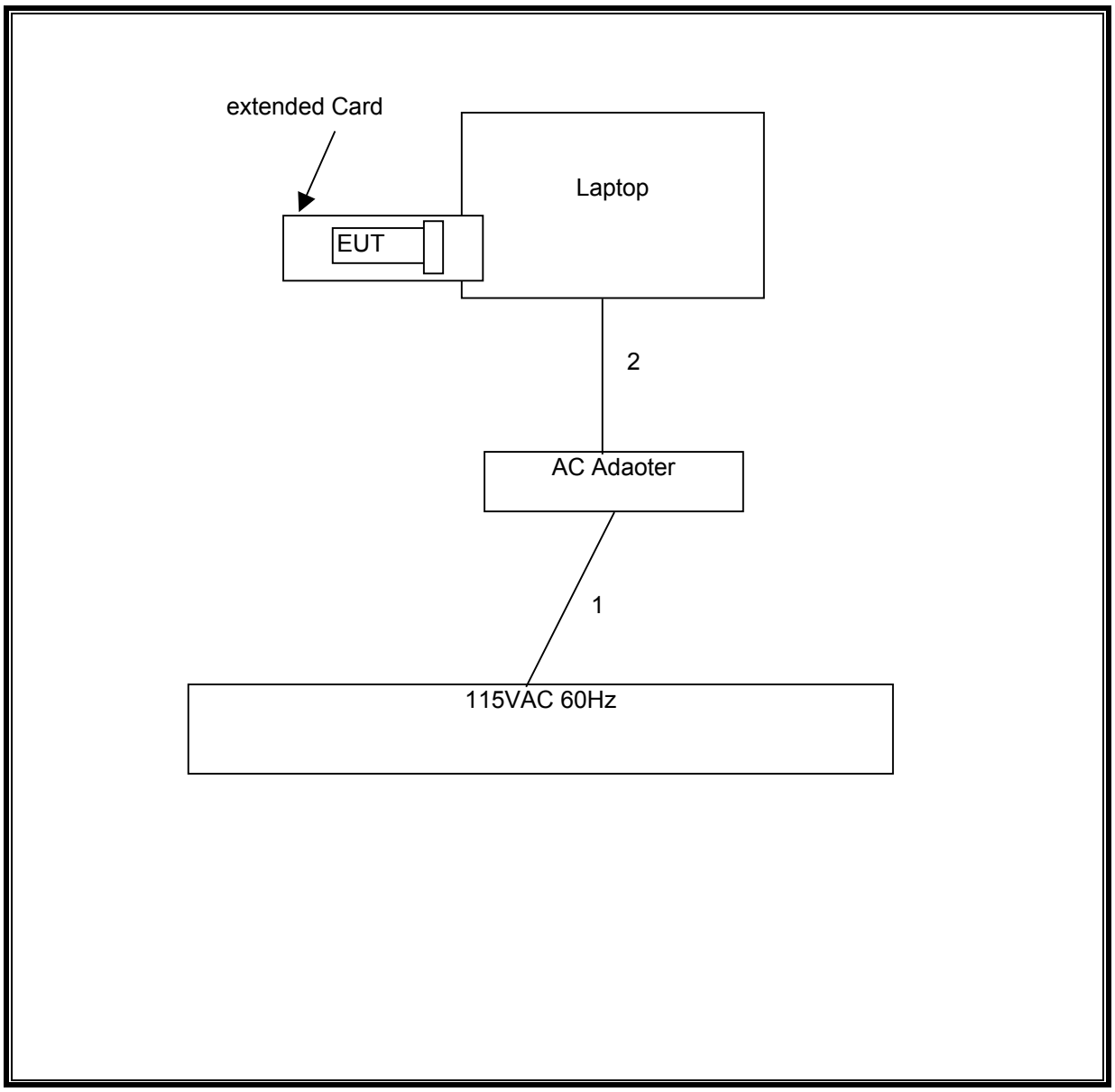
### I/O CABLES

| I/O CABLE LIST | | | | | | |
|---|---|---|---|---|---|---|
| **Cable No.** | **Port** | **# of Identical Ports** | **Connector Type** | **Cable Type** | **Cable Length** | **Remarks** |
| 1 | AC | 1 | US 115V | Un-shielded | 2m | NA |
| 2 | DC | 1 | DC | Un-shielded | 2m | NA |

### TEST SETUP

The EUT is installed in a host laptop computer via a PCIExpress Minicard extender board during the tests. Test software exercised the radio card.

**SETUP DIAGRAM FOR TESTS**



# 6. TEST AND MEASUREMENT EQUIPMENT

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

| TEST EQUIPMENT LIST | | | | |
|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Serial Number** | **Cal Due** |
| Antenna, Bilog 30 MHz ~ 2 Ghz | Sunol Sciences | JB1 | A121003 | 9/3/2006 |
| RF Filter Section | Agilent / HP | 85420E | 3705A00256 | 2/4/2007 |
| EMI Receiver, 9 kHz ~ 2.9 GHz | Agilent / HP | 8542E | 3942A00286 | 2/4/2007 |
| Antenna, Horn 1 ~ 18 GHz | EMCO | 3115 | 6717 | 4/22/2007 |
| Antenna, Horn, 18 ~ 26 GHz | ARA | MWH-1826/B | 1013 | 9/12/2006 |
| Preamplifier, 1 ~ 26.5 GHz | Agilent / HP | 8449B | 3008A00369 | 8/17/2006 |
| Antenna, Horn 26 ~ 40 GHz | ARA | MWH-2640/B | 1029 | 4/13/2007 |
| Preamplifier, 26 ~ 40 GHz | Miteq | NSP4000-SP2 | 924343 | 8/18/2006 |
| Spectrum Analyzer 3 Hz ~ 44 GHz | Agilent / HP | E4446A | MY45300064 | 12/19/2006 |
| Peak / Average Power Sensor | Agilent | E9327A | US40440755 | 12/2/2007 |
| Peak Power Meter | Agilent / HP | E4416A | GB41291160 | 12/2/2007 |
| EMI Test Receiver | R & S | ESHS 20 | 827129/006 | 11/3/2006 |
| LISN, 10 kHz ~ 30 MHz | FCC | LISN-50/250-25-2 | 2023 | 8/30/2006 |

# 7. LIMITS AND RESULTS

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

### 7.1.1. 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 300 kHz. The sweep time is coupled.

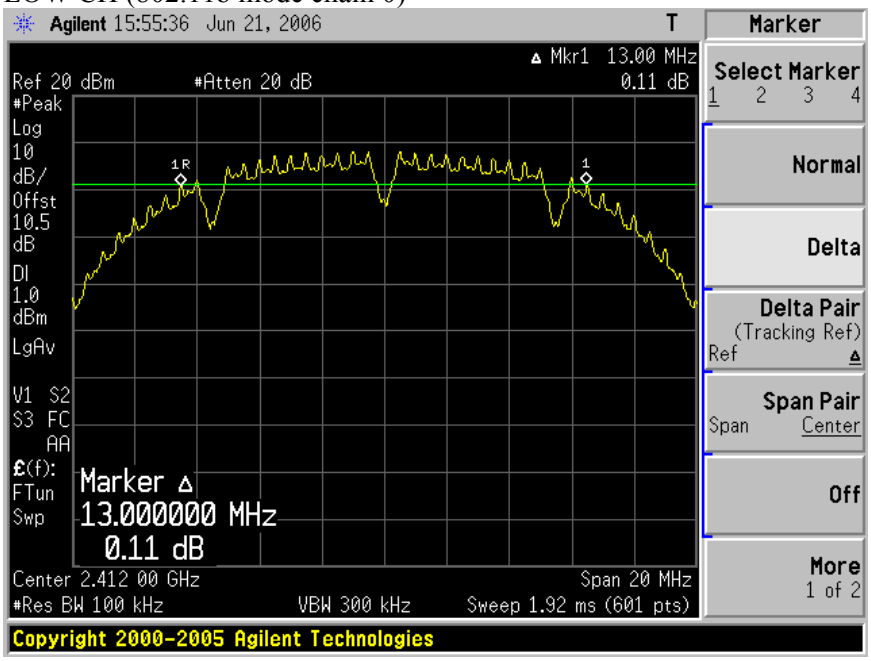
**RESULTS**

No non-compliance noted:

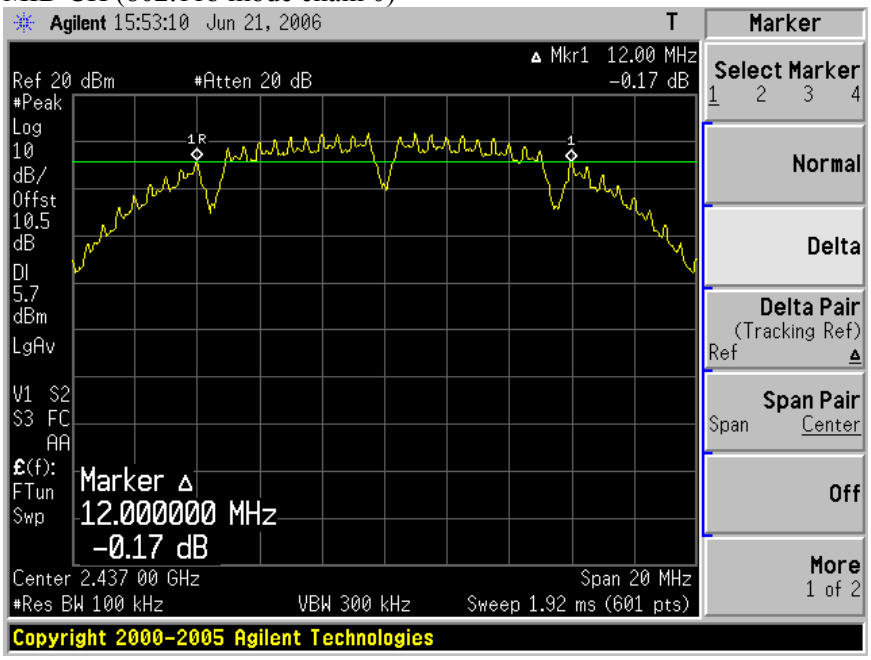
| Mode Channel | Frequency (MHz) | 6 dB BW Chain 0 (kHz) | 6 dB BW Chain 1 (kHz) | Minimum Limit (kHz) | Minimum Margin (kHz) |
|---|---|---|---|---|---|
| 802.11b Mode | | | | | |
| Low | 2412 | 13000 | 12100 | 500 | 11600 |
| Middle | 2437 | 12000 | 12000 | 500 | 11500 |
| High | 2462 | 12030 | 12030 | 500 | 11530 |
| 802.11g Mode | | | | | |
| Low | 2412 | 16330 | 16400 | 500 | 15830 |
| Middle | 2437 | 16330 | 16370 | 500 | 15830 |
| High | 2462 | 16430 | 16500 | 500 | 15930 |
| 802.11n HT20 Mode | | | | | |
| Low | 2412 | 17600 | 17530 | 500 | 17030 |
| Mid | 2437 | 17570 | 17530 | 500 | 17030 |
| High | 2462 | 17600 | 17630 | 500 | 17100 |
| 802.11n HT40 Mode | | | | | |
| Low | 2422 | 36250 | 36500 | 500 | 35750 |
| Mid | 2437 | 36420 | 36500 | 500 | 35920 |
| High | 2452 | 36250 | 36500 | 500 | 35750 |

**(802.11b MODE CHAIN 0)**

LOW CH (802.11b mode chain 0)



MID CH (802.11b mode chain 0)



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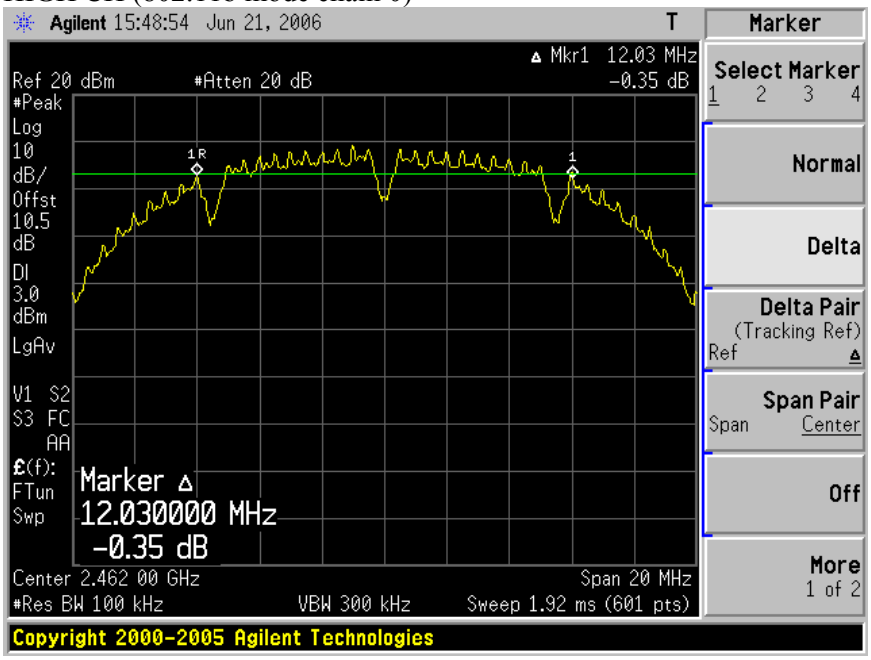
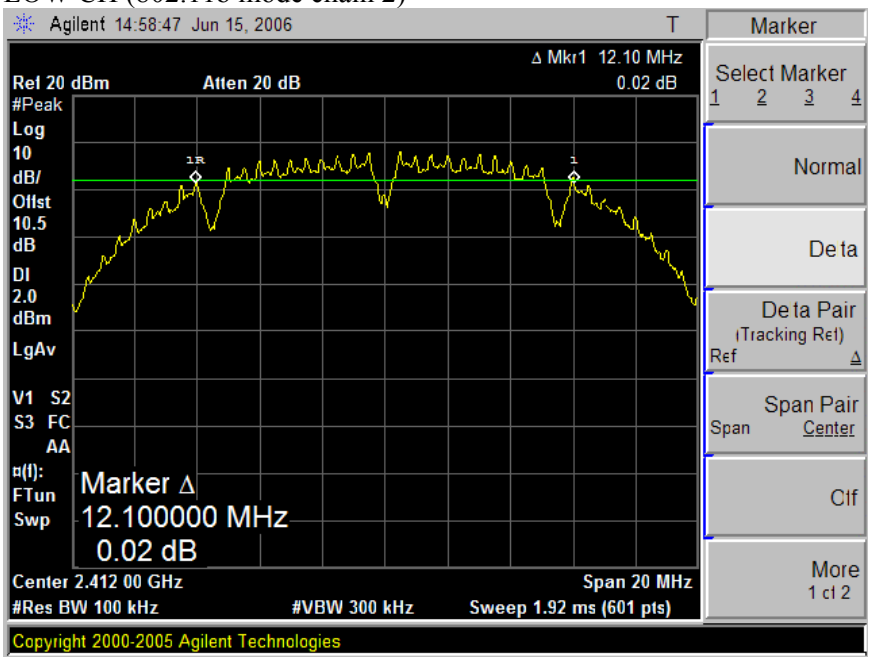
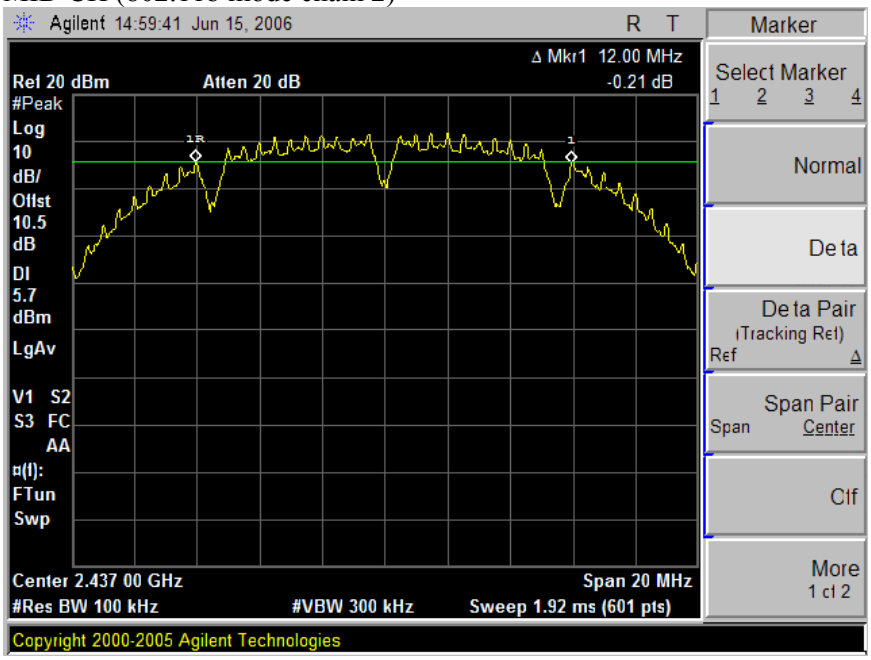


**(802.11b MODE CHAIN 2)**

LOW CH (802.11b mode chain 2)



MID CH (802.11b mode chain 2)



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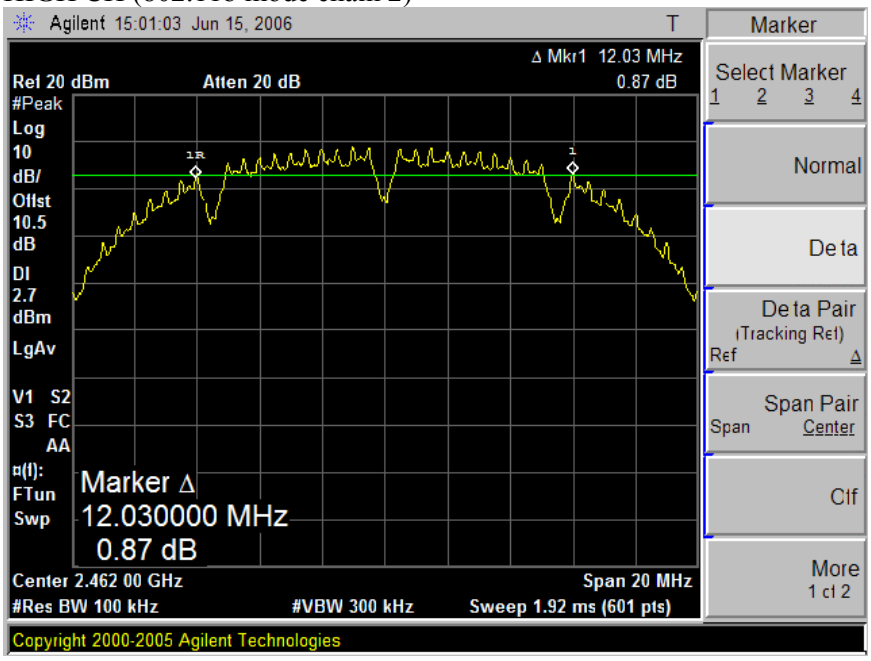
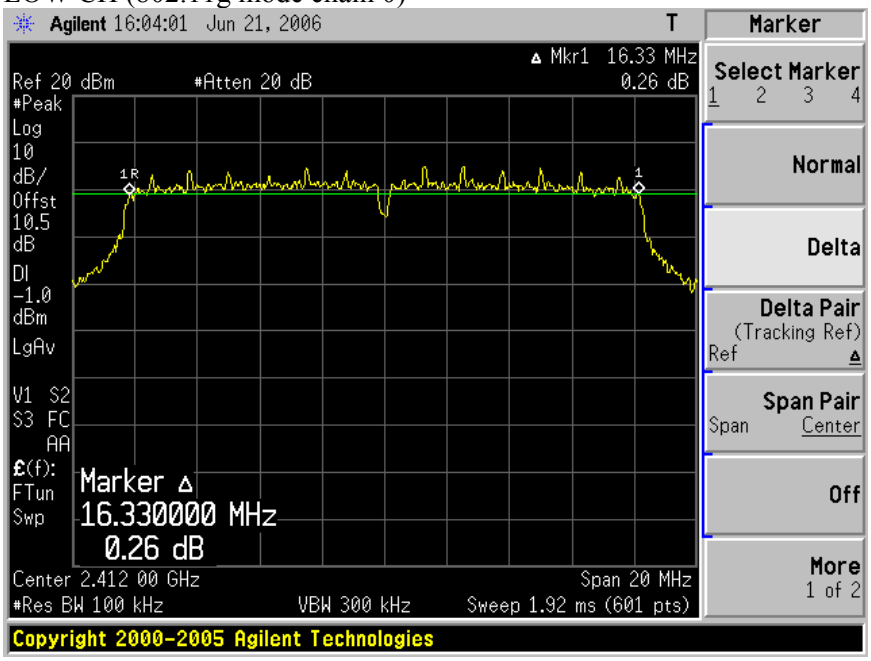
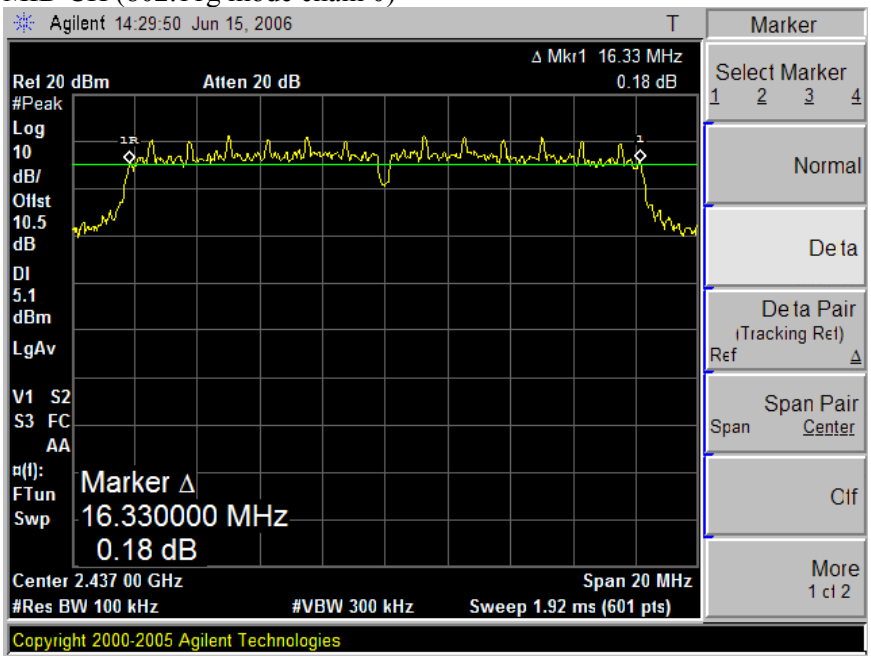


**(802.11g MODE CHAIN 0)**

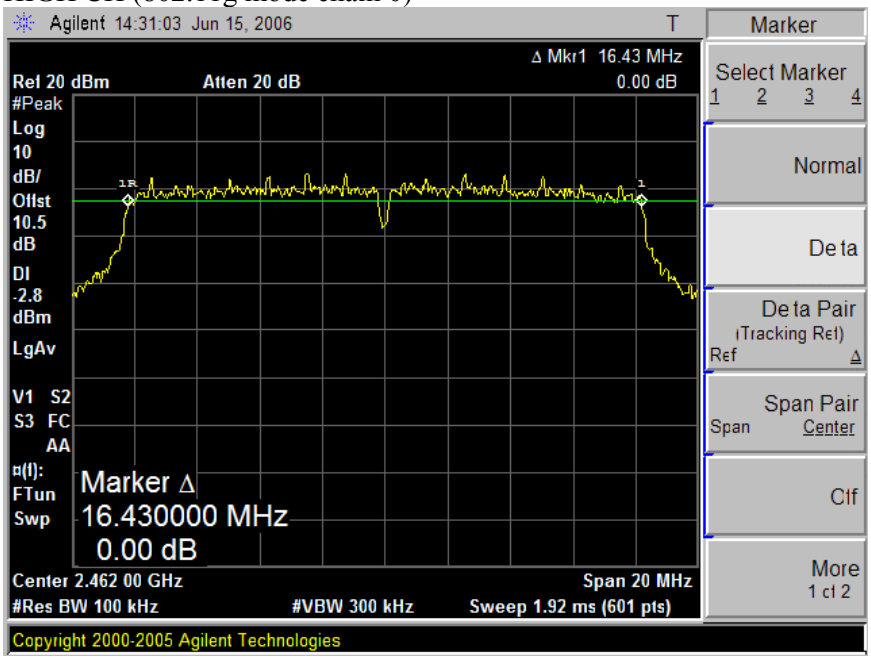
LOW CH (802.11g mode chain 0)



MID CH (802.11g mode chain 0)

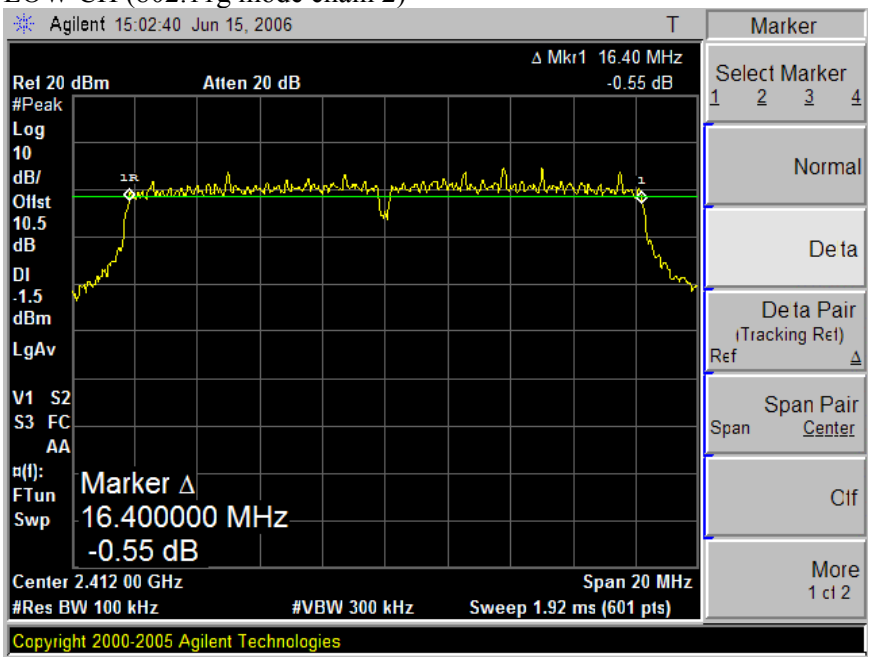


HIGH CH (802.11g mode chain 0)

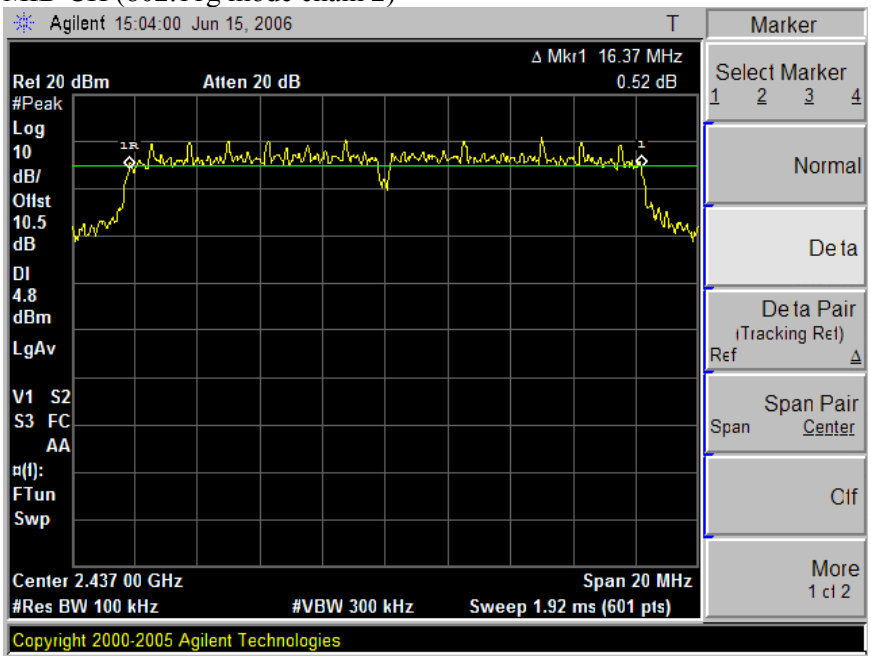


**(802.11g MODE CHAIN 2)**

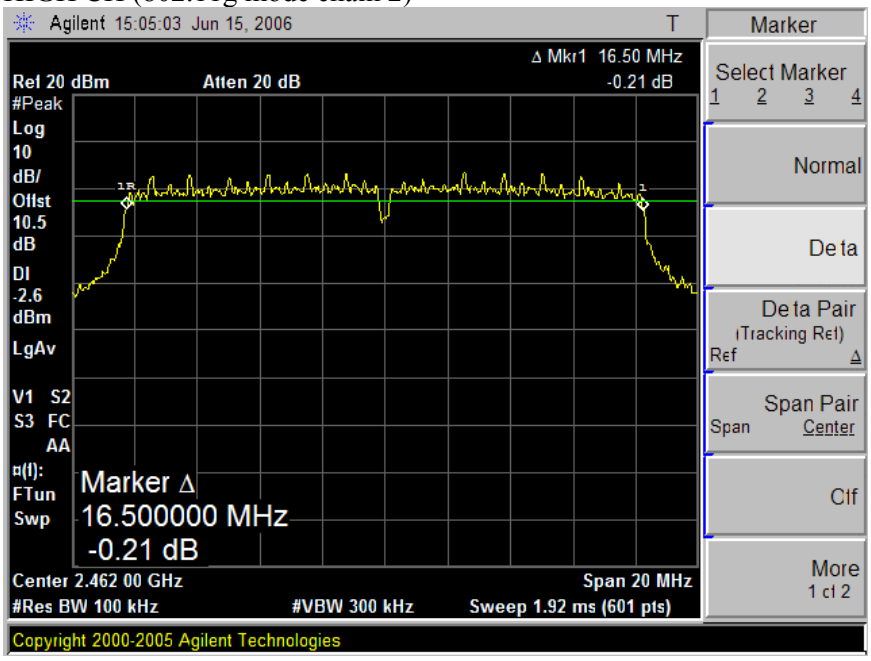
LOW CH (802.11g mode chain 2)



MID CH (802.11g mode chain 2)

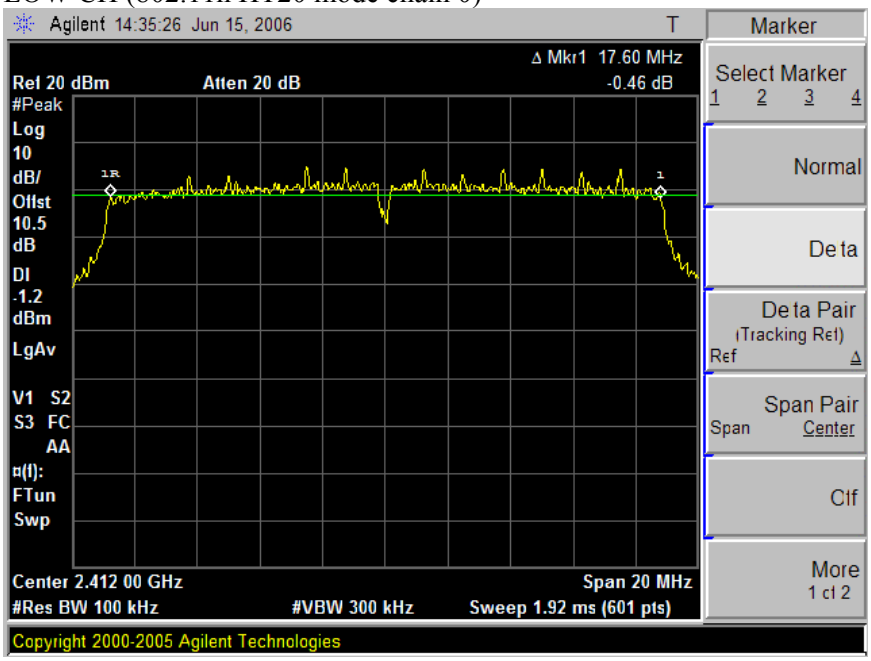


HIGH CH (802.11g mode chain 2)

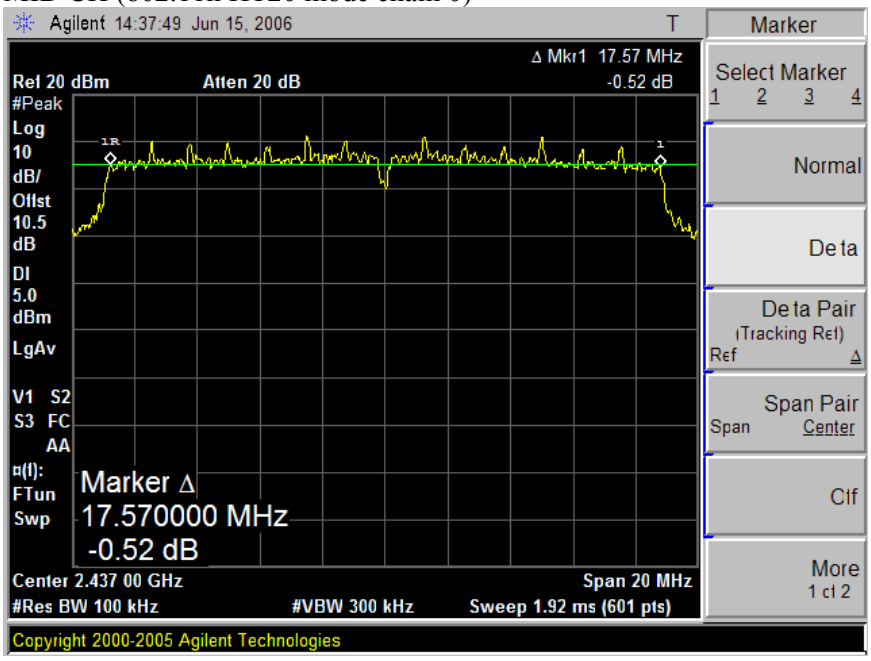


**(802.11n HT20 MODE CHAIN 0)**

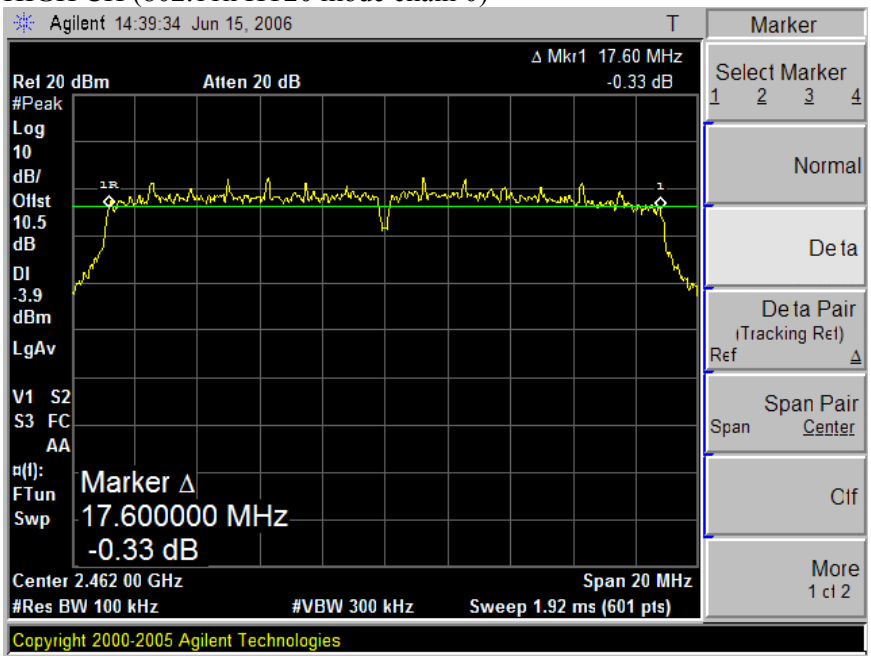
LOW CH (802.11n HT20 mode chain 0)



MID CH (802.11n HT20 mode chain 0)

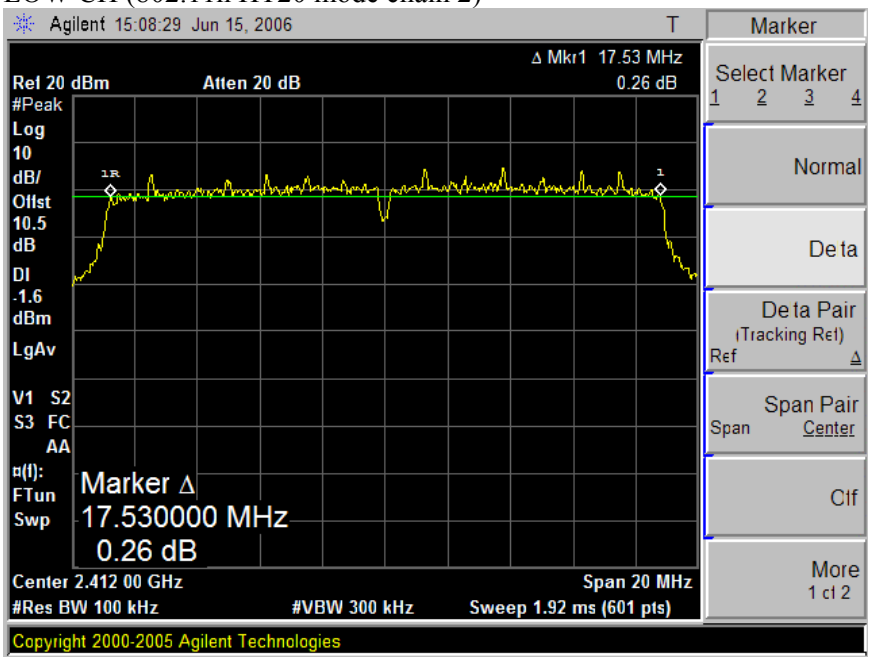


HIGH CH (802.11n HT20 mode chain 0)

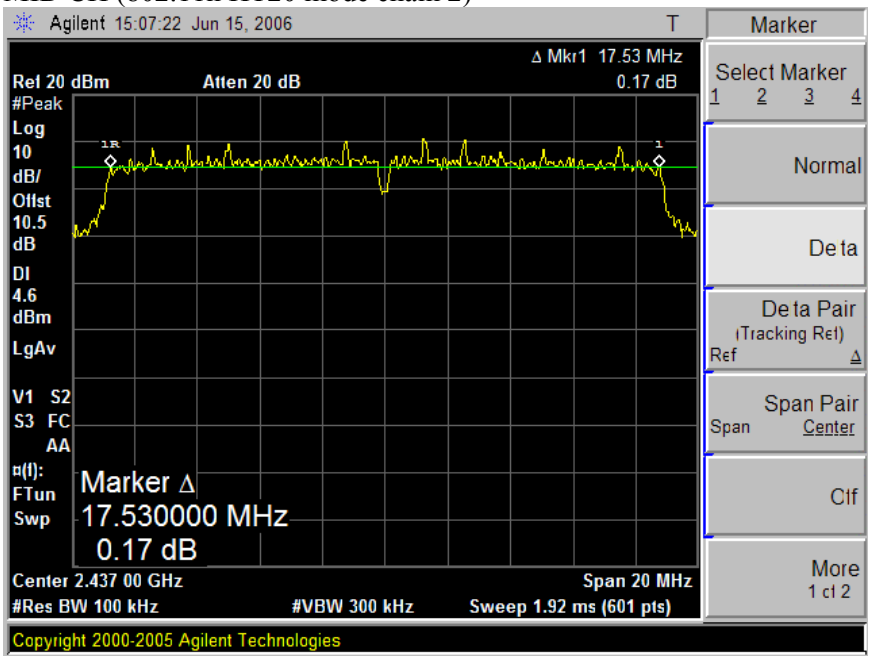


**(802.11 HT20 MODE CHAIN 2)**

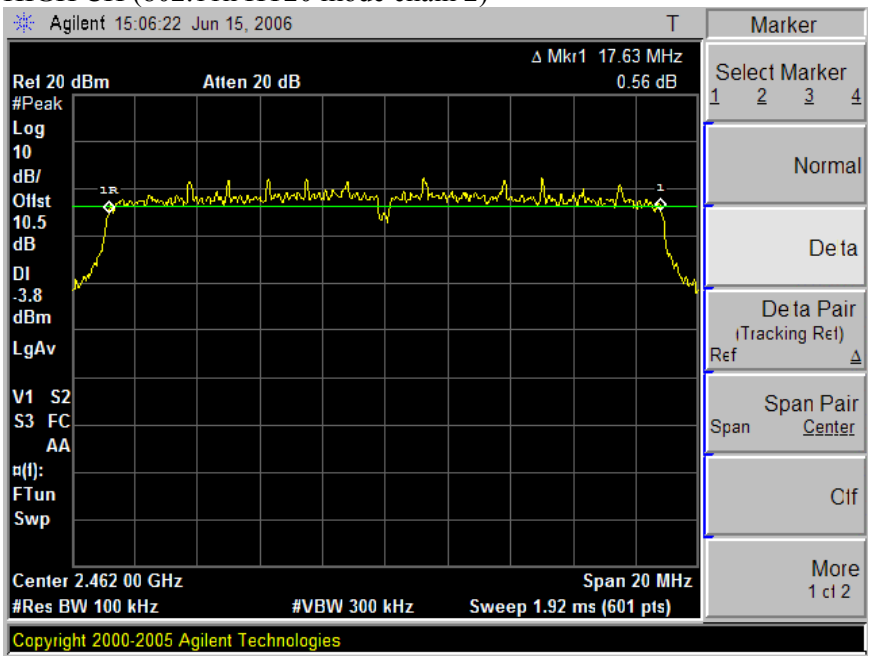
LOW CH (802.11n HT20 mode chain 2)



MID CH (802.11n HT20 mode chain 2)

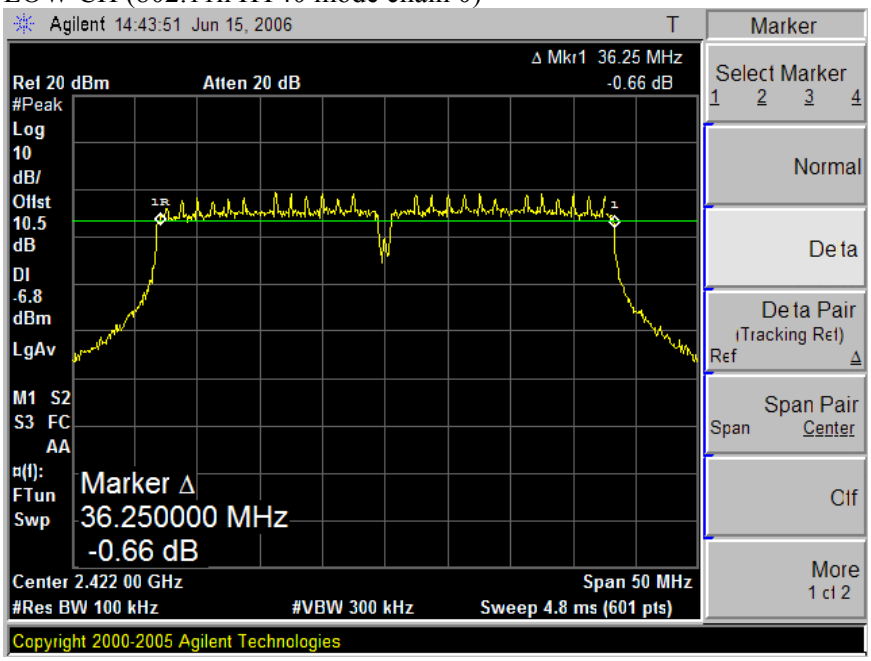


HIGH CH (802.11n HT20 mode chain 2)

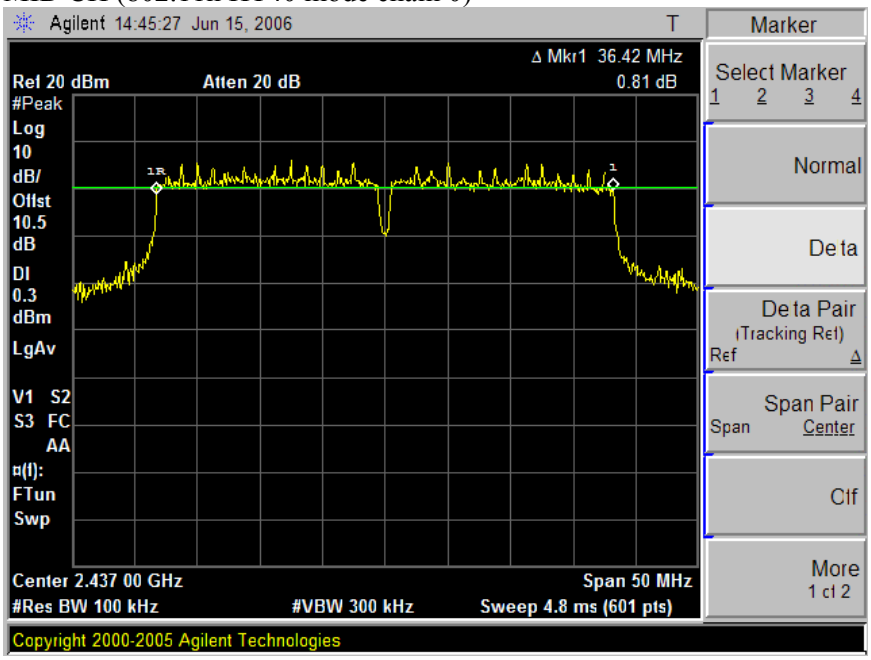


**(802.11 HT40 MODE CHAIN 0)**

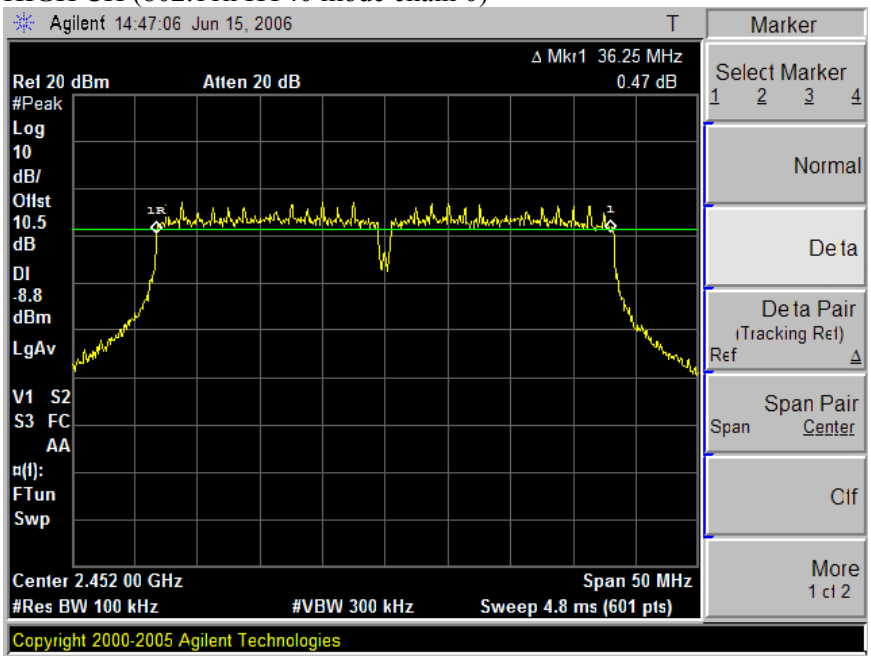
LOW CH (802.11n HT40 mode chain 0)



MID CH (802.11n HT40 mode chain 0)

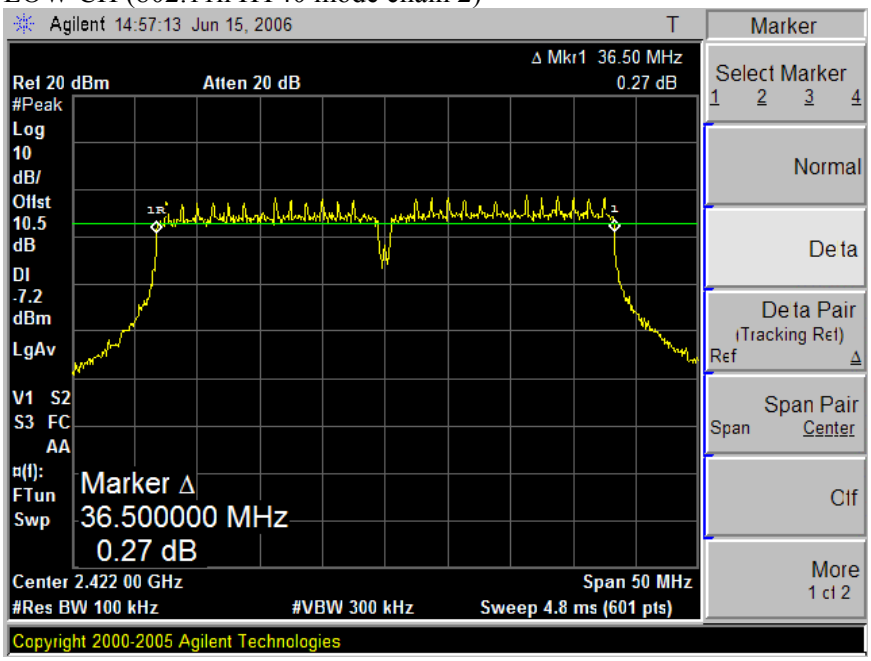


HIGH CH (802.11n HT40 mode chain 0)

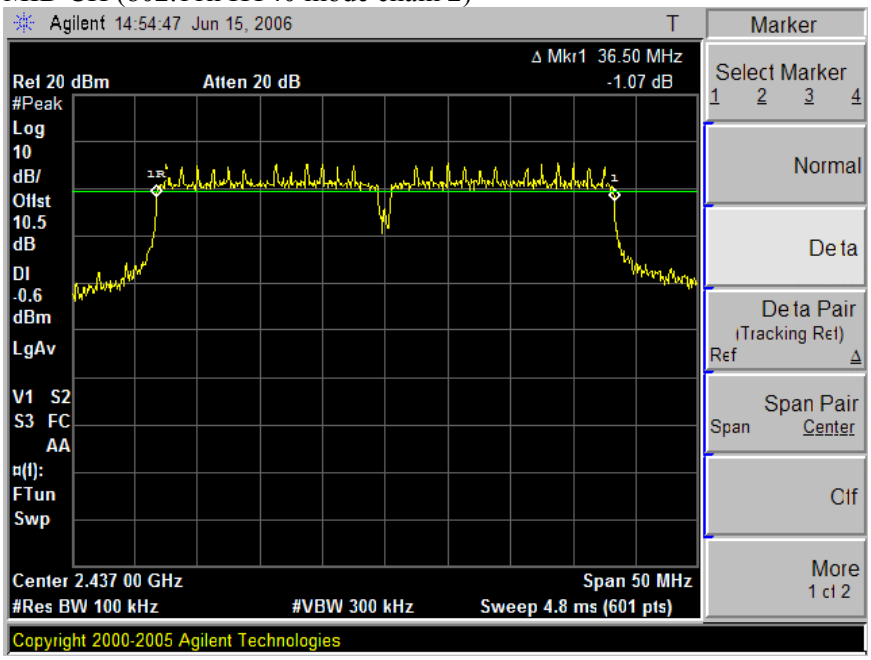


**(802.11 HT40 MODE CHAIN 2)**

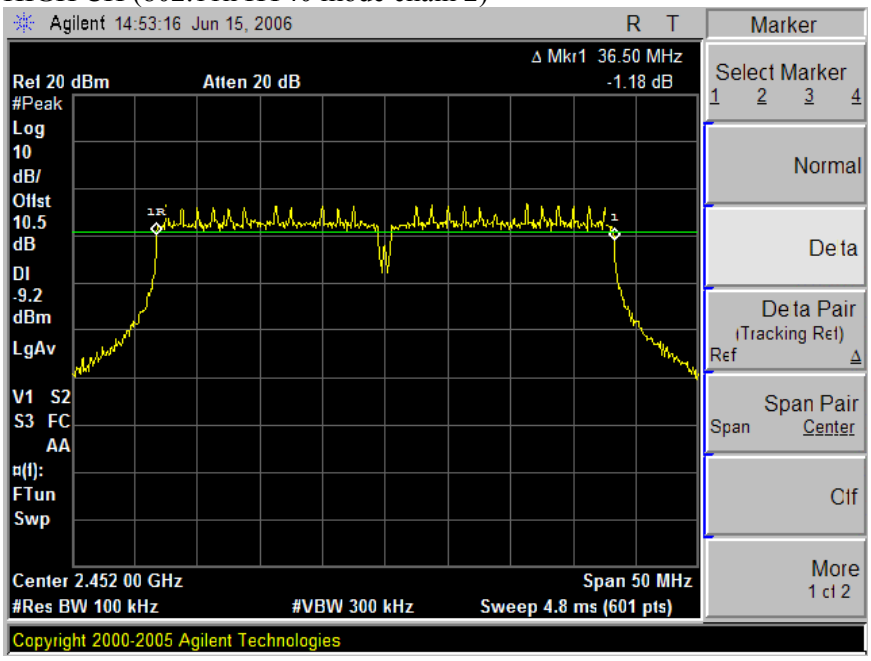
LOW CH (802.11n HT40 mode chain 2)



MID CH (802.11n HT40 mode chain 2)



HIGH CH (802.11n HT40 mode chain 2)



### 7.1.2. 99% BANDWIDTH AND 26 dB 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 and 26 dB bandwidth functions are utilized.

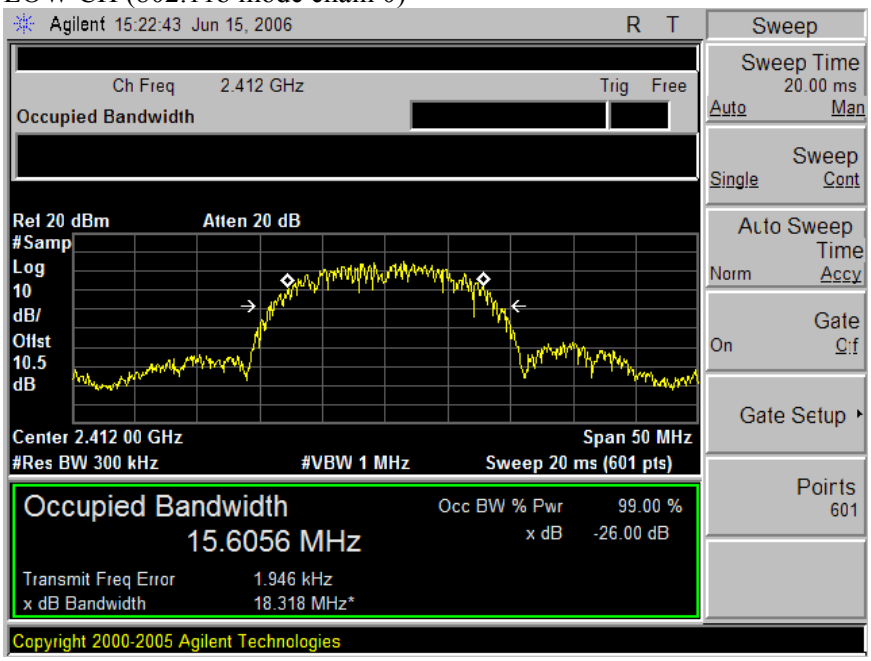
**RESULTS**

No non-compliance noted:

| Mode Channel | Frequency (MHz) | 99% BW Chain 0 (MHz) | 99% BW Chain 2 (MHz) | 26 dB BW Chain 0 (MHz) | 26 dB BW Chain 2 (MHz) |
|---|---|---|---|---|---|
| 802.11b Mode | | | | | |
| Low | 2412 | 15.6056 | 15.5471 | 18.318 | 18.75 |
| Middle | 2437 | 15.5859 | 15.4618 | 18.504 | 18.86 |
| High | 2462 | 16.7115 | 16.4614 | 18.831 | 18.27 |
| 802.11g Mode | | | | | |
| Low | 2412 | 16.5306 | 16.4825 | 21.013 | 21.60 |
| Middle | 2437 | 16.4925 | 16.4694 | 21.232 | 21.42 |
| High | 2462 | 16.4723 | 16.4233 | 21.605 | 21.50 |
| 802.11n HT20 Mode | | | | | |
| Low | 2412 | 17.6962 | 17.5351 | 21.206 | 23.13 |
| Mid | 2437 | 17.8 | 17.7602 | 21.816 | 23.67 |
| High | 2462 | 17.6658 | 17.7898 | 22.974 | 23.18 |
| 802.11n HT40 Mode | | | | | |
| Low | 2422 | 36.2066 | 36.3169 | 46.271 | 44.47 |
| Mid | 2437 | 36.3271 | 36.2187 | 45.77 | 46.74 |
| High | 2452 | 36.3204 | 36.0857 | 46.492 | 47.93 |

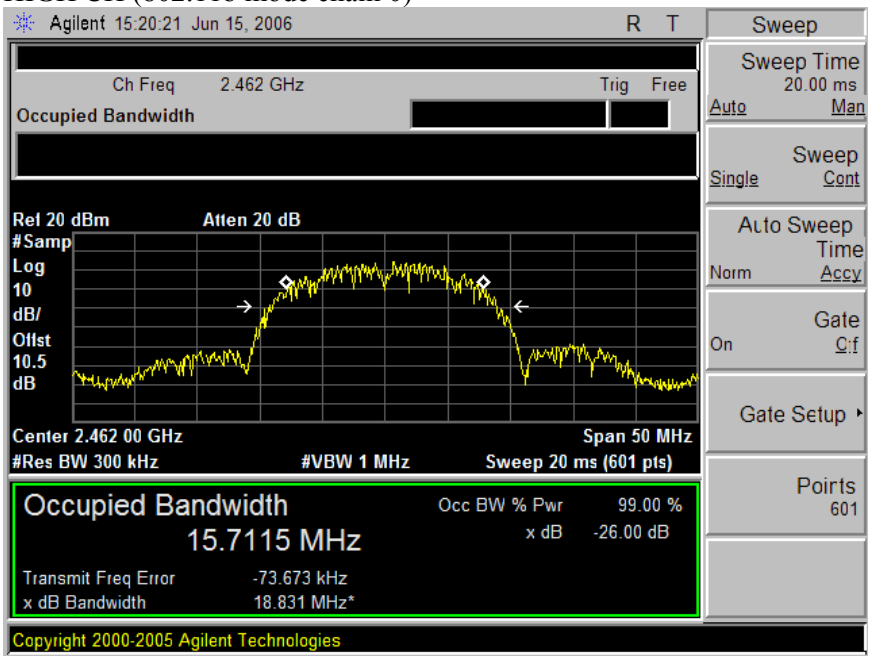
**(802.11b MODE CHAIN 0)**

LOW CH (802.11b mode chain 0)



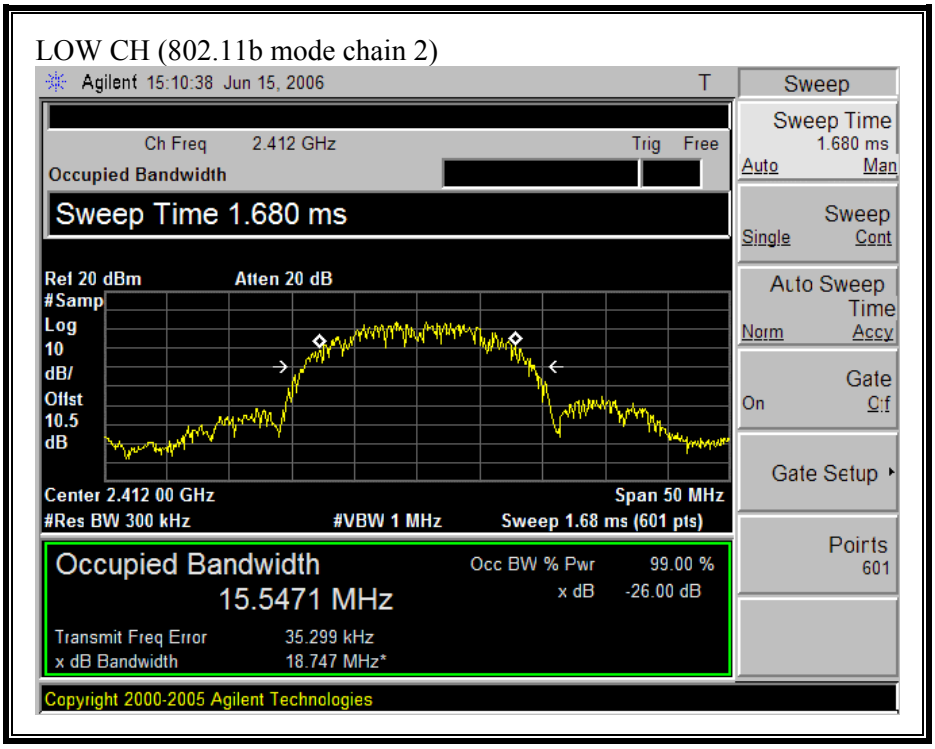
MID CH (802.11b mode chain 0)

HIGH CH (802.11b mode chain 0)

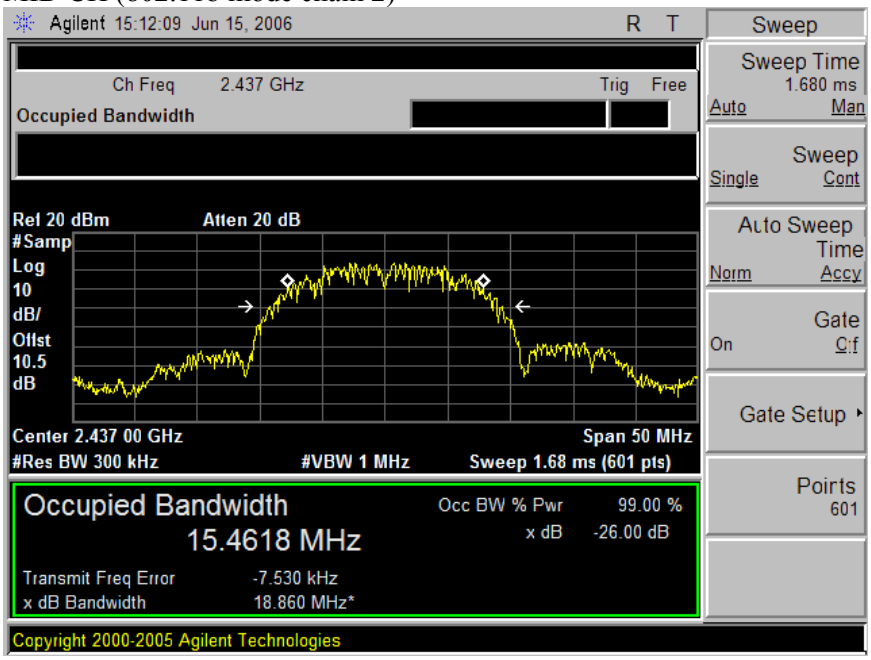


**(802.11b MODE CHAIN 2)**

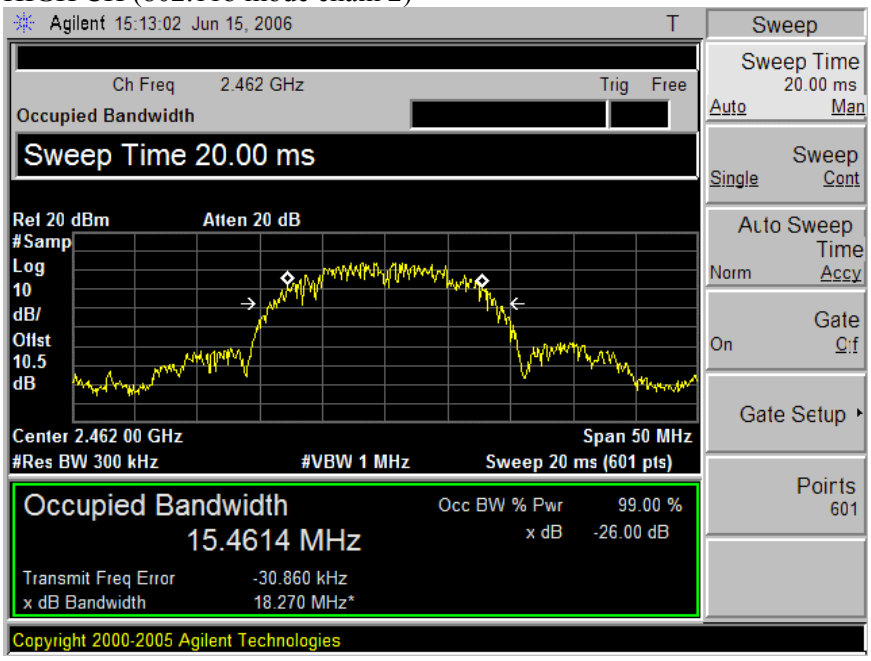
LOW CH (802.11b mode chain 2)



MID CH (802.11b mode chain 2)

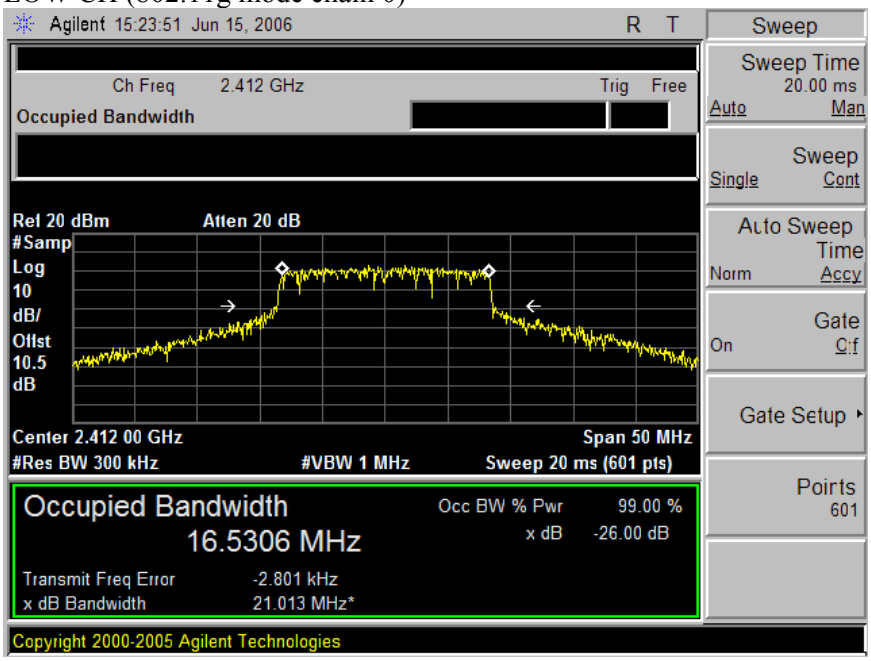


HIGH CH (802.11b mode chain 2)

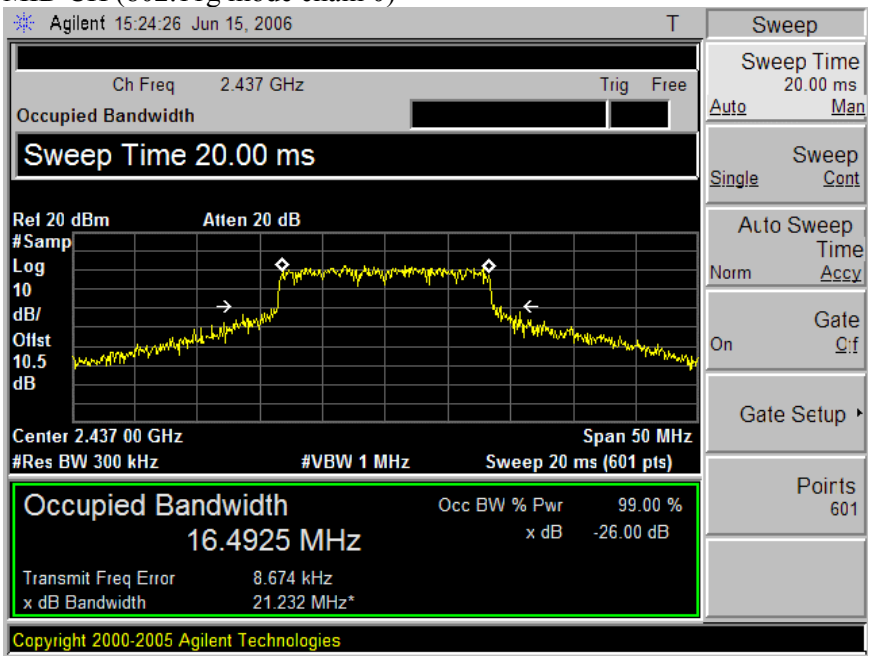


**(802.11g MODE CHAIN 0)**

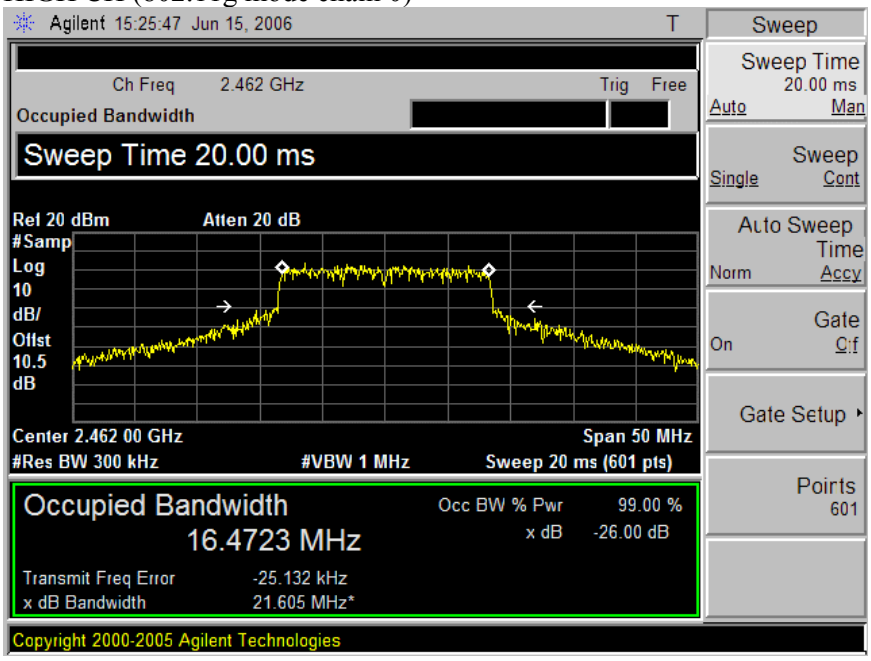
LOW CH (802.11g mode chain 0)



MID CH (802.11g mode chain 0)

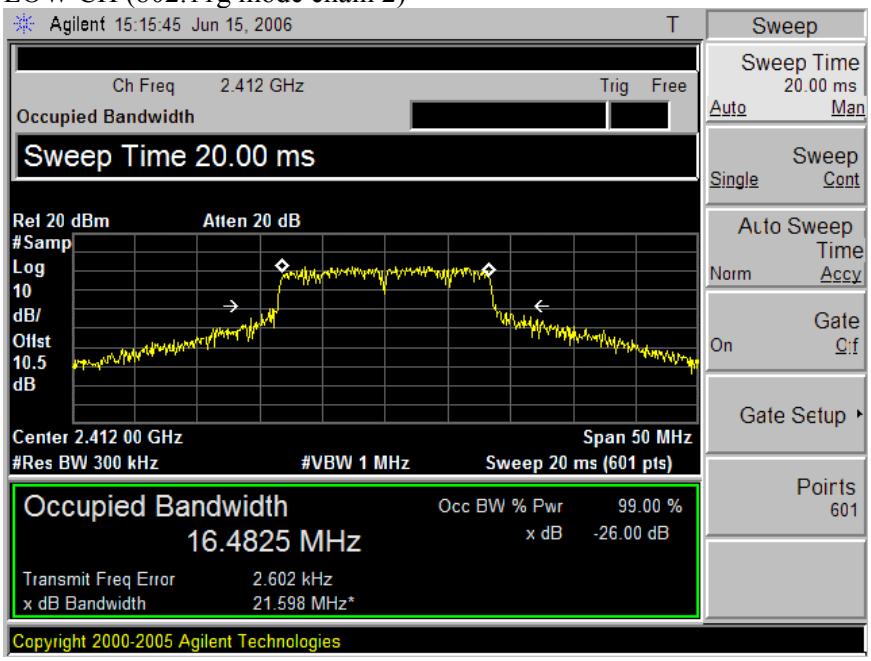


HIGH CH (802.11g mode chain 0)

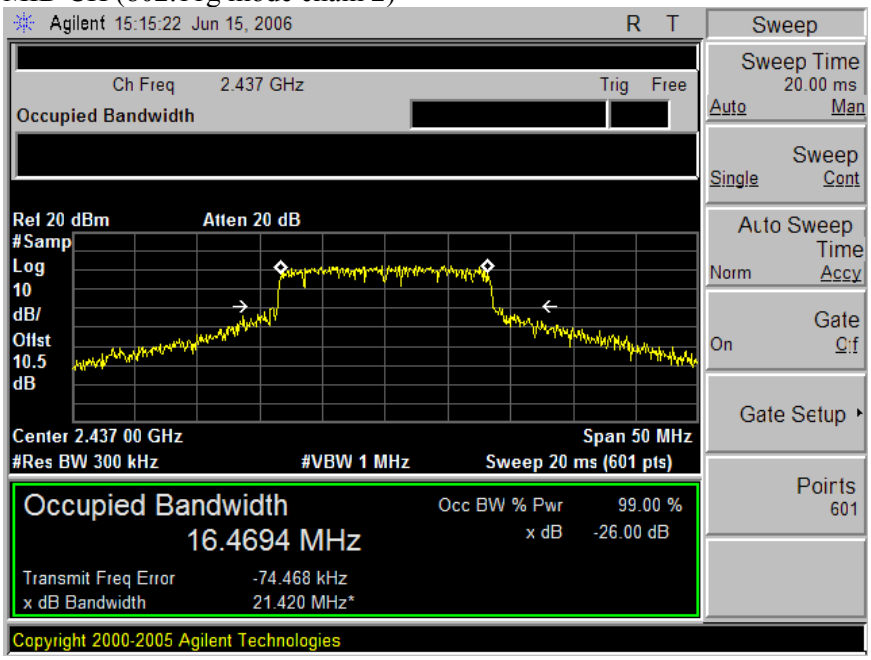


**(802.11g MODE CHAIN 2)**

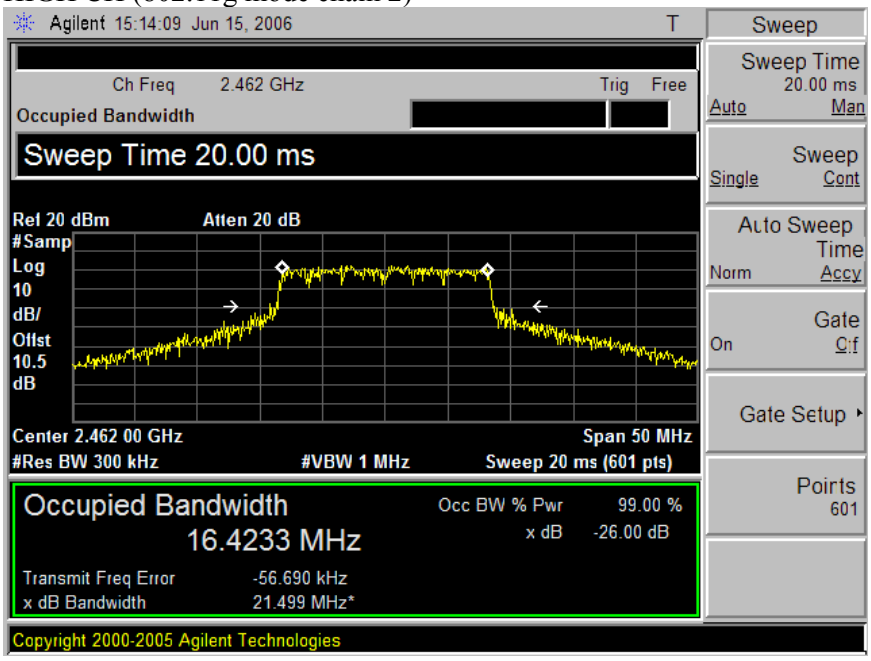
LOW CH (802.11g mode chain 2)



MID CH (802.11g mode chain 2)

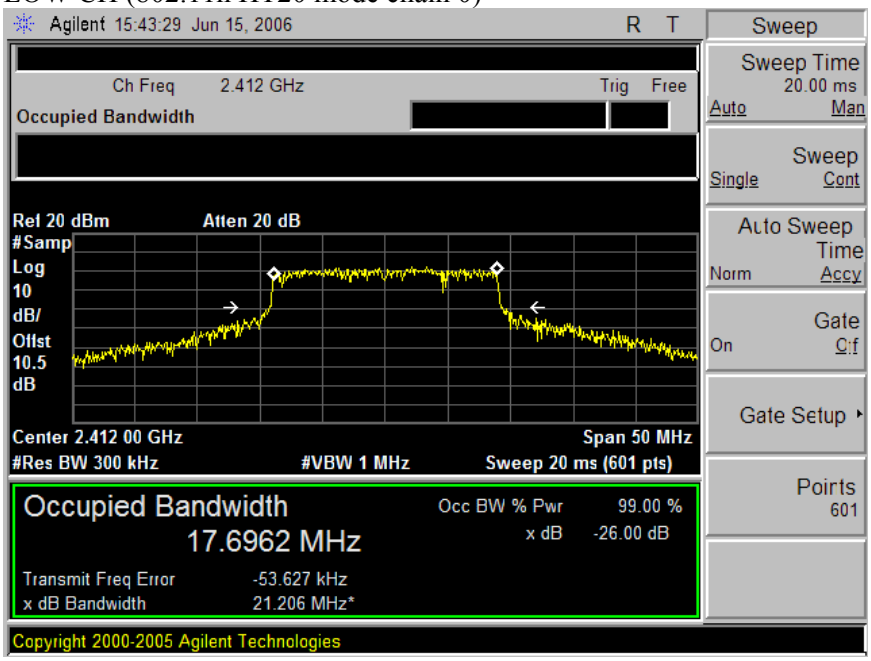


HIGH CH (802.11g mode chain 2)

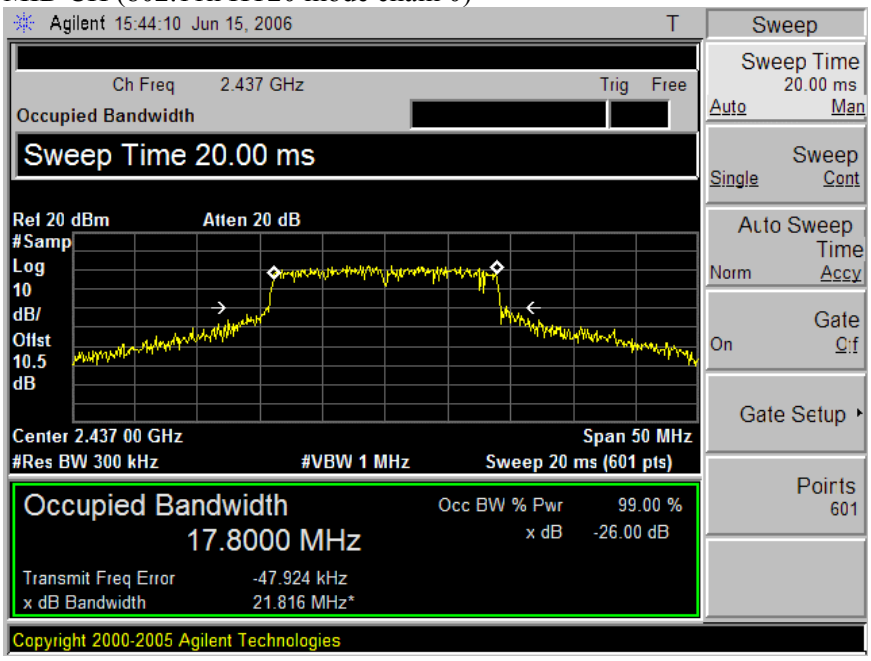


**(802.11n HT20 MODE CHAIN 0)**

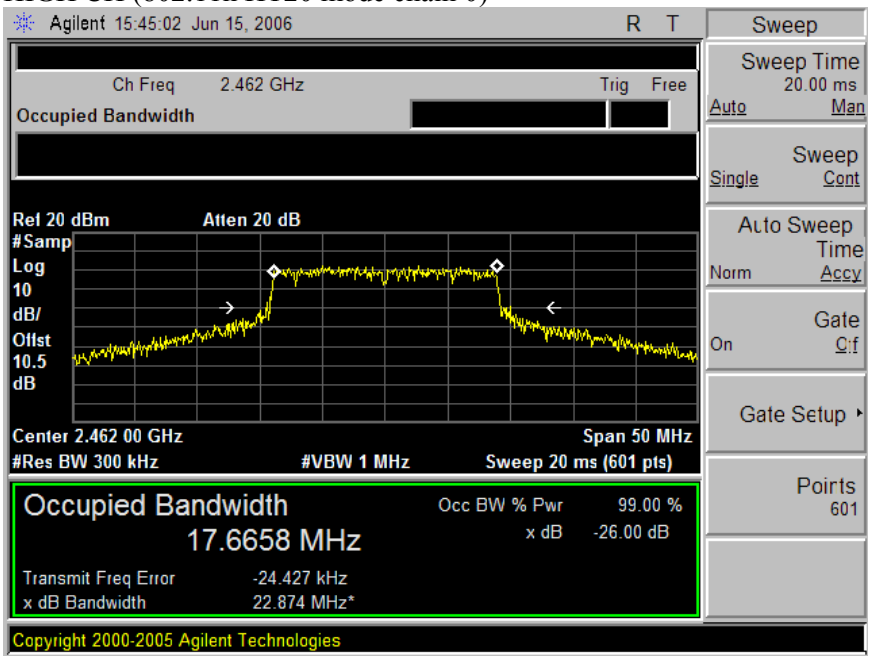
LOW CH (802.11n HT20 mode chain 0)



MID CH (802.11n HT20 mode chain 0)

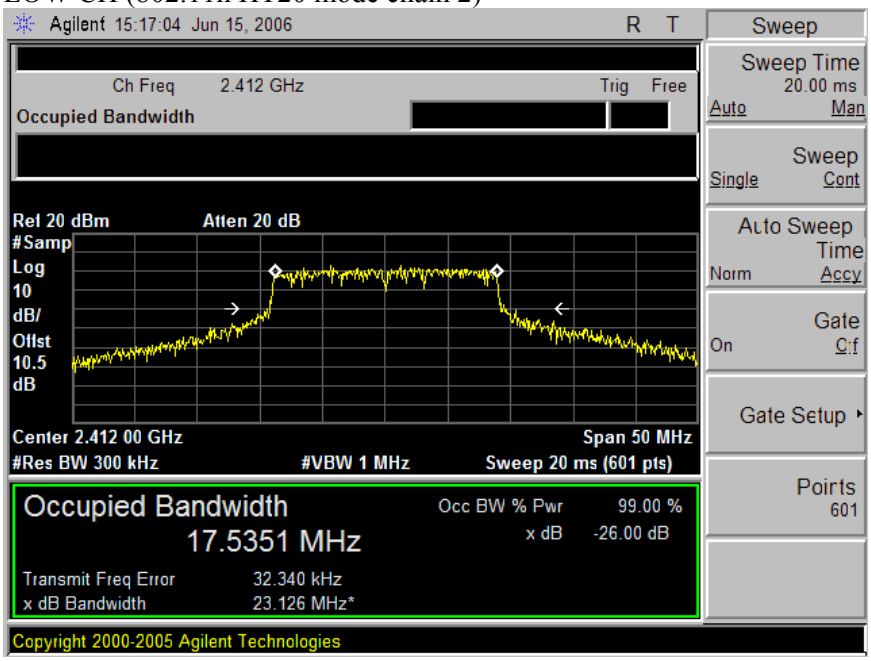


HIGH CH (802.11n HT20 mode chain 0)

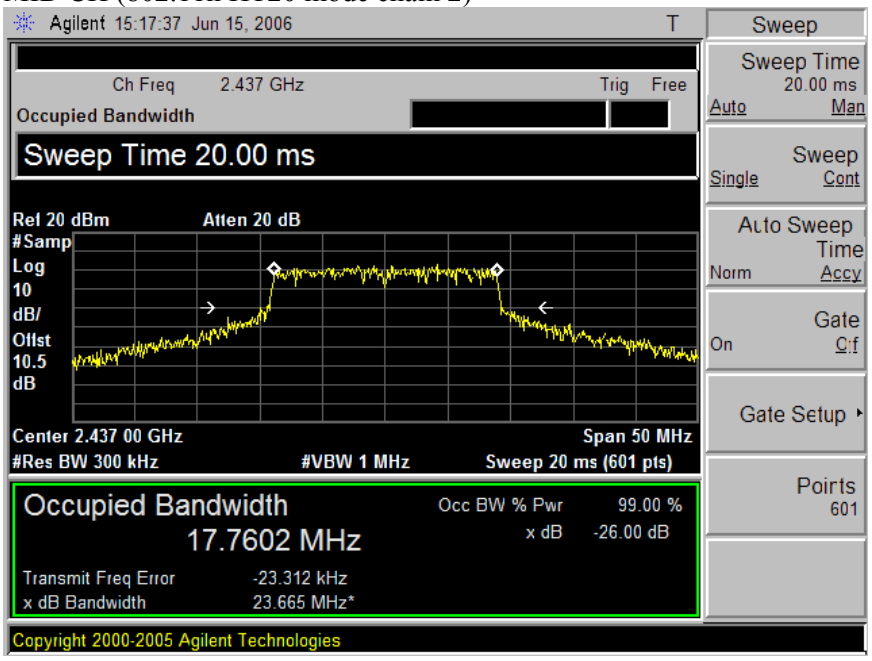


**(802.11 HT20 MODE CHAIN 2)**

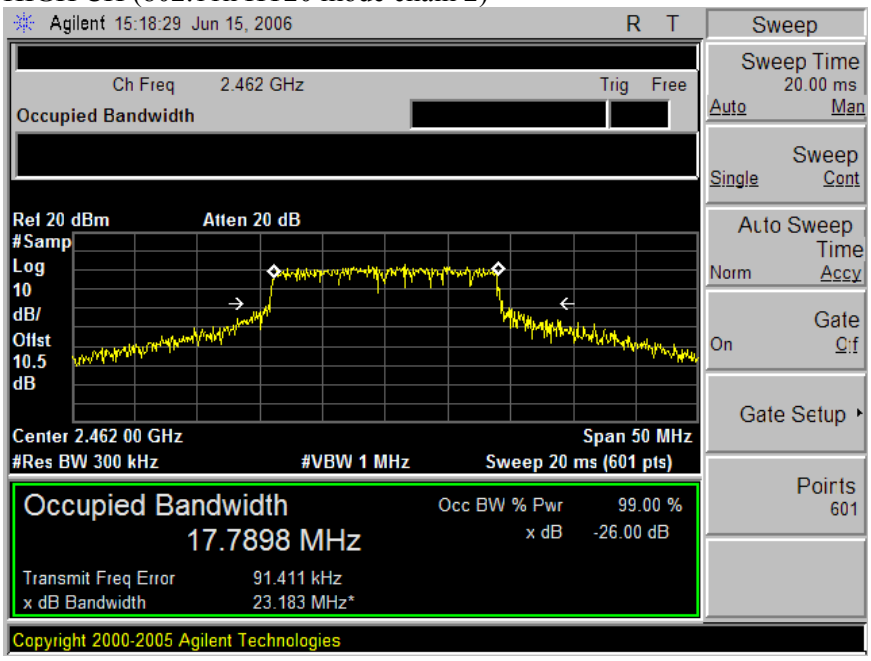
LOW CH (802.11n HT20 mode chain 2)



MID CH (802.11n HT20 mode chain 2)

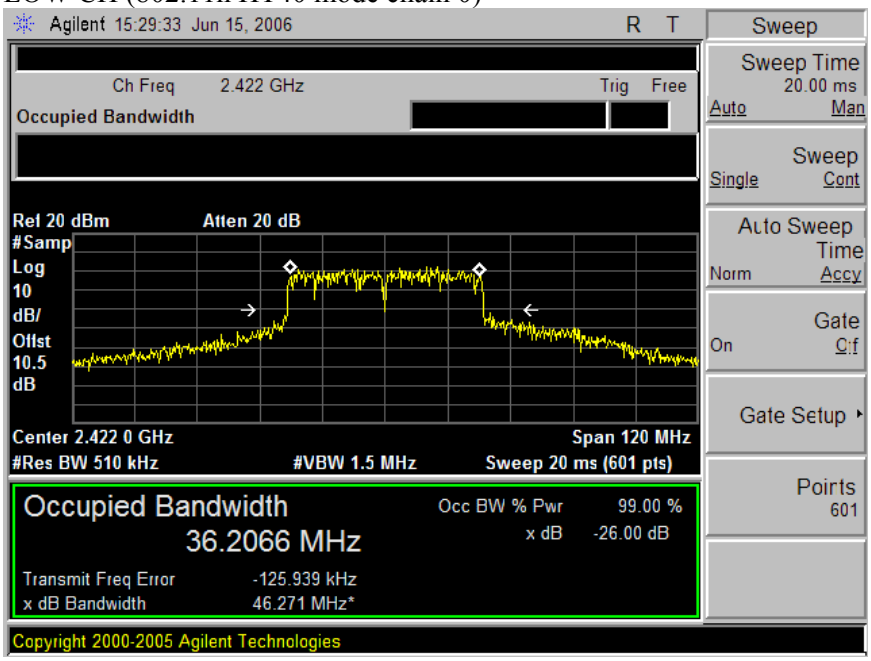


HIGH CH (802.11n HT20 mode chain 2)

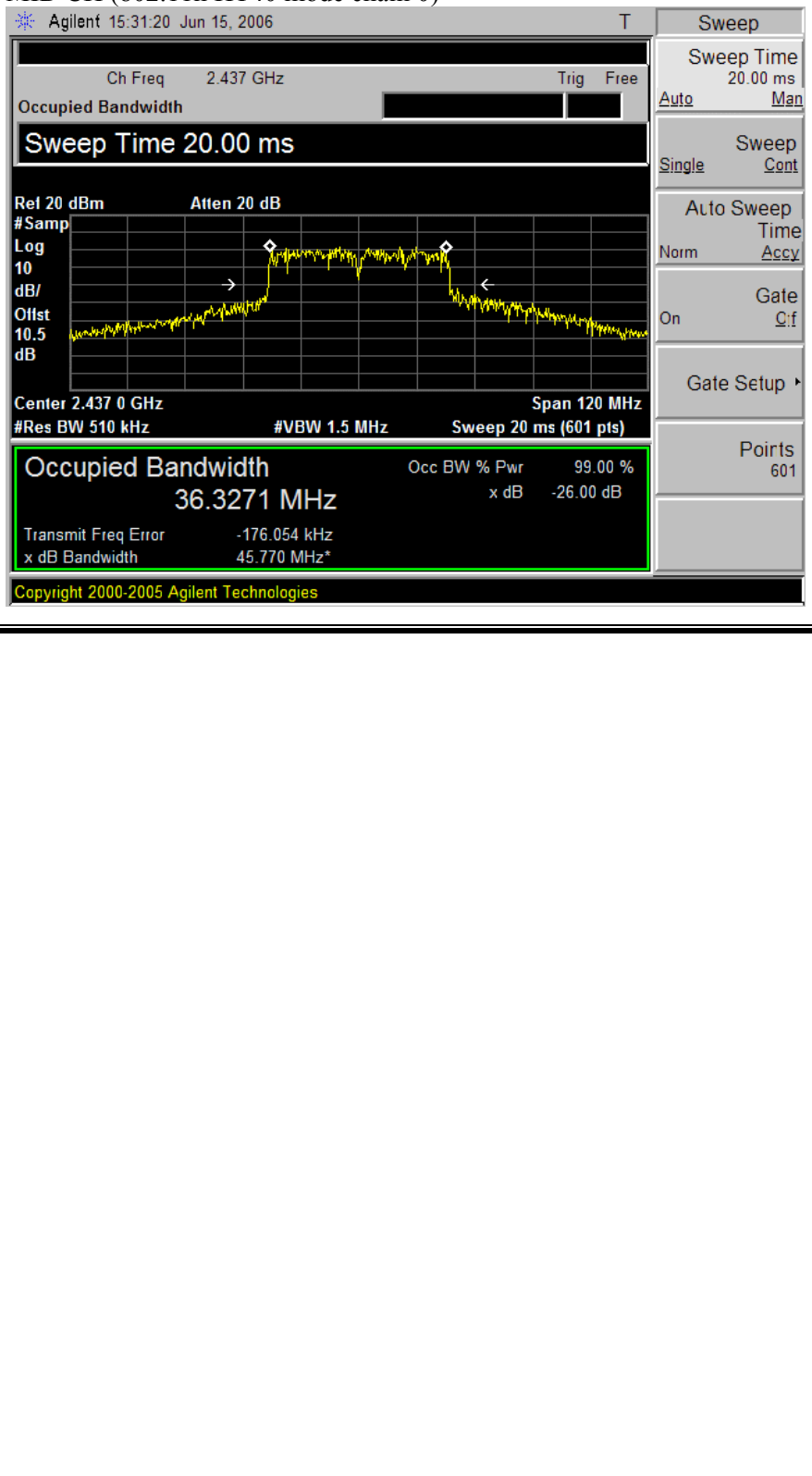


**(802.11 HT40 MODE CHAIN 0)**

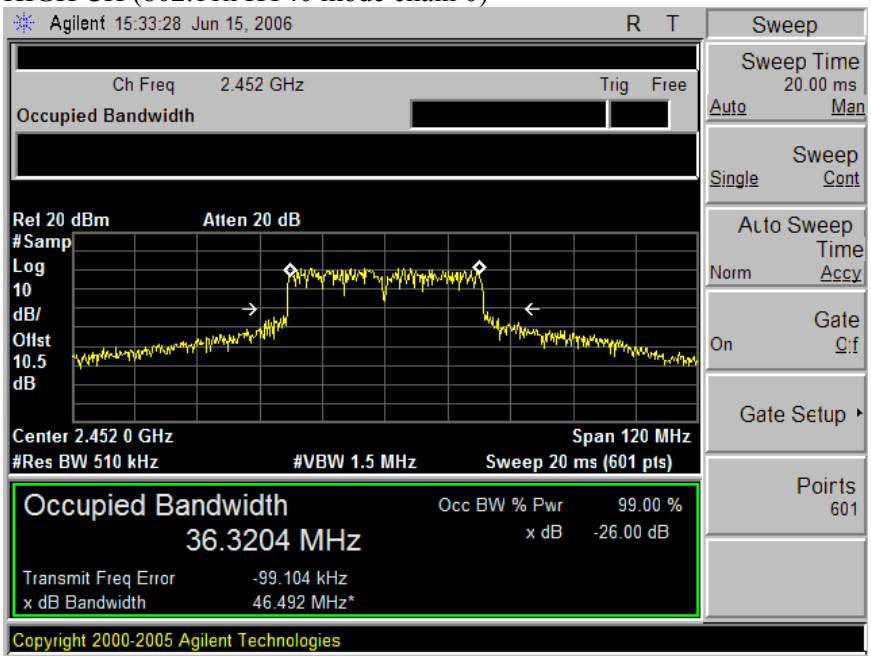
LOW CH (802.11n HT40 mode chain 0)



MID CH (802.11n HT40 mode chain 0)

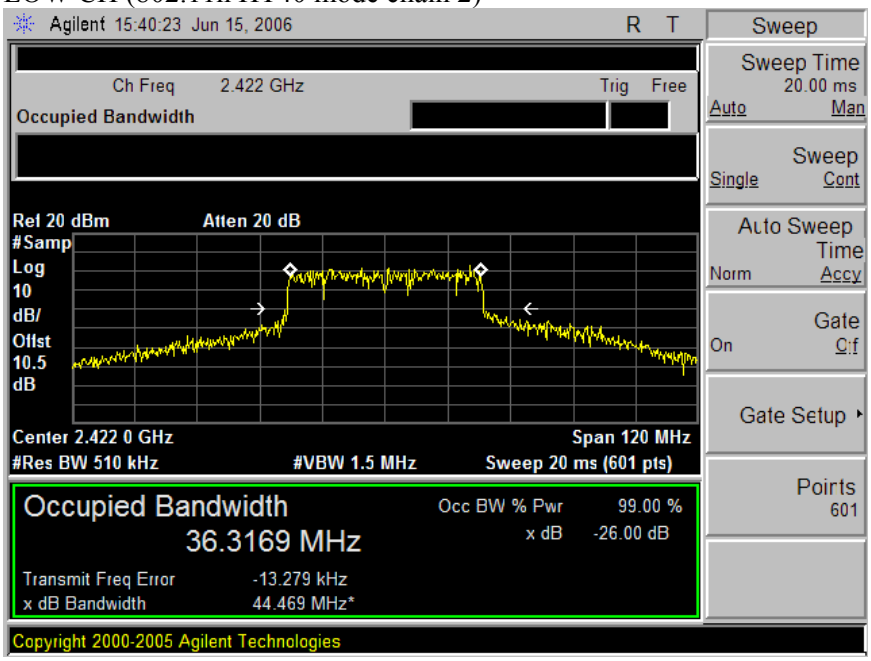


HIGH CH (802.11n HT40 mode chain 0)

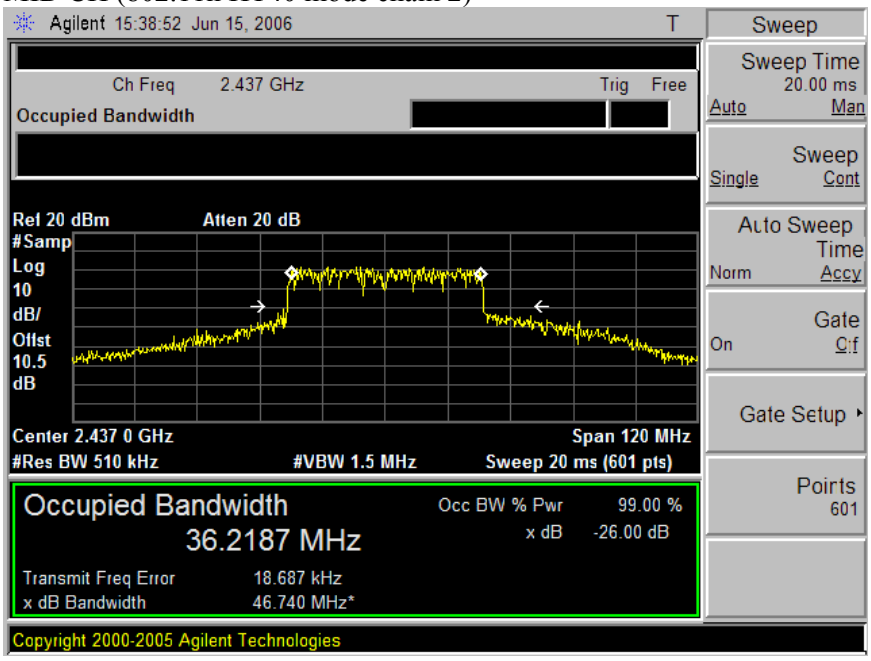


**(802.11 HT40 MODE CHAIN 2)**

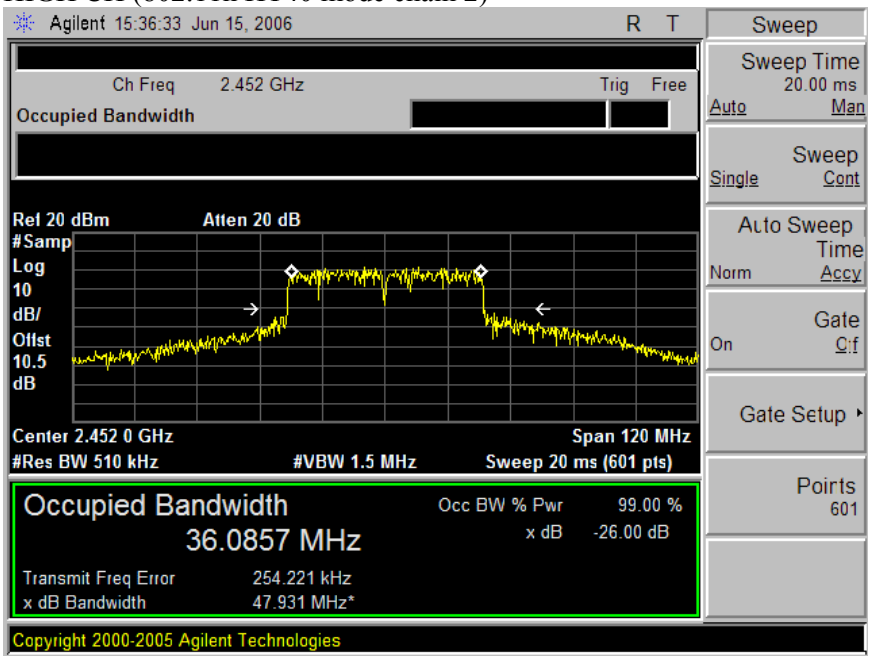
LOW CH (802.11n HT40 mode chain 2)



MID CH (802.11n HT40 mode chain 2)



HIGH CH (802.11n HT40 mode chain 2)



## 7.1.3. MAXIMUM OUTPUT 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. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The test is performed in accordance with Option 2 procedures in FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005. The transmitter operates continuously therefore Method # 1 is used.

Each chain is measured separately and the total power is calculated using:

Total Power = 10 log (10^ (Chain 0 Power / 10) + 10^ (Chain 2 Power / 10))

**RESULTS**

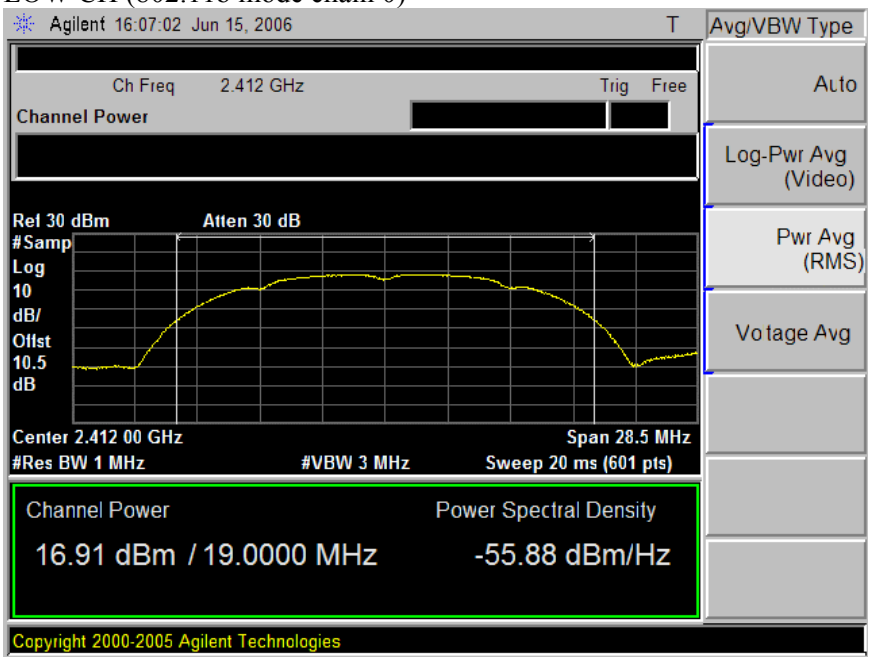
The maximum antenna gain is 3.62dBi for other than fixed, point-to-point operations, therefore the limit is 30 dBm. In the legacy mode, the effective antenna gain is 3.62 + 10*Log(2) = 6.63 dBi.

No non-compliance noted:

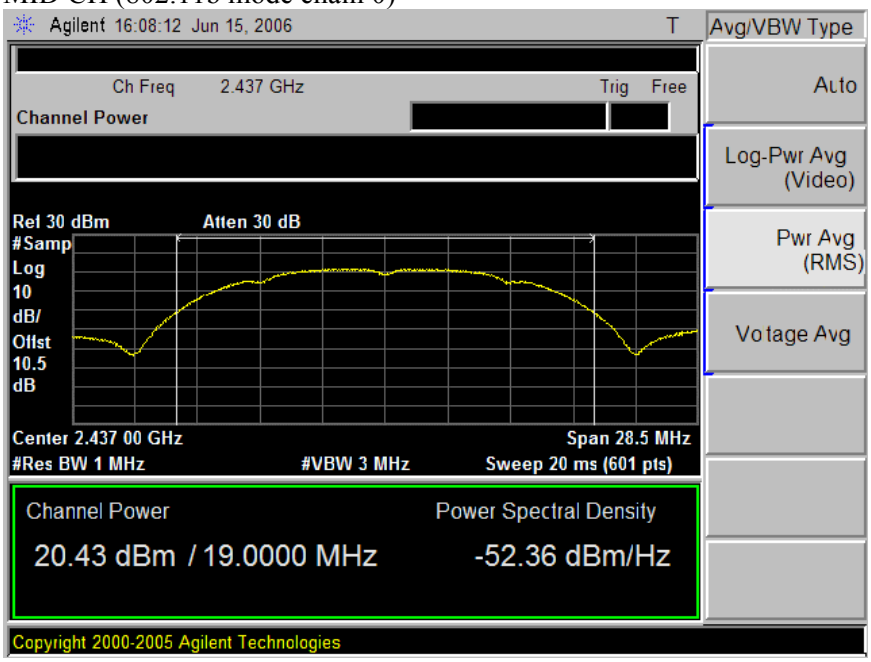
| Mode Channel | Frequency (MHz) | Max Power Chain 0 (dBm) | Max Power Chain 2 (dBm) | Max Power Total (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 802.11b Mode | | | | | | |
| Low | 2412 | 16.91 | 16.95 | 19.94 | 29.4 | -9.43 |
| Middle | 2437 | 20.43 | 21.01 | 23.74 | 29.4 | -5.63 |
| High | 2462 | 17.19 | 17.56 | 20.39 | 29.4 | -8.98 |
| 802.11g Mode | | | | | | |
| Low | 2412 | 15.36 | 15.25 | 18.32 | 29.4 | -11.05 |
| Middle | 2437 | 20.37 | 20.86 | 23.63 | 29.4 | -5.74 |
| High | 2462 | 14.05 | 14.46 | 17.27 | 29.4 | -12.10 |
| 802.11n HT20 Mode | | | | | | |
| Low | 2412 | 14.80 | 15.30 | 18.07 | 30.0 | -11.93 |
| Middle | 2437 | 20.54 | 20.84 | 23.70 | 30.0 | -6.30 |
| High | 2462 | 13.09 | 13.21 | 16.16 | 30.0 | -13.84 |
| 802.11n HT40 Mode | | | | | | |
| Low | 2422 | 12.42 | 12.78 | 15.61 | 30.0 | -14.39 |
| Middle | 2437 | 18.75 | 18.83 | 21.80 | 30.0 | -8.20 |
| High | 2452 | 10.55 | 10.80 | 13.69 | 30.0 | -16.31 |

**(802.11b MODE CHAIN 0)**

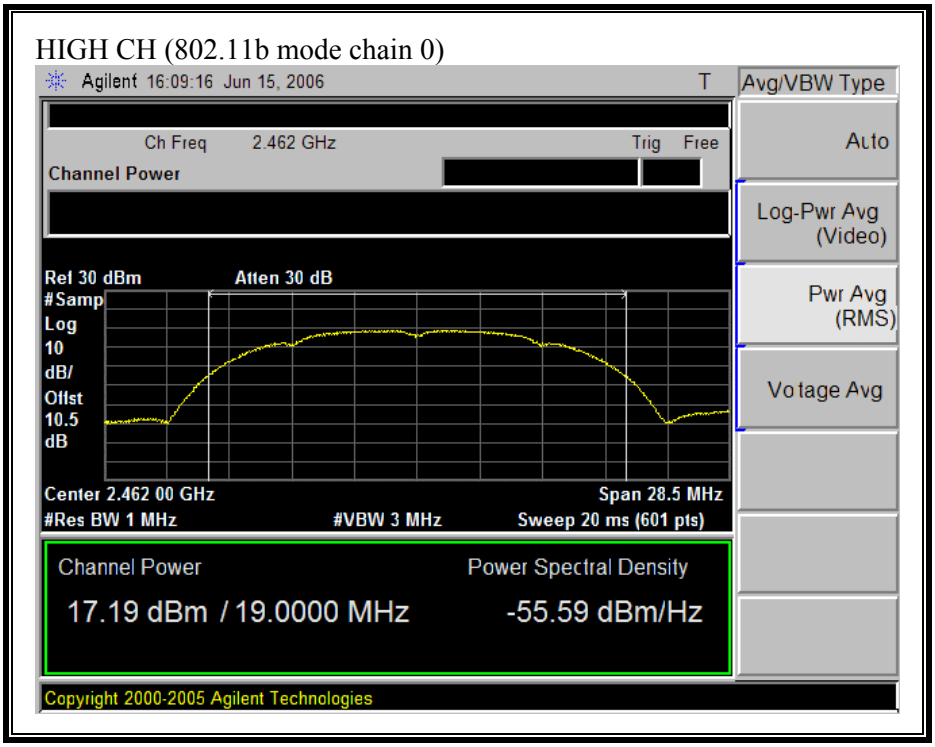
LOW CH (802.11b mode chain 0)



MID CH (802.11b mode chain 0)

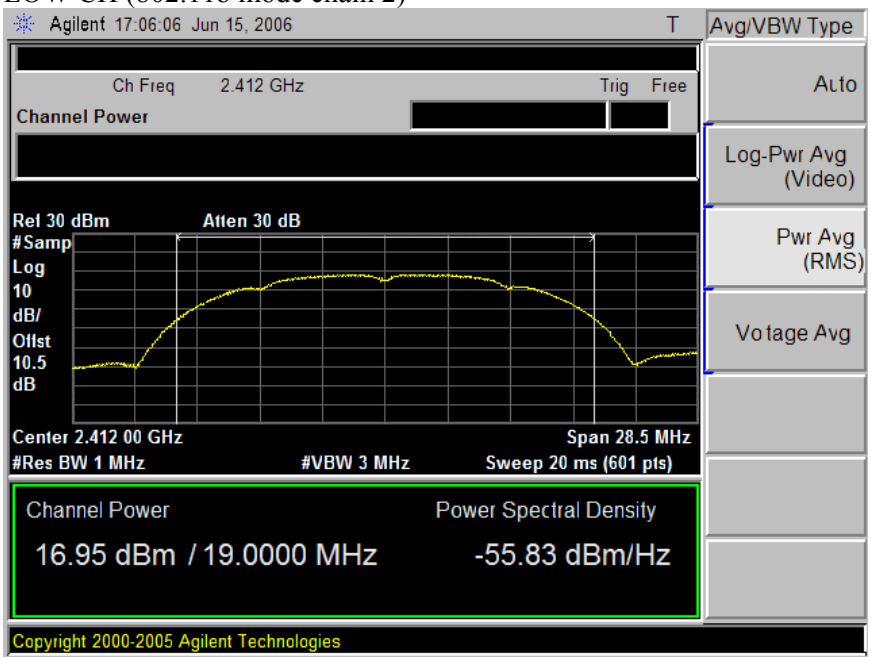


HIGH CH (802.11b mode chain 0)

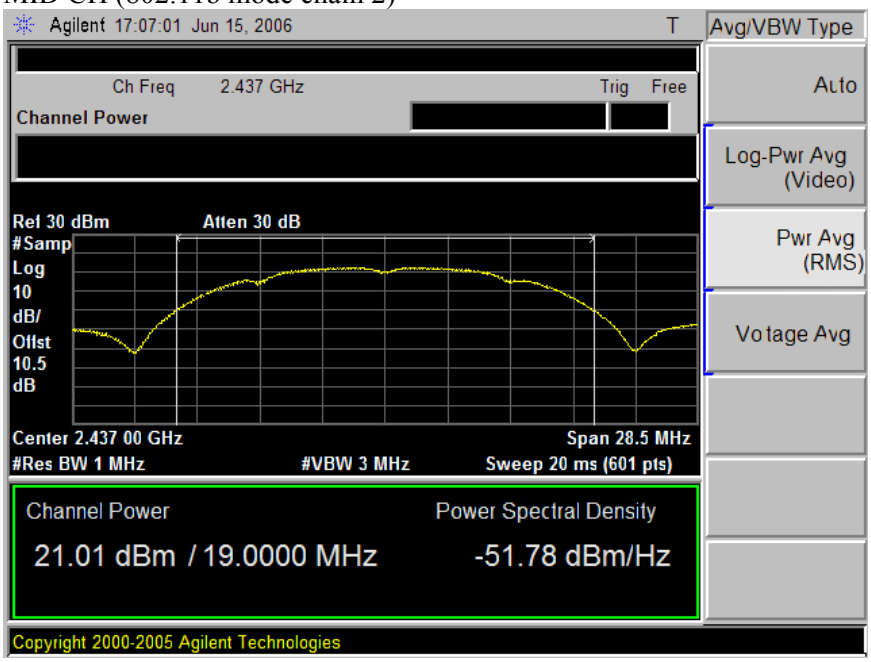


**(802.11b MODE CHAIN 2)**

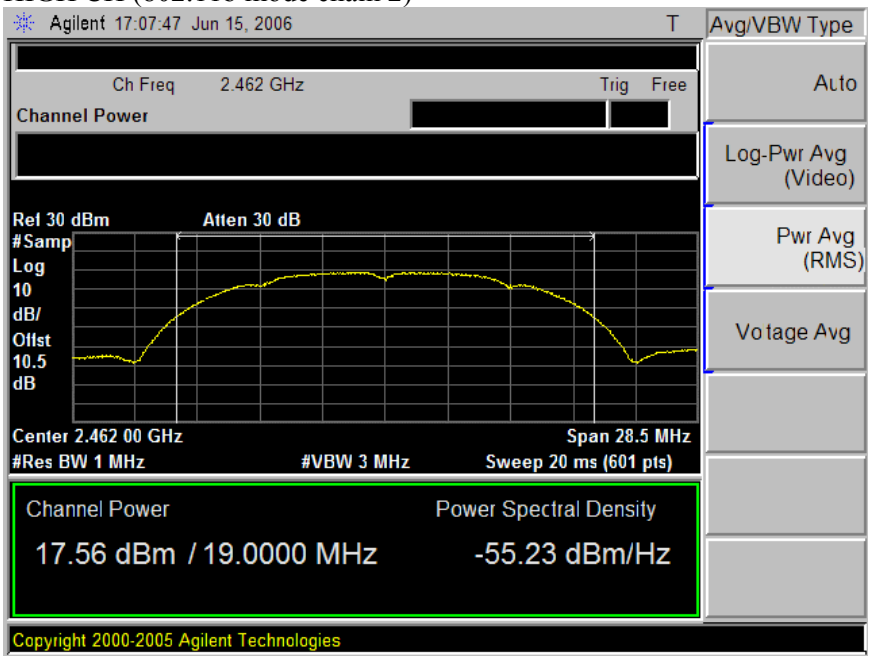
LOW CH (802.11b mode chain 2)



MID CH (802.11b mode chain 2)

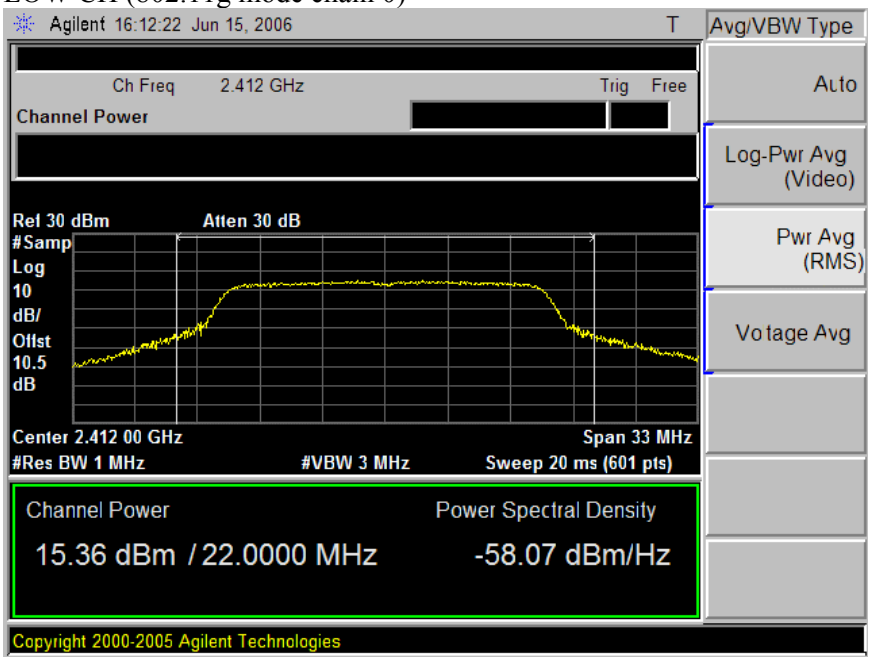


HIGH CH (802.11b mode chain 2)

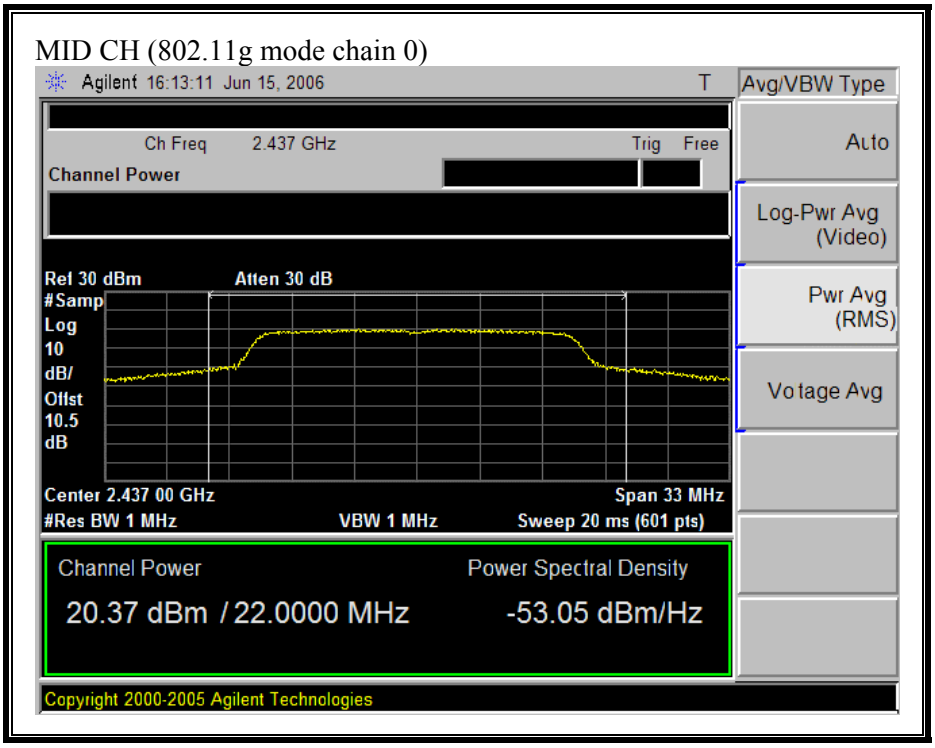


**(802.11g MODE CHAIN 0)**

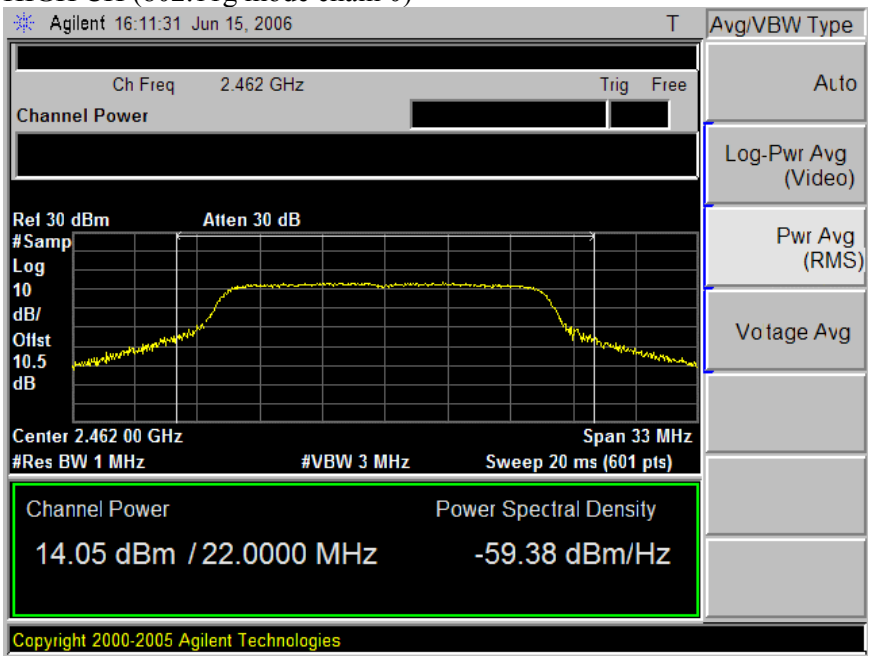
LOW CH (802.11g mode chain 0)



MID CH (802.11g mode chain 0)

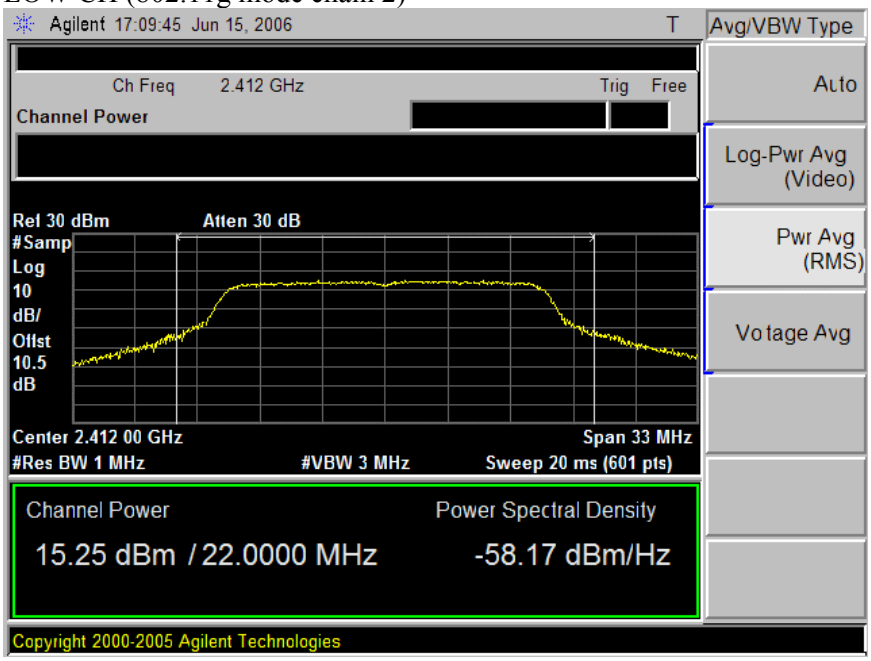


HIGH CH (802.11g mode chain 0)

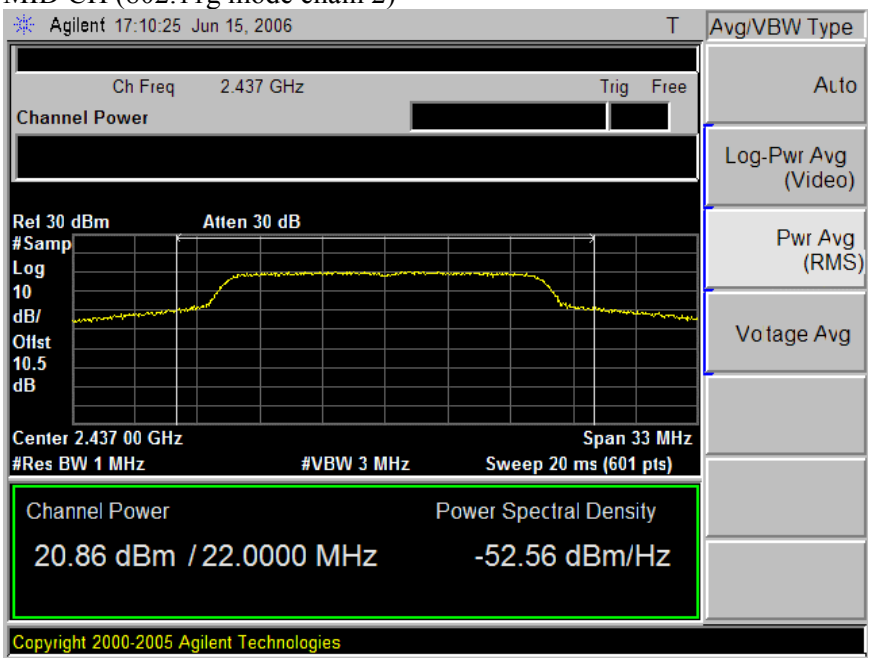


**(802.11g MODE CHAIN 2)**

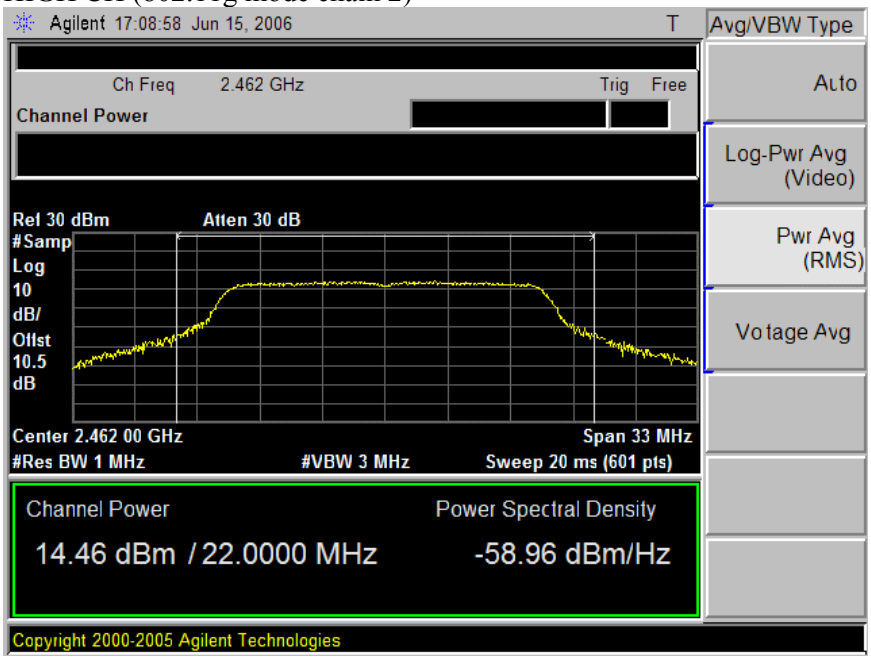
LOW CH (802.11g mode chain 2)



MID CH (802.11g mode chain 2)

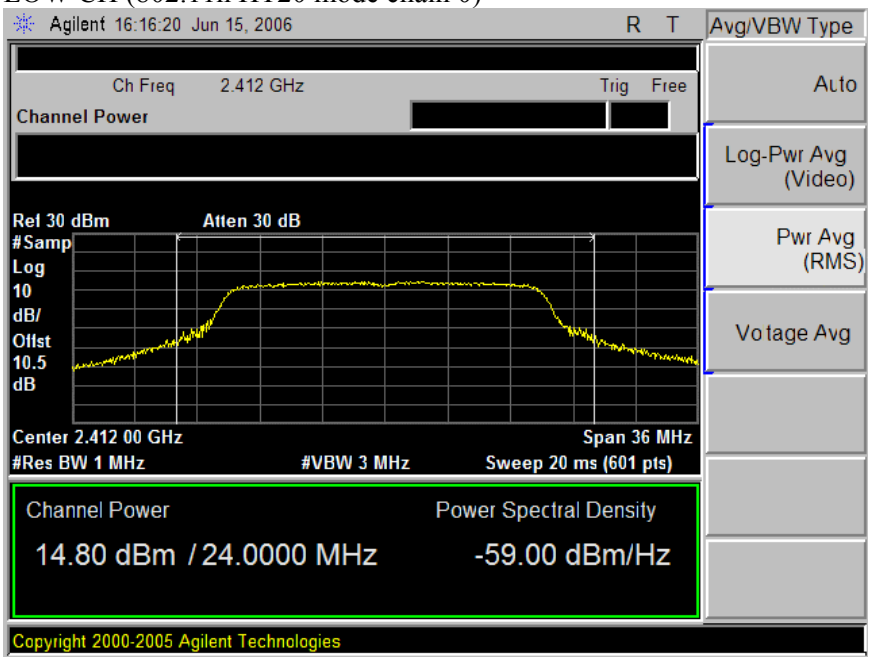


HIGH CH (802.11g mode chain 2)

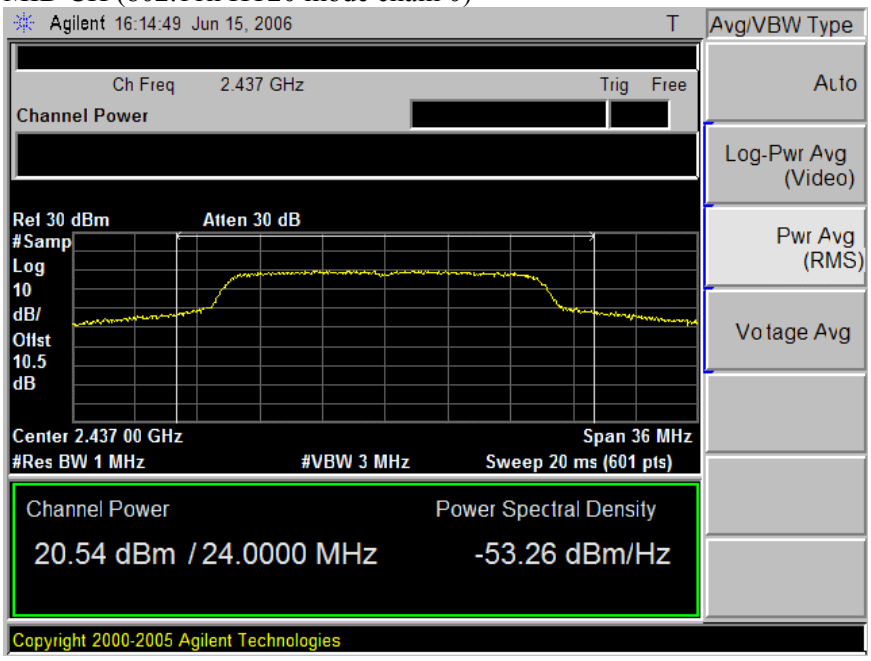


**(802.11n HT20 MODE CHAIN 0)**

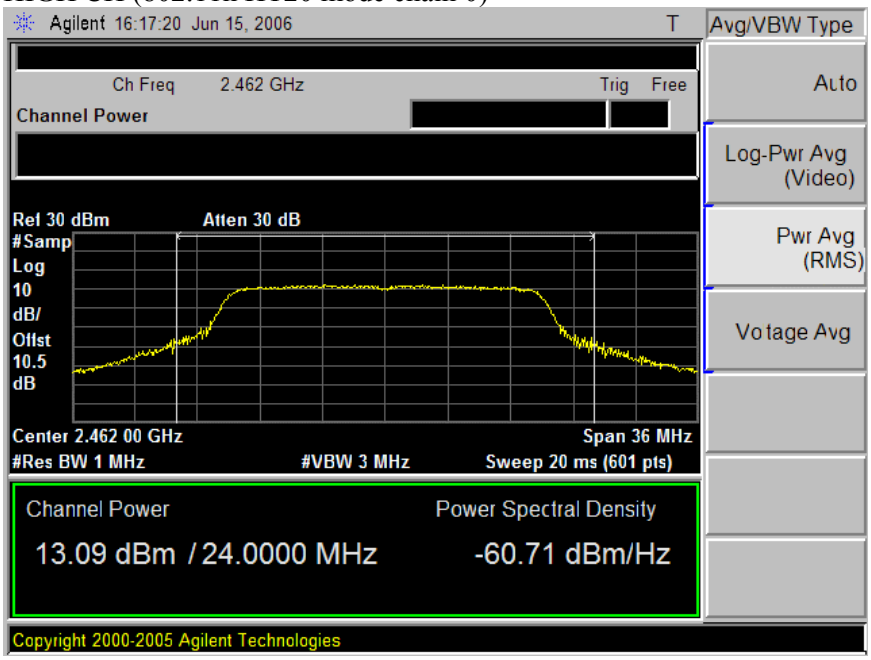
LOW CH (802.11n HT20 mode chain 0)



MID CH (802.11n HT20 mode chain 0)

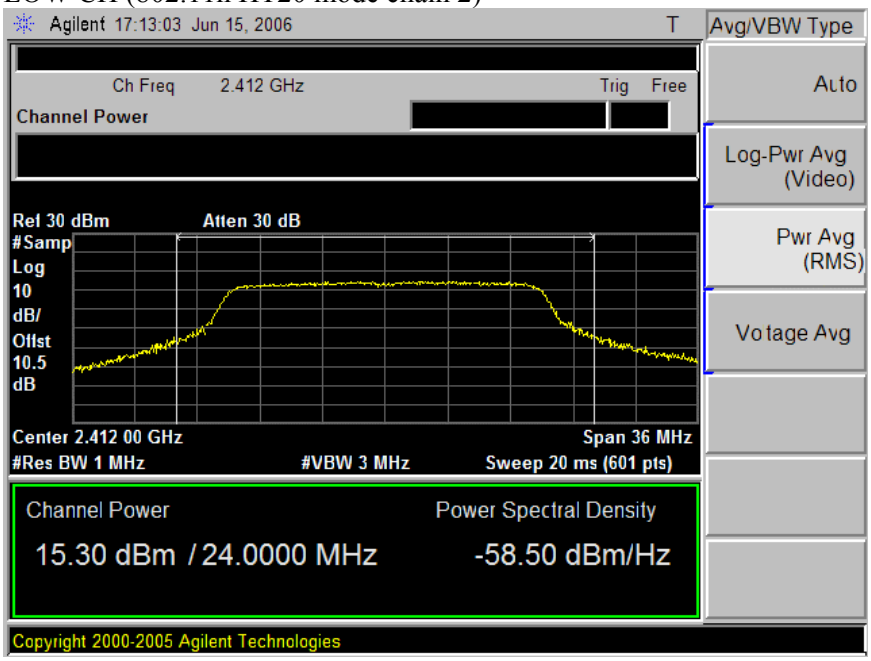


HIGH CH (802.11n HT20 mode chain 0)

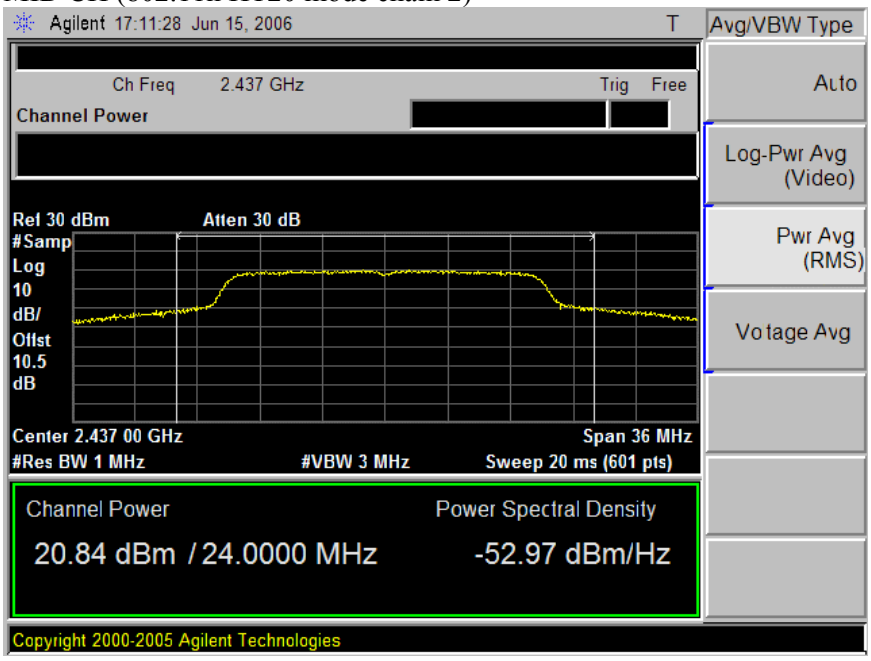


**(802.11 HT20 MODE CHAIN 2)**

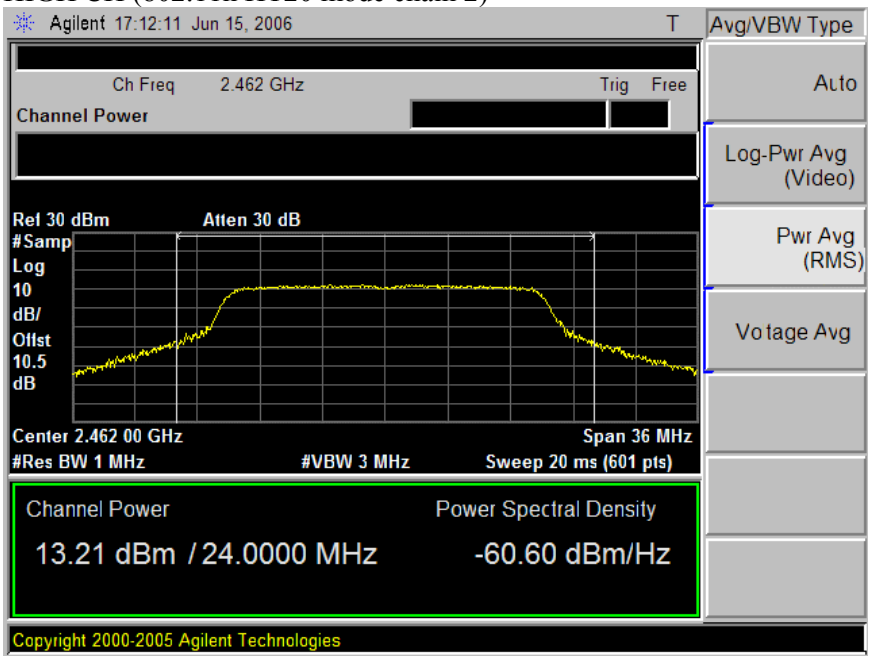
LOW CH (802.11n HT20 mode chain 2)



MID CH (802.11n HT20 mode chain 2)

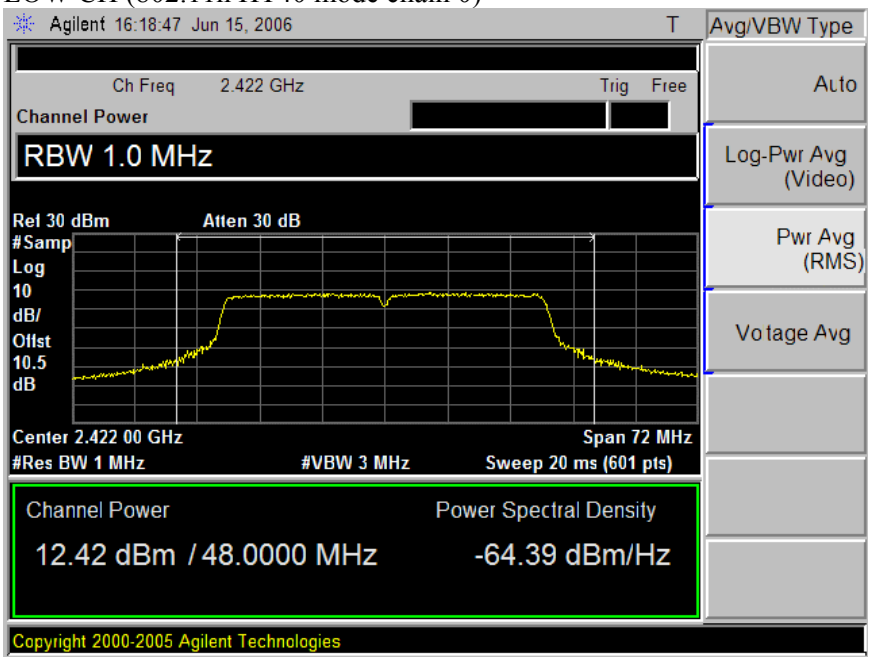


HIGH CH (802.11n HT20 mode chain 2)

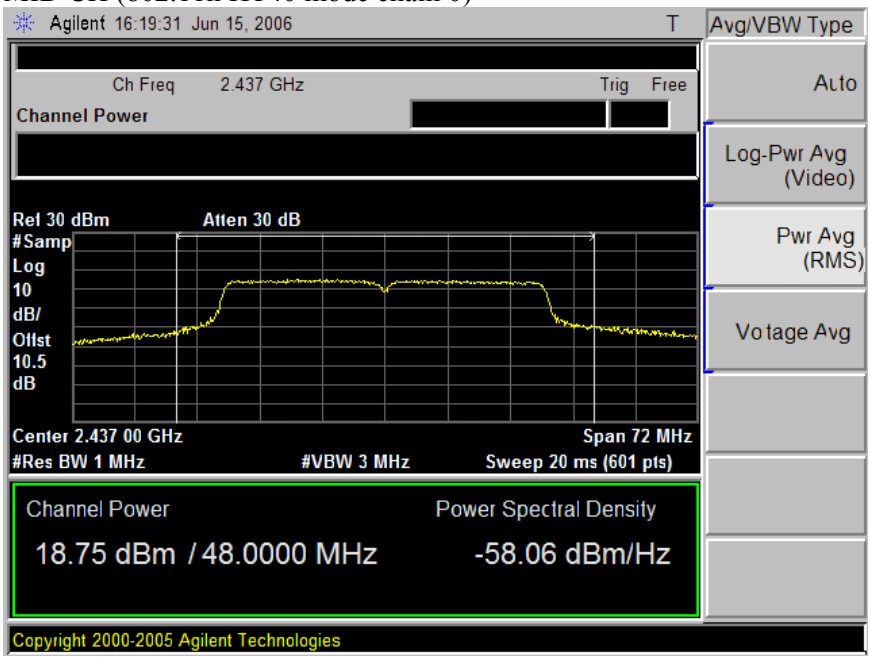


**(802.11 HT40 MODE CHAIN 0)**

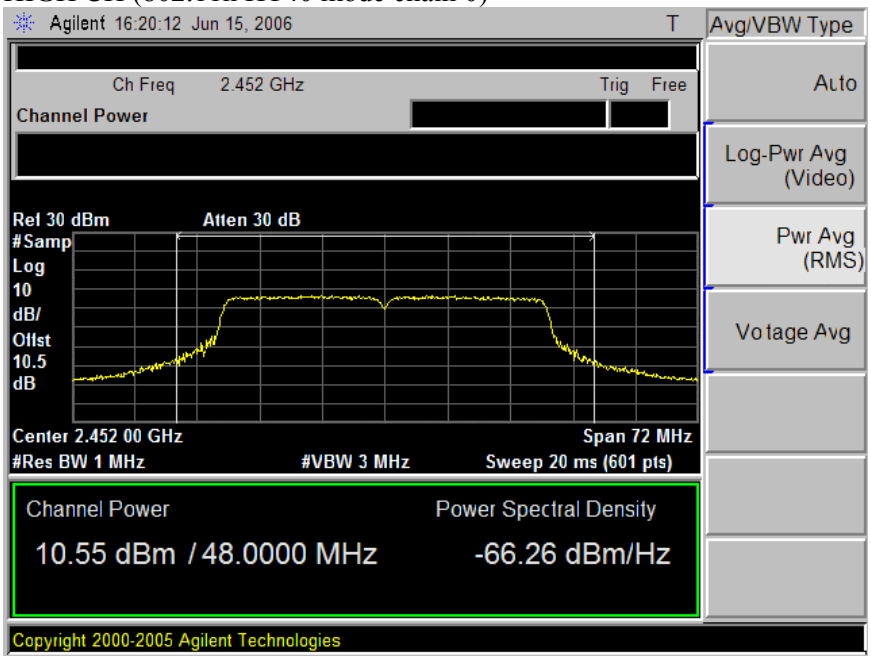
LOW CH (802.11n HT40 mode chain 0)



MID CH (802.11n HT40 mode chain 0)

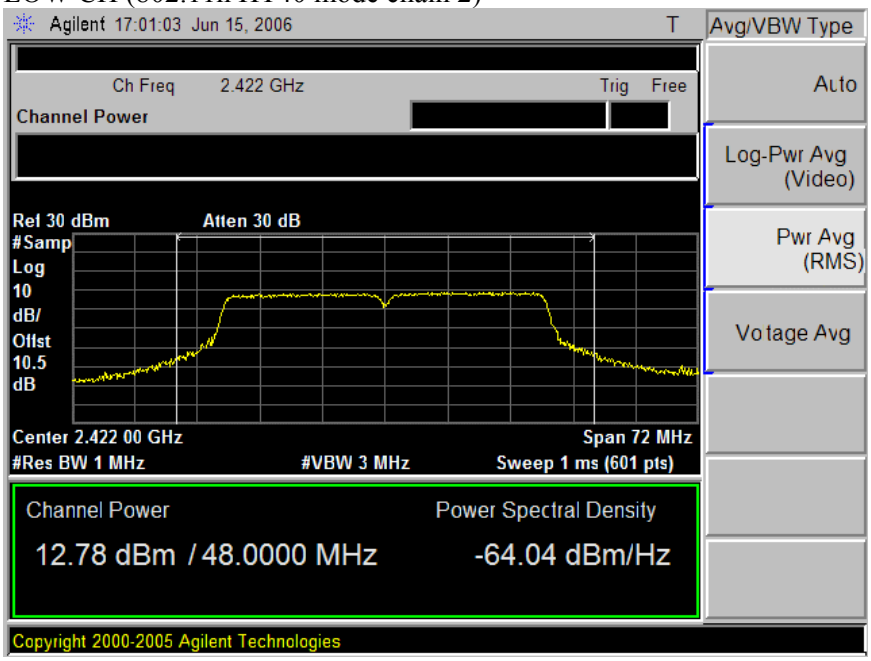


HIGH CH (802.11n HT40 mode chain 0)

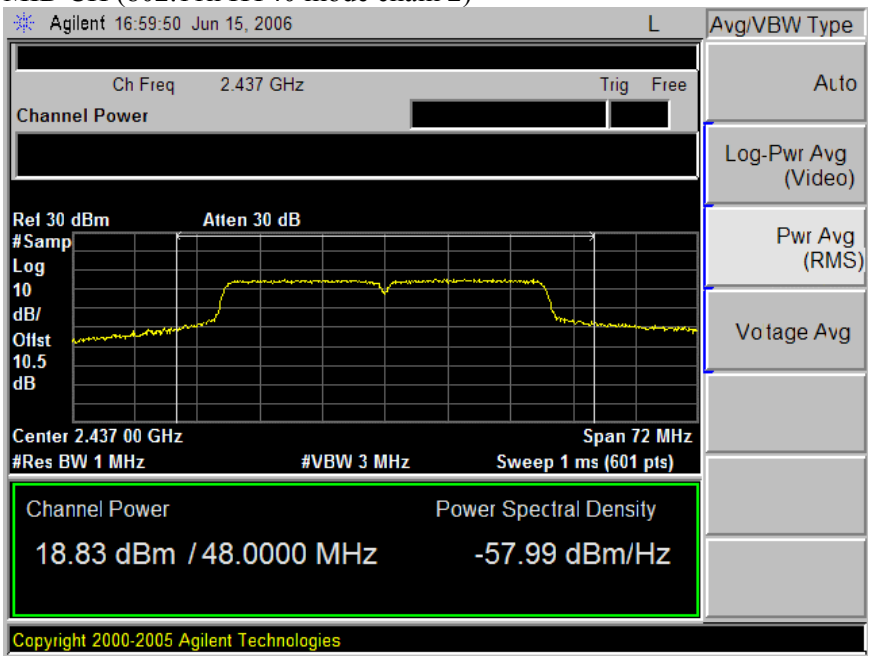


**(802.11 HT40 MODE CHAIN 2)**

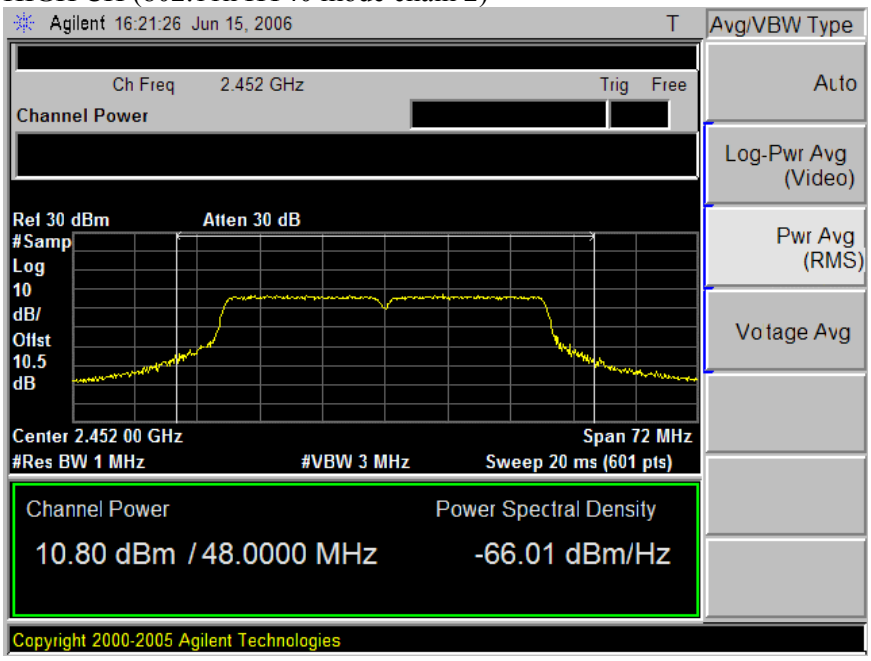
LOW CH (802.11n HT40 mode chain 2)



MID CH (802.11n HT40 mode chain 2)



HIGH CH (802.11n HT40 mode chain 2)



## 7.1.4. AVERAGE POWER

### AVERAGE POWER LIMIT

None; for reporting purposes only.

### TEST PROCEDURE

The transmitter output is connected to a power meter.

Each chain is measured separately and the total power is calculated using:

Total Power = 10 log (10^ (Chain 0 Power / 10) + 10^ (Chain 2 Power / 10))

## RESULTS

No non-compliance noted:

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

| Mode Channel | Frequency (MHz) | Average Power Chain 0 (dBm) | Average Power Chain 2 (dBm) | Average Power Total (dBm) |
|---|---|---|---|---|
| 802.11b Mode | | | | |
| Low | 2412 | 17.1 | 16.9 | 20.0 |
| Middle | 2437 | 20.4 | 20.9 | 23.7 |
| High | 2462 | 17.4 | 17.6 | 20.5 |
| 802.11g Mode | | | | |
| Low | 2412 | 15.2 | 15.1 | 18.1 |
| Middle | 2437 | 20.3 | 20.7 | 23.5 |
| High | 2462 | 13.8 | 14.2 | 17.0 |
| 802.11n HT20 Mode | | | | |
| Low | 2412 | 15.1 | 15.1 | 18.1 |
| Middle | 2437 | 20.4 | 20.6 | 23.5 |
| High | 2462 | 12.5 | 12.8 | 15.7 |
| 802.11n HT40 Mode | | | | |
| Low | 2422 | 12.0 | 12.2 | 15.1 |
| Middle | 2437 | 18.6 | 18.6 | 21.6 |
| High | 2452 | 10.3 | 10.3 | 13.3 |

## 7.1.5. 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 test is performed in accordance with Option 2 procedures in FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005. The conditions for sample detection are satisfied. The PPSD is the highest level found across the emission in any 3 kHz band.

Each chain is measured separately and the total PPSD is calculated using:

Total PPSD = 10 log (10^ (Chain 0 PPSD / 10) + 10^ (Chain 2 PPSD / 10))

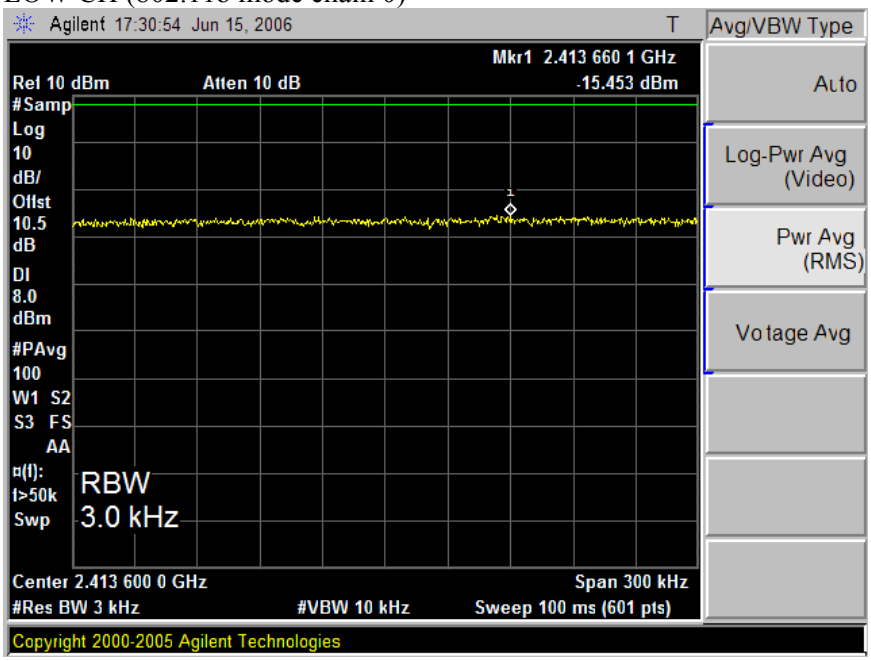
**RESULTS**

No non-compliance noted:

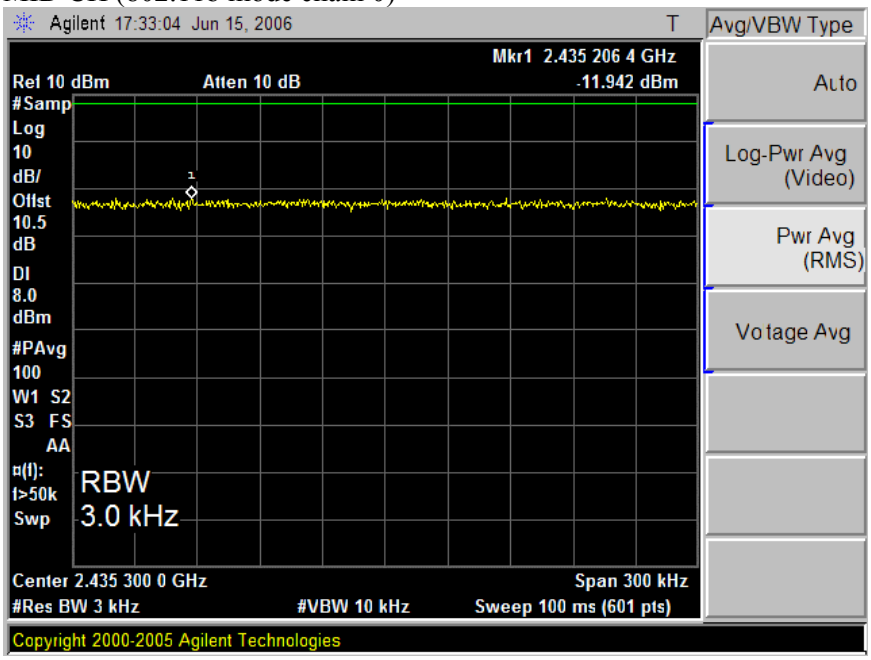
| Mode Channel | Frequency (MHz) | PPSD Chain 0 (dBm) | PPSD Chain 2 (dBm) | PPSD Total (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 802.11b Mode | | | | | | |
| Low | 2412 | -15.45 | -15.72 | -12.57 | 8 | -20.57 |
| Middle | 2437 | -11.94 | -12.91 | -9.39 | 8 | -17.39 |
| High | 2462 | -15.79 | -15.86 | -12.81 | 8 | -20.81 |
| 802.11g Mode | | | | | | |
| Low | 2412 | -18.89 | -18.36 | -15.61 | 8 | -23.61 |
| Middle | 2437 | -13.47 | -13.12 | -10.28 | 8 | -18.28 |
| High | 2462 | -20.39 | -19.17 | -16.73 | 8 | -24.73 |
| 802.11n HT20 Mode | | | | | | |
| Low | 2412 | -19.13 | -18.62 | -15.86 | 8 | -23.86 |
| Middle | 2437 | -13.65 | -13.42 | -10.52 | 8 | -18.52 |
| High | 2462 | -21.81 | -19.54 | -17.52 | 8 | -25.52 |
| 802.11n HT40 Mode | | | | | | |
| Low | 2422 | -25.58 | -25.55 | -22.55 | 8 | -30.55 |
| Middle | 2437 | -19.39 | -18.63 | -15.98 | 8 | -23.98 |
| High | 2452 | -27.07 | -27.05 | -24.05 | 8 | -32.05 |

**(802.11b MODE CHAIN 0)**

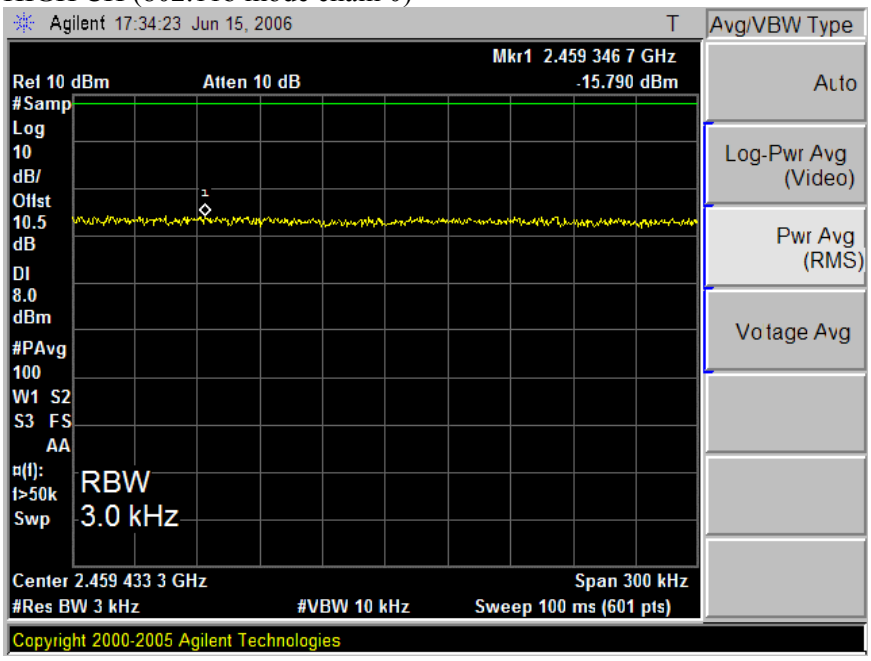
LOW CH (802.11b mode chain 0)



MID CH (802.11b mode chain 0)

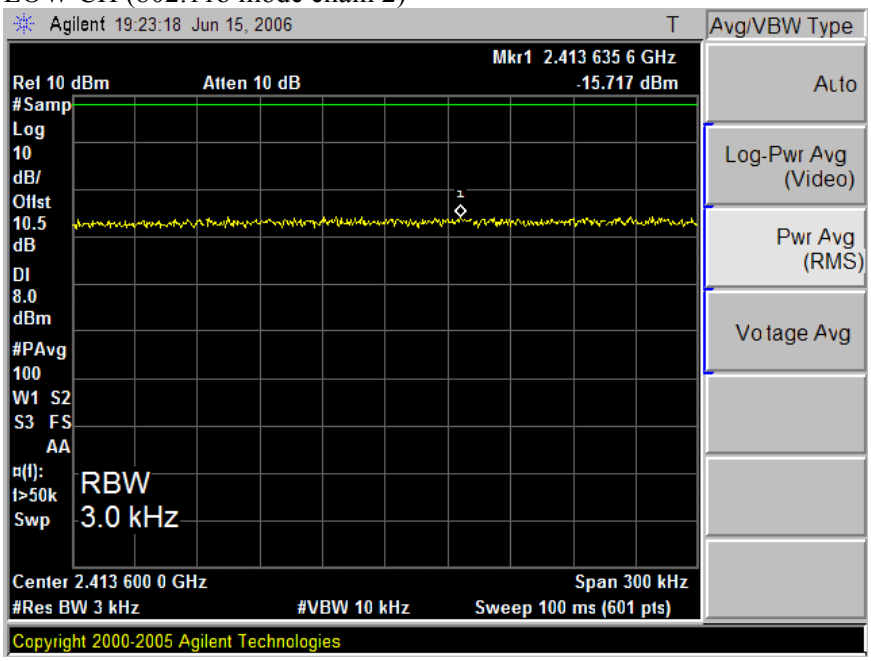


HIGH CH (802.11b mode chain 0)

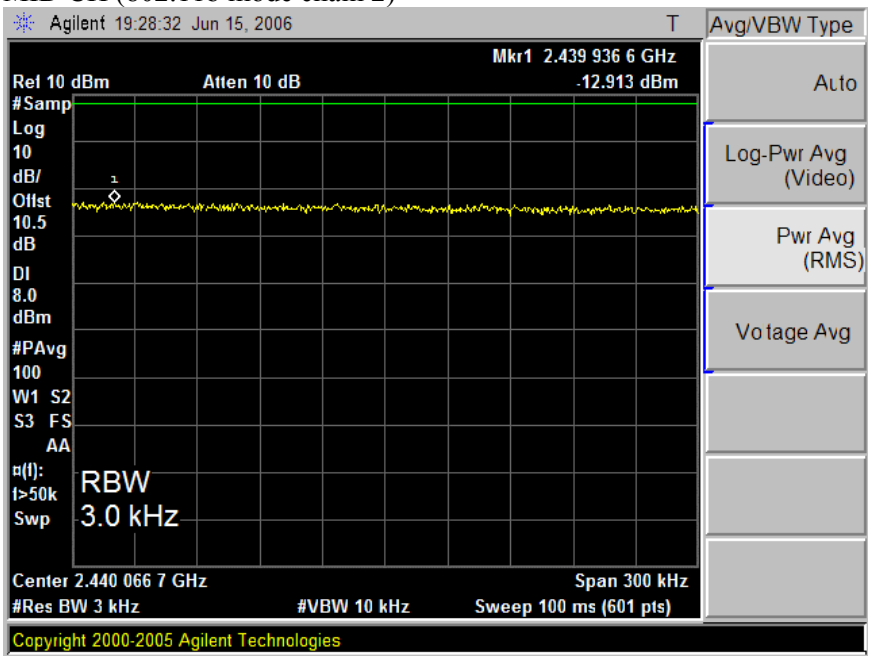


**(802.11b MODE CHAIN 2)**

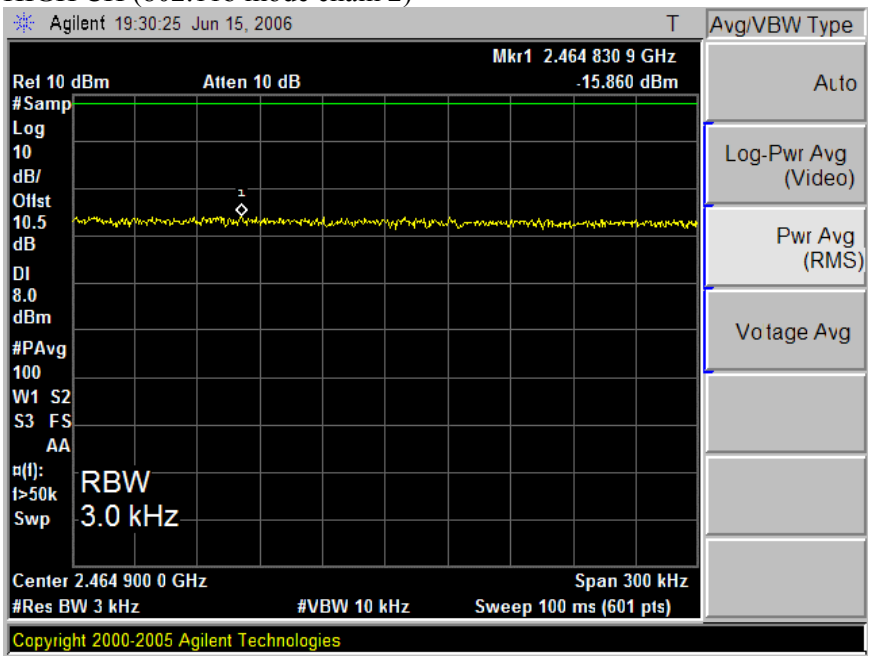
LOW CH (802.11b mode chain 2)



MID CH (802.11b mode chain 2)

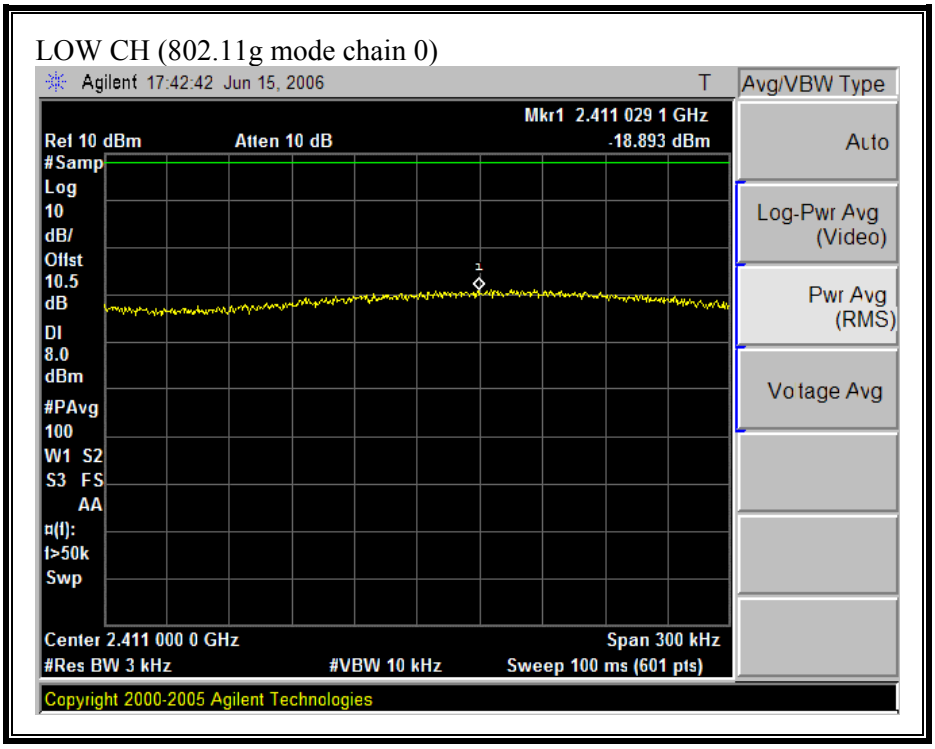


HIGH CH (802.11b mode chain 2)

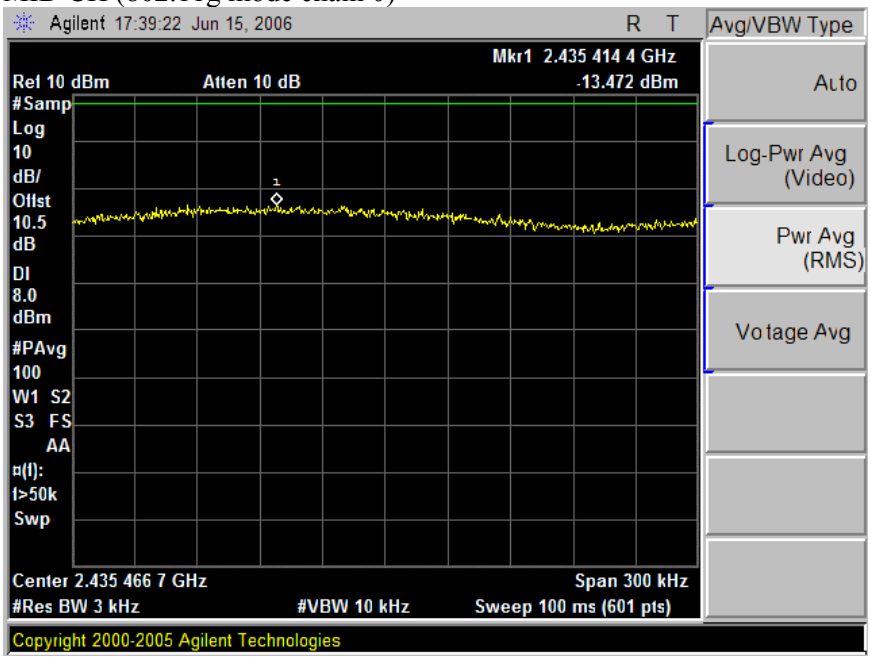


**(802.11g MODE CHAIN 0)**

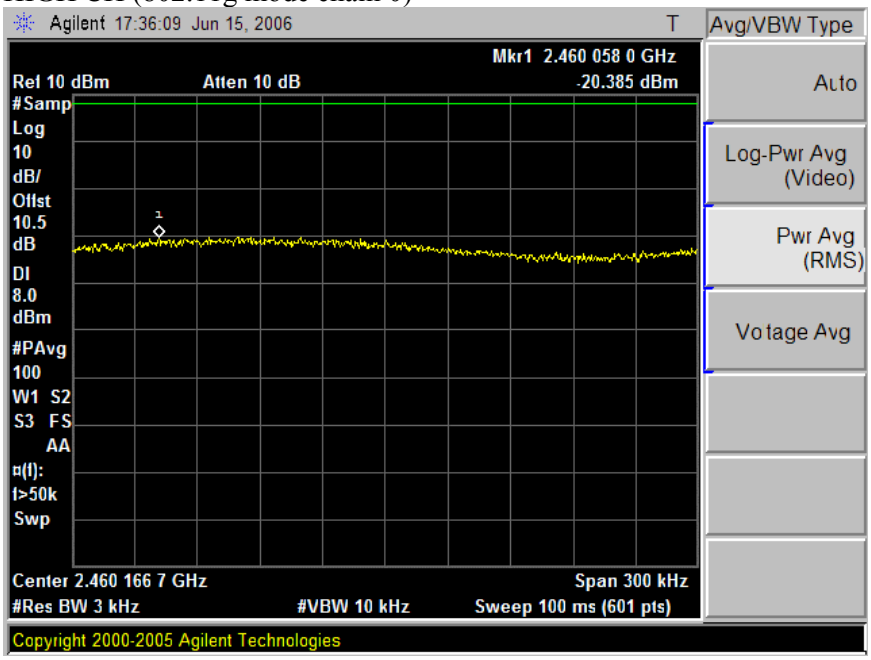
LOW CH (802.11g mode chain 0)



MID CH (802.11g mode chain 0)

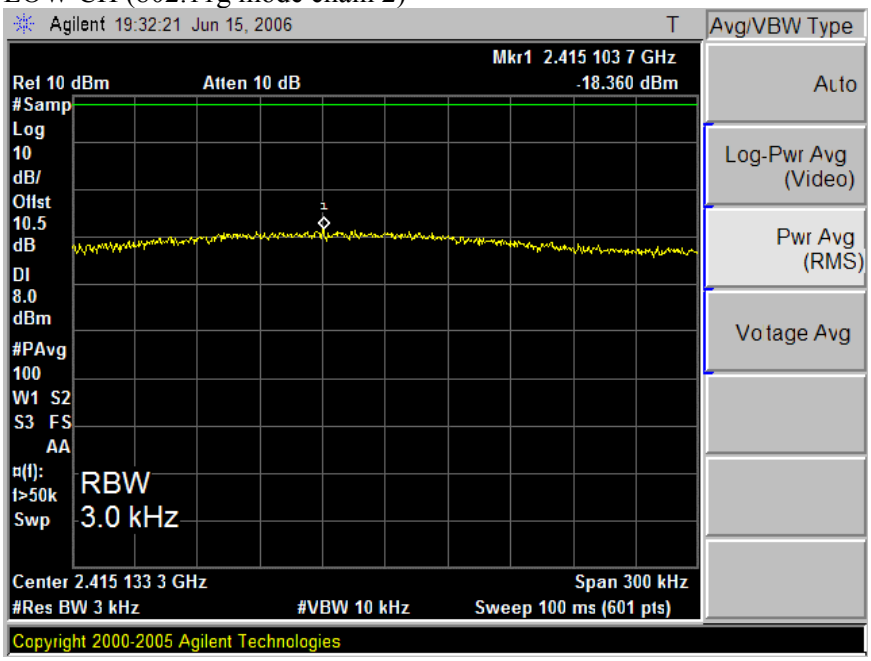


HIGH CH (802.11g mode chain 0)

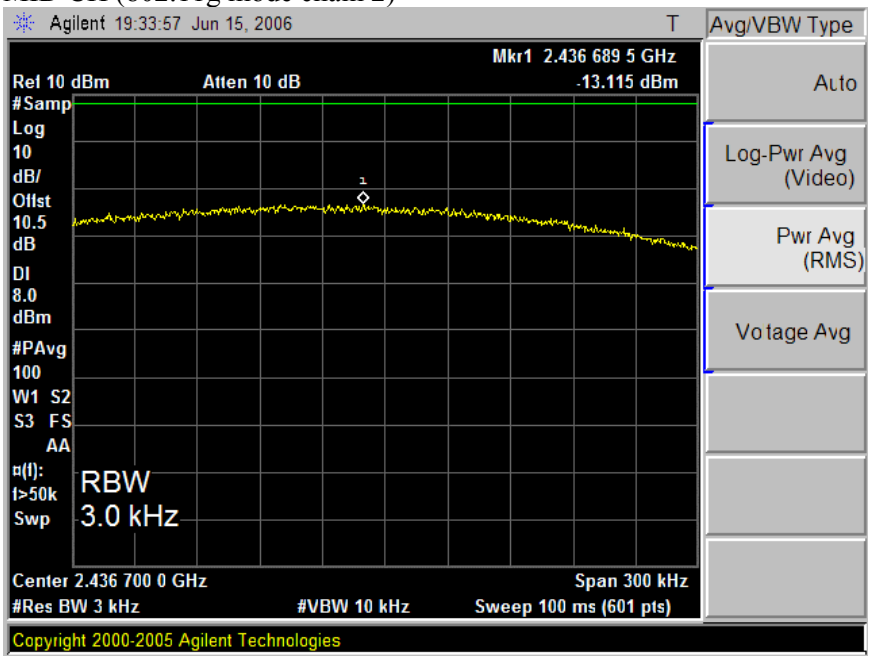


**(802.11g MODE CHAIN 2)**

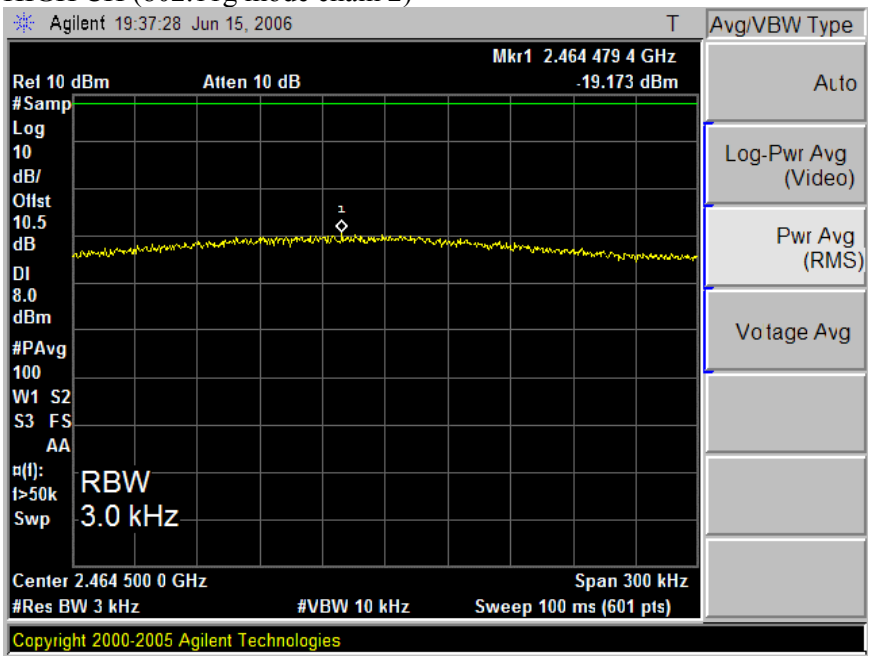
LOW CH (802.11g mode chain 2)



MID CH (802.11g mode chain 2)

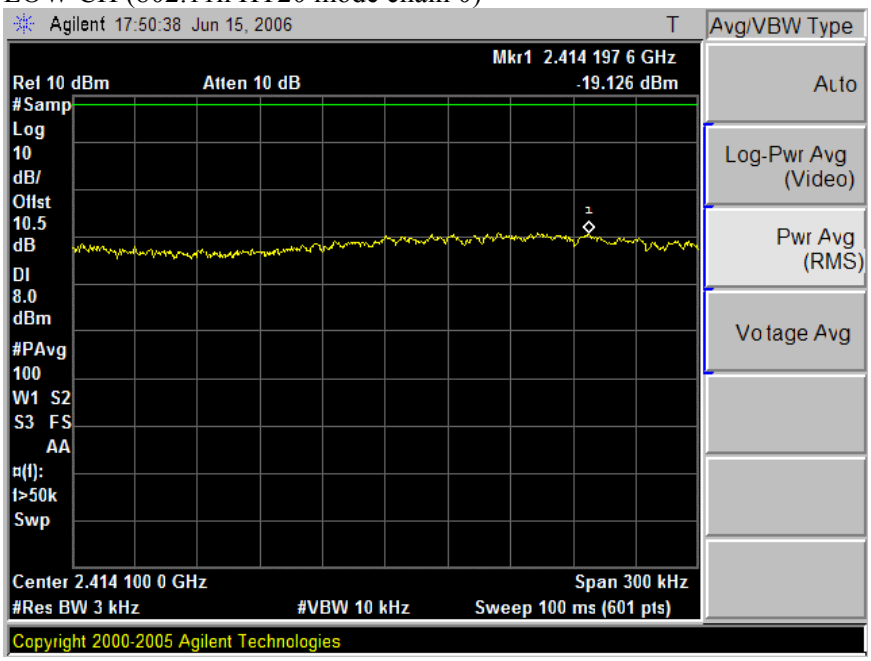


HIGH CH (802.11g mode chain 2)

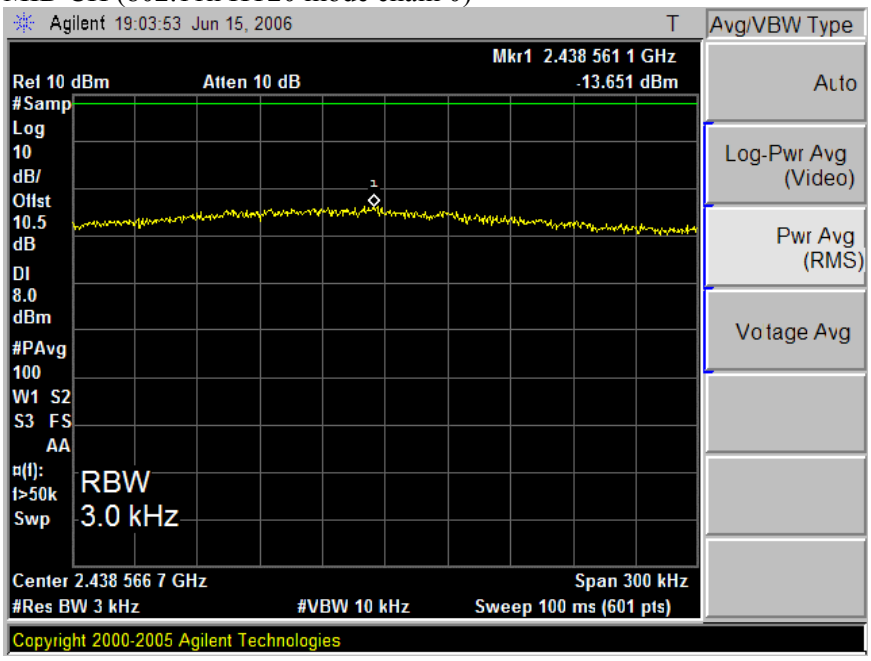


**(802.11n HT20 MODE CHAIN 0)**

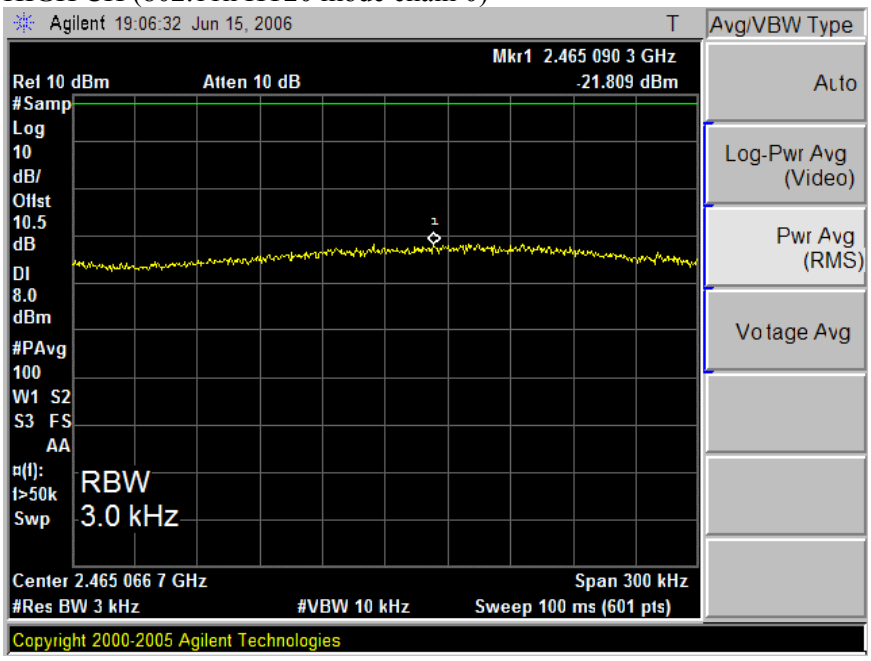
LOW CH (802.11n HT20 mode chain 0)



MID CH (802.11n HT20 mode chain 0)

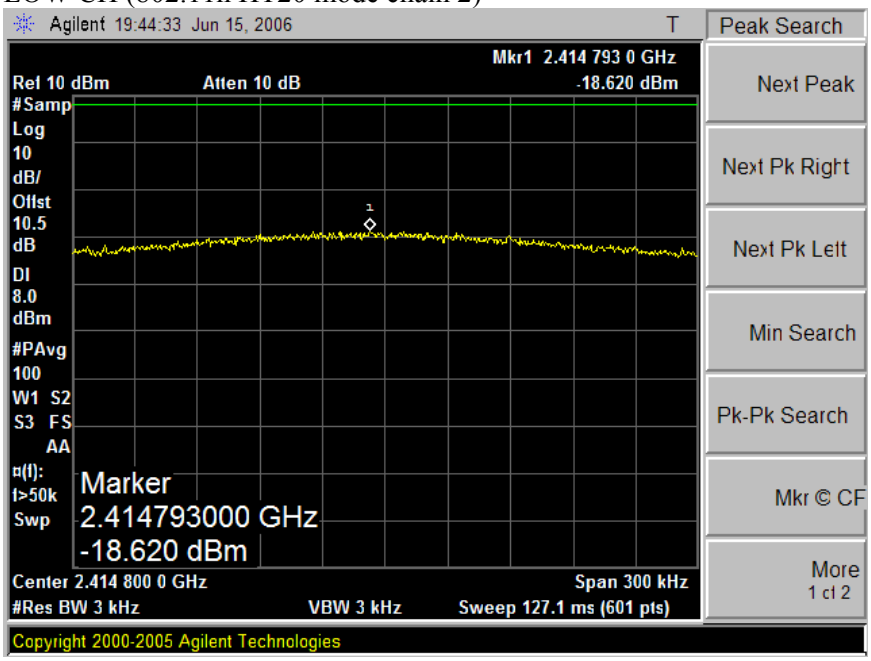


HIGH CH (802.11n HT20 mode chain 0)

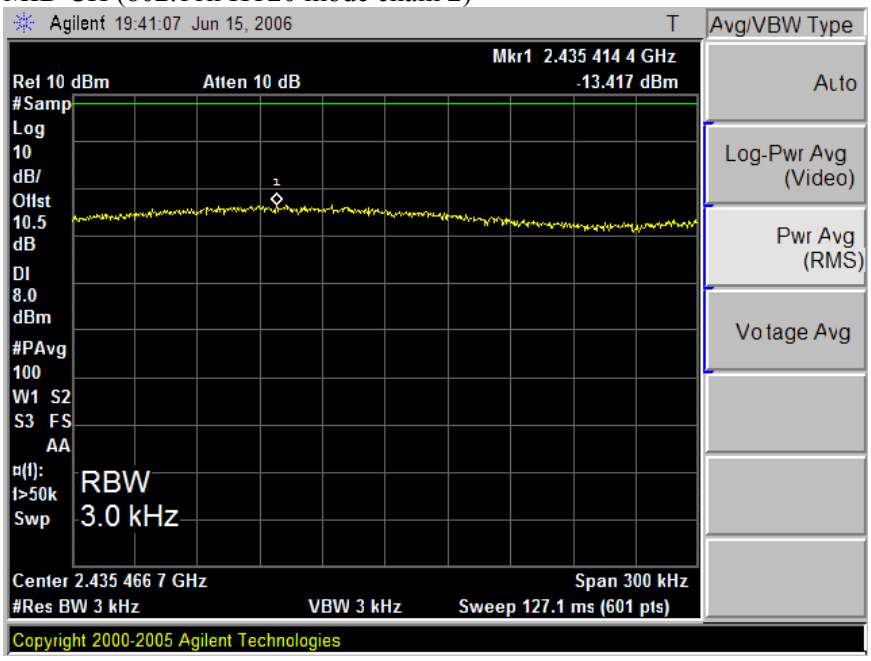


**(802.11 HT20 MODE CHAIN 2)**

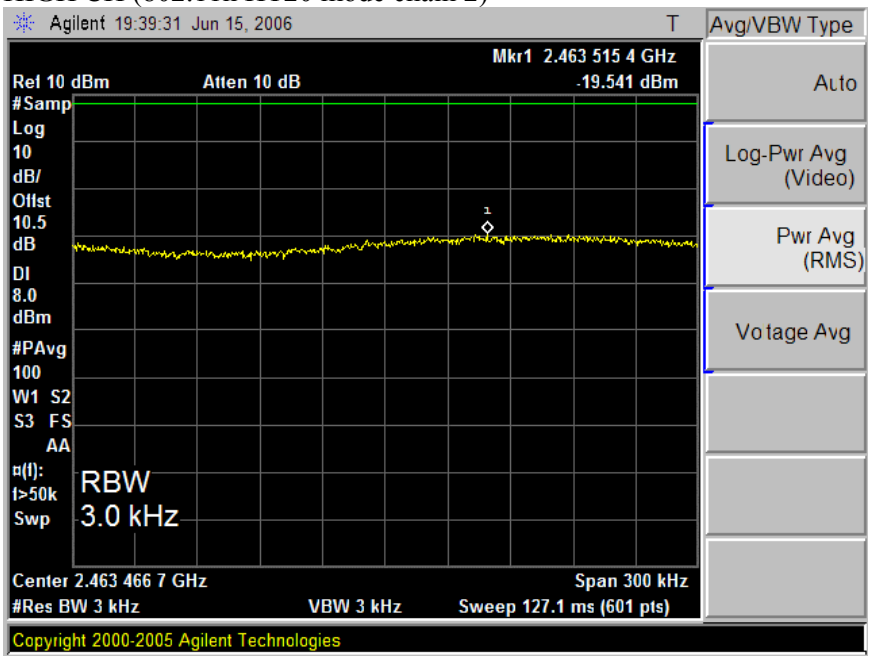
LOW CH (802.11n HT20 mode chain 2)



MID CH (802.11n HT20 mode chain 2)

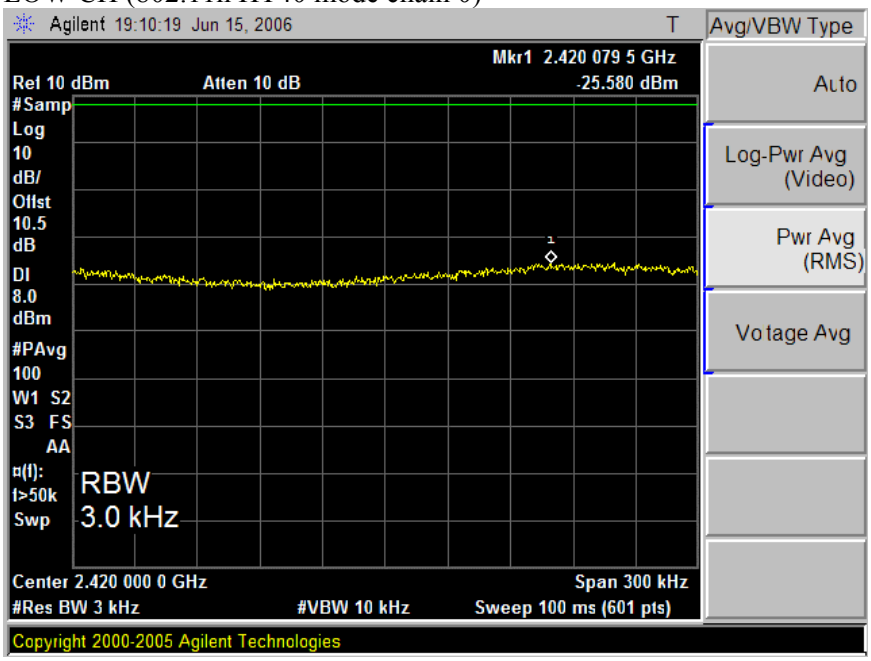


HIGH CH (802.11n HT20 mode chain 2)

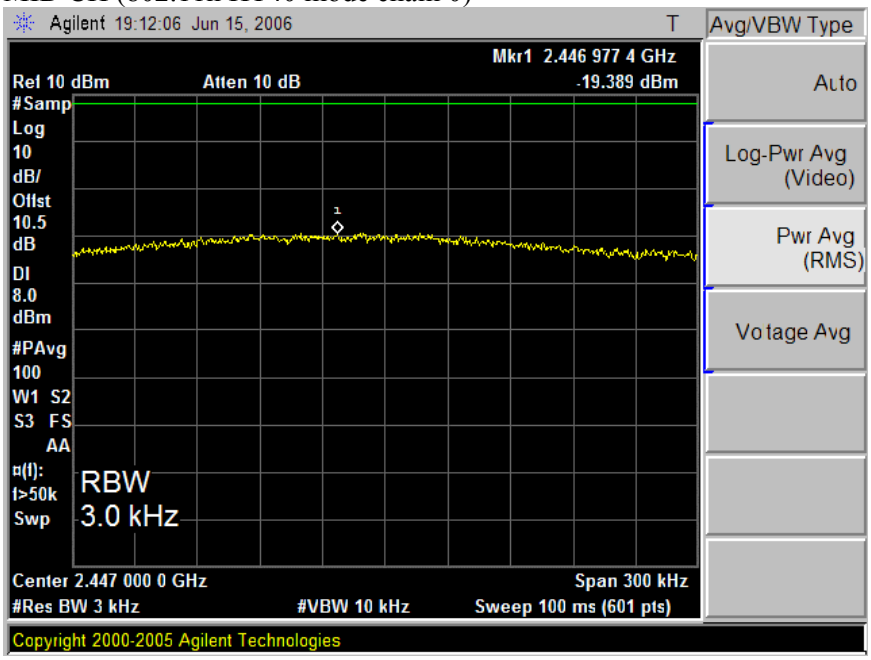


**(802.11 HT40 MODE CHAIN 0)**

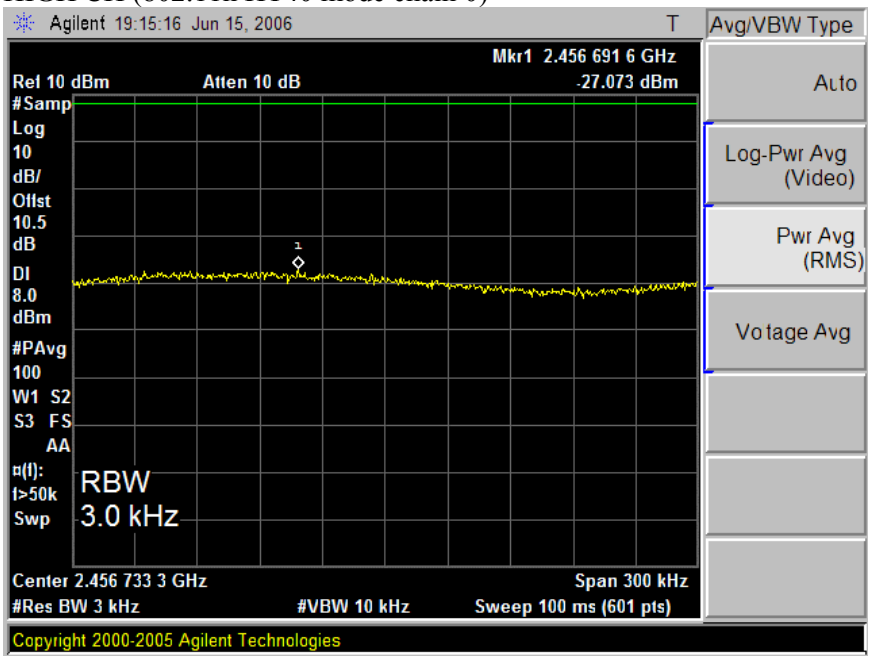
LOW CH (802.11n HT40 mode chain 0)



MID CH (802.11n HT40 mode chain 0)

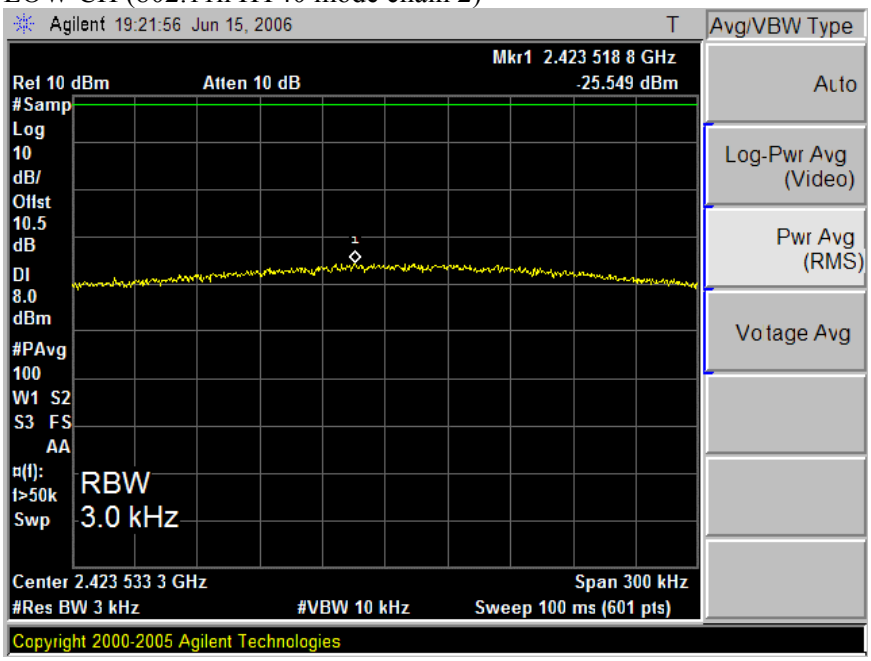


HIGH CH (802.11n HT40 mode chain 0)

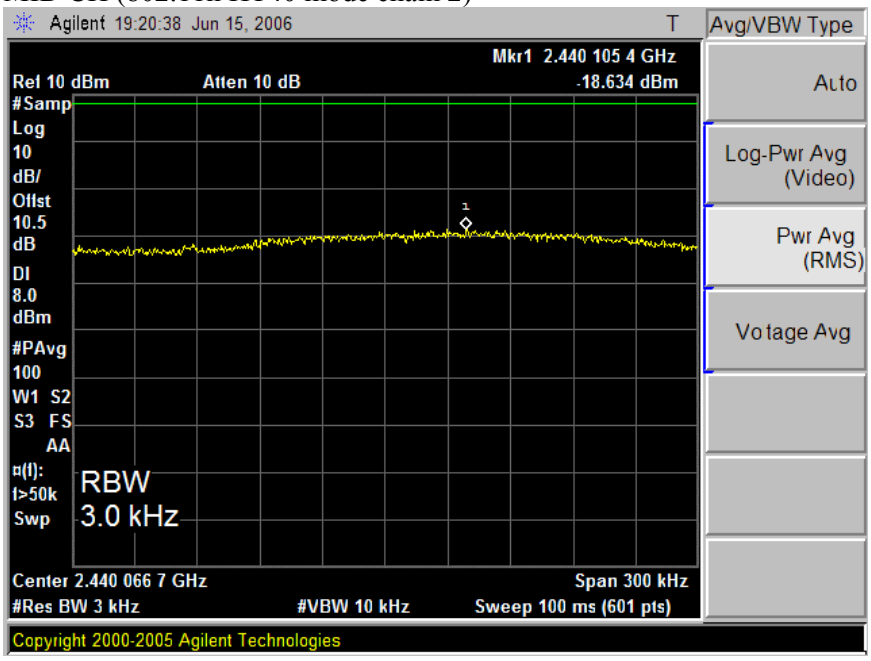


**(802.11 HT40 MODE CHAIN 2)**

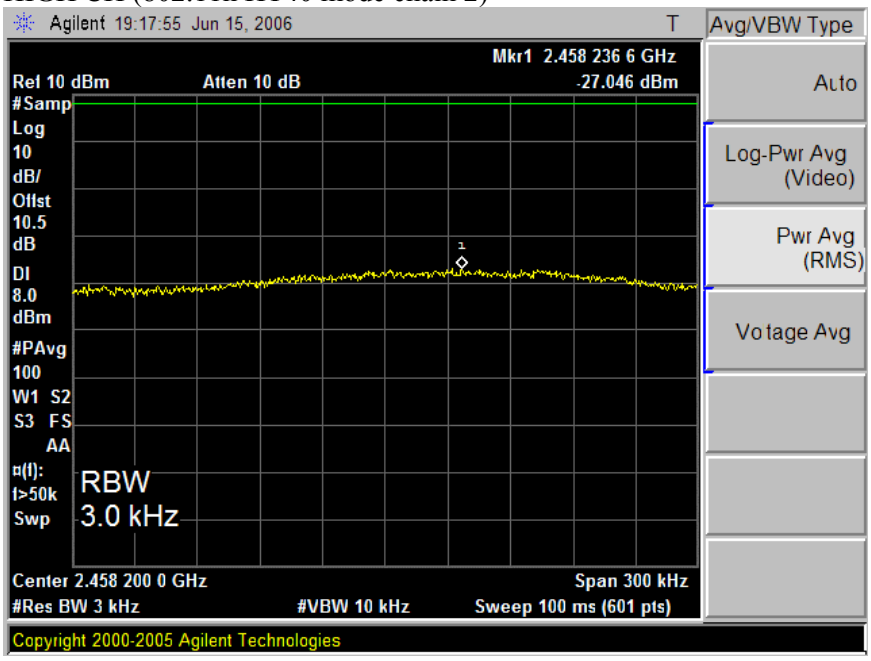
LOW CH (802.11n HT40 mode chain 2)



MID CH (802.11n HT40 mode chain 2)



HIGH CH (802.11n HT40 mode chain 2)



## 7.1.6. CONDUCTED SPURIOUS EMISSIONS

**LIMITS**

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

Conducted power was measured using the Option 2 procedures, therefore the required attenuation is 30 dB.

**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 150 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: