FCC CFR47 PART 15 SUBPART E
CERTIFICATION
TEST REPORT

FOR

802.11n DUAL BAND CARDBUS ADAPTER

MODEL NUMBER: AR5BCB-00072

FCC ID: PPD-AR5BCB-00072

REPORT NUMBER: 06U10485-12

ISSUE DATE: NOVEMBER 02, 2006

Prepared for
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Revision History

Rev.	Issue Date	Revisions	Revised By
--	11/2/2006	Initial Issue based on 06U10485-2, Performed DFS tests with new AP software revision, Added High Channel for HT40 mode in 5150 to 5250 MHz band	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: 802.11n DUAL BAND CARDBUS ADAPTER

MODEL: AR5BCB-00072

SERIAL NUMBER: CB72-020-L0073

DATE TESTED: AUGUST 8- NOVEMBER 1, 2006

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART E	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
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15 and FCC 06-96 APPENDIX "COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVCIES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION".

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 AR5BCB-00072 is designed for 802.11a/b/g/n applications using the AR541X/51XX chipset with a PCMCIA interface, configured in a Cardbus form factor. 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 with inverted-F antennas and the middle chain (chain 1) as Rx only with a PCB antenna.

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 peak conducted output power as follows:

5150 to 5250 MHz Authorized Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5180 - 5240	802.11a	14.64	29.11
5180 - 5240	802.11n HT20	14.94	31.19
5190 - 5230	802.11n HT40	16.73	47.10

5250 to 5350 MHz Authorized Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5260 - 5320	802.11a	21.15	130.32
5260 - 5320	802.11n HT20	21.07	127.94

5470 to 5725 MHz Authorized Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5500 - 5700	802.11a	21.32	135.52
5500 - 5700	802.11n HT20	21.43	139.00

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The 2x3 configuration utilizes a set of two identical Inverted-F antennas for Tx/Rx Chains 0 and 2, with a maximum gain of 2.0 dBi at5.2 GHz and 1.0 dBi at 5.5 GHz, plus a PCB Integrated monopole antenna for Rx Chain 1, with a maximum gain of 1.0 dBi at 5.2 GHz and 1.0 dBi at 5.5 GHz.

Two identical Inverted-F antennas as 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 0.4 Build #4 Art 11n

5.5. WORST-CASE CONFIGURATION AND MODE

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

In our opinion 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.

In our opinion 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	Thinkpad T43	L3-CL842	DoC
AC adapter	IBM	92P1020	11SP1020Z1ZBRM63EGJA	DoC

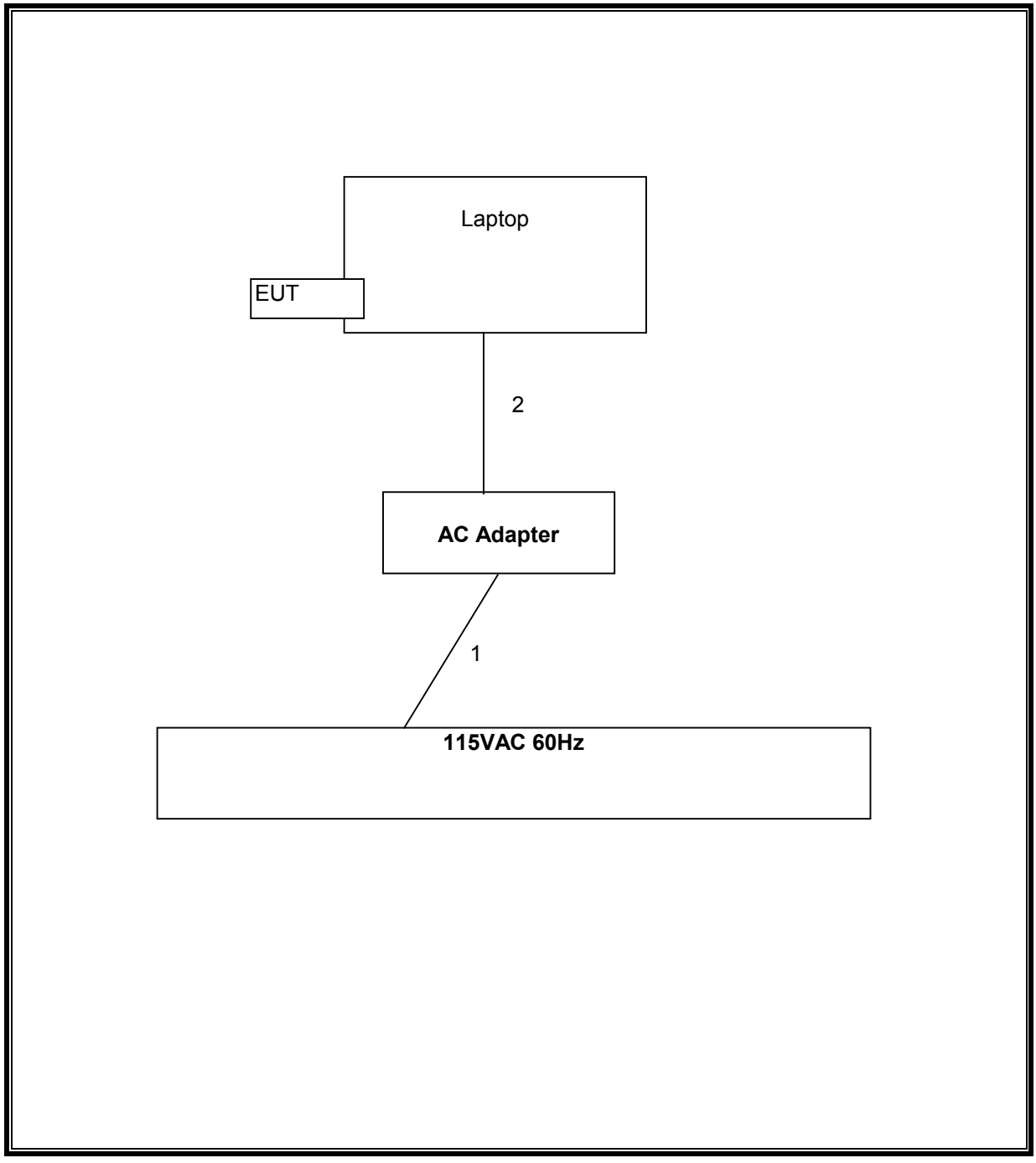
I/O CABLES

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 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, Horn 1 ~ 18 GHz	EMCO	3115	6717	4/22/2007
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00561	10/3/2007
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	US42510266	10/18/2007
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	8/13/2007
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	2/4/2007
RF Filter Section	Agilent / HP	85420E	3705A00256	2/4/2007
Peak Power Meter	Agilent / HP	E4416A	GB41291160	12/2/2007
Peak / Average Power Sensor	Agilent	E9327A	US40440755	12/2/2007
Antenna, Horn 18 ~ 26 GHz	ARA	MWH-1826/B	1049	4/22/2007
Preamplifier, 26 ~ 40 GHz	Miteq	NSP4000-SP2	924343	8/24/2007
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	9/15/2007
EMI Test Receiver	R & S	ESHS 20	827129/006	1/27/2008
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00369	8/1/2007
Antenna, Horn 26 ~ 40 GHz	ARA	MWH-2640/B	1029	4/13/2007

7. LIMITS AND RESULTS

7.1. CHANNEL TESTS FOR THE 5150 TO 5250 MHz BAND

7.1.1. 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.

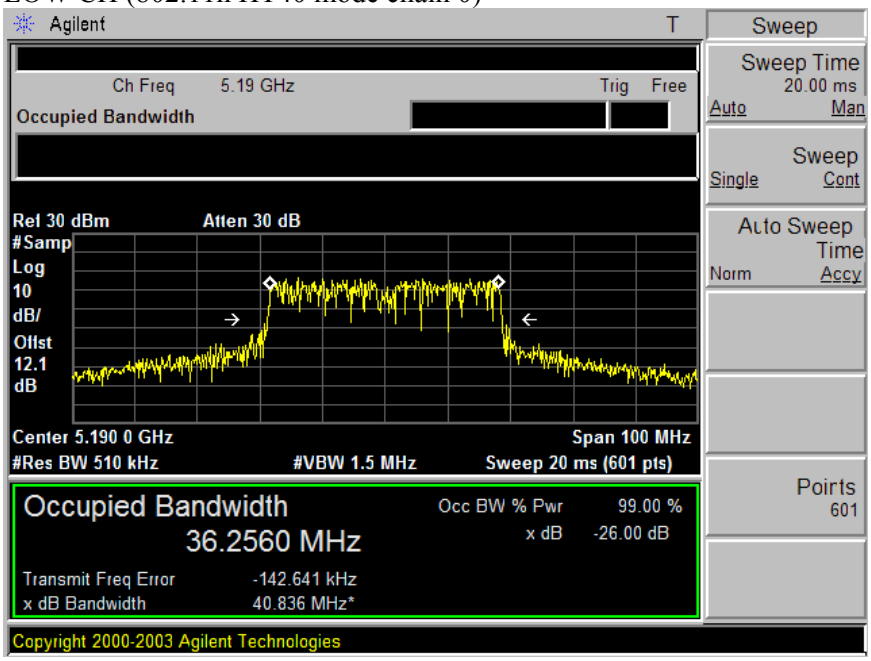
RESULTS

No non-compliance noted:

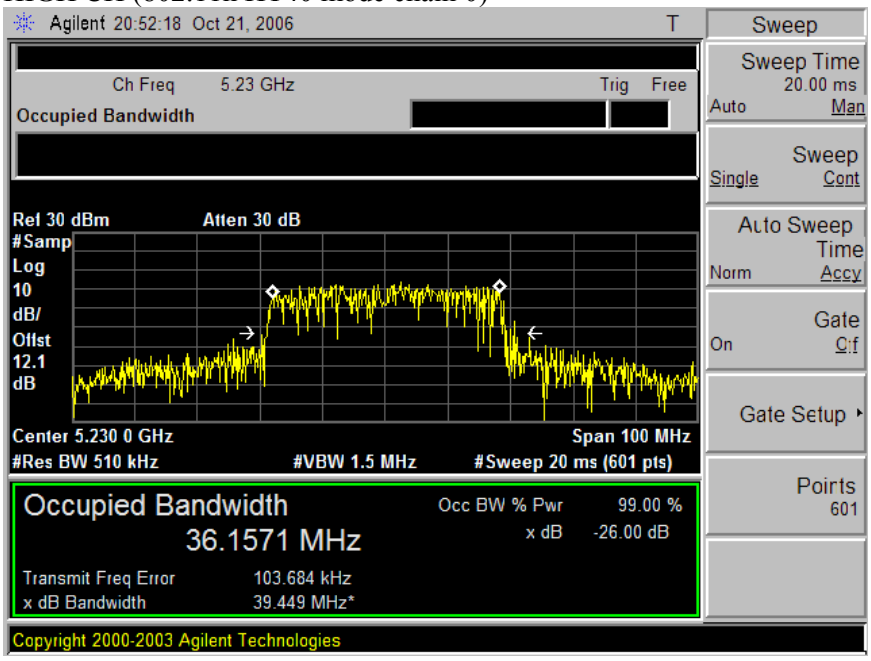
Mode Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 2 (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 2 (MHz)	Worst Case 10 Log B (dB)
802.11n HT40 Mode						
Low	5190	36.256	36.5291	40.836	41.228	16.15
High	5230	36.1571	36.3778	39.449	39.635	15.98

(802.11 HT40 MODE CHAIN 0)

LOW CH (802.11n HT40 mode chain 0)

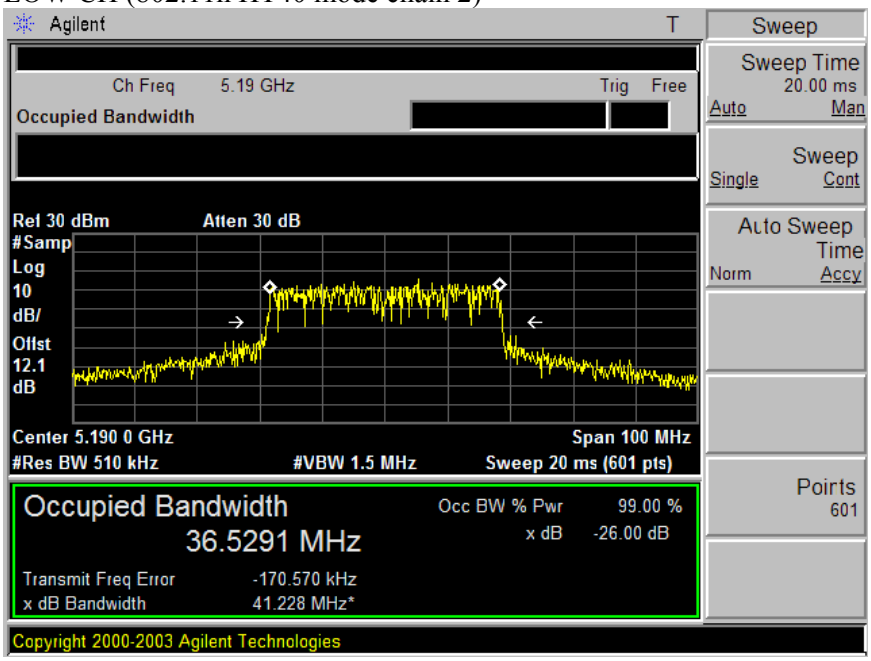


HIGH CH (802.11n HT40 mode chain 0)

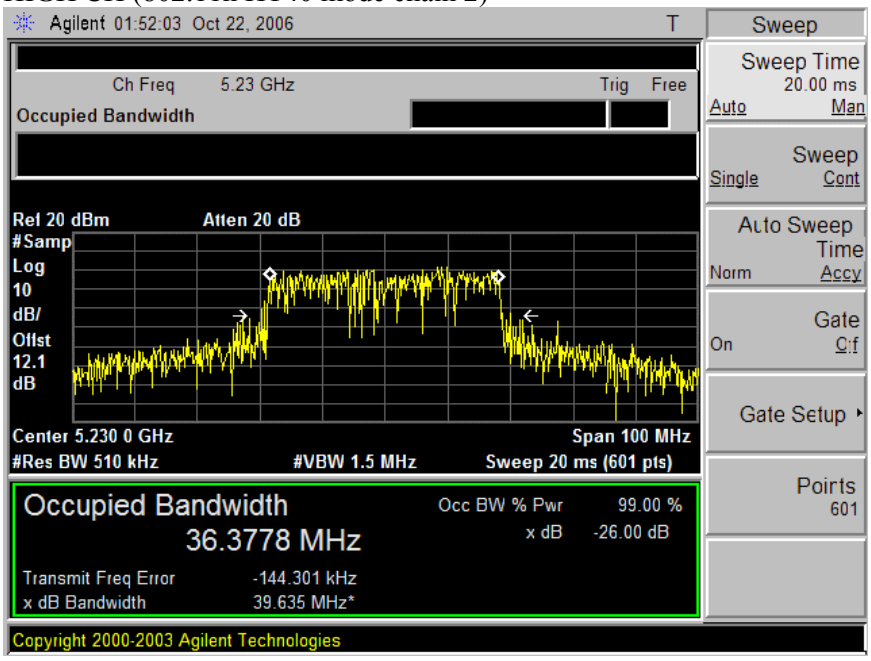


(802.11 HT40 MODE CHAIN 2)

LOW CH (802.11n HT40 mode chain 2)



HIGH CH (802.11n HT40 mode chain 2)



7.1.2. MAXIMUM POWER

LIMIT

§15.407 (a) (1) For the band 5.15-5.25 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407 (a) (1) For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output 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))

LIMITS AND RESULTS

No non-compliance noted:

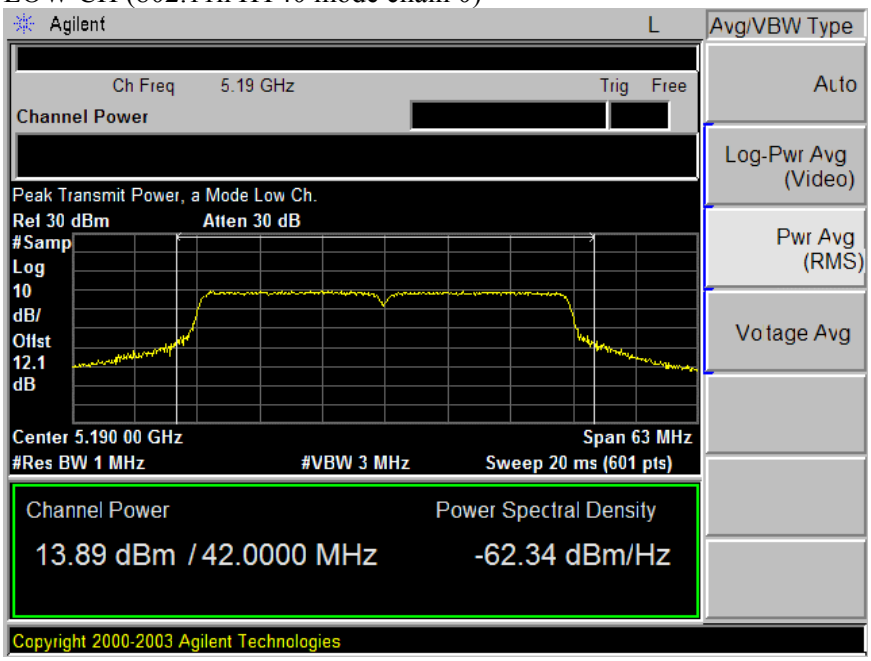
5150 to 5250 Band

Fixed Limit (dBm)	17
Antenna Gain (dBi)	2
10 Log (# Tx Chains)	3.01
Effective Legacy Gain	5.01

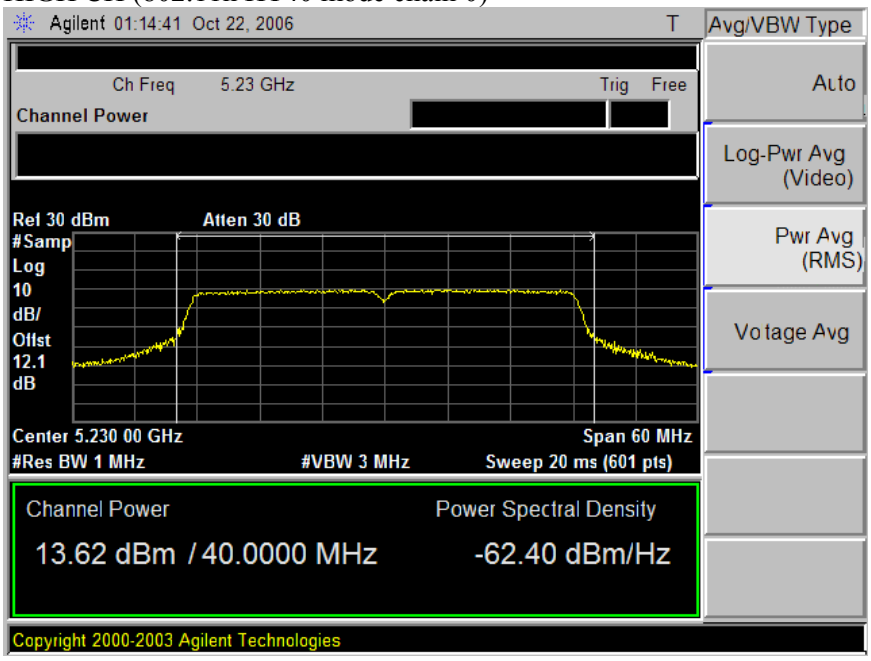
Mode Chan	Freq (MHz)	10LogB (dBm)	4+10LogB / 11+10LogB Limit (dBm)	Limit (dBm)	Chain 0 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Margin (dB)
802.11n HT40 Mode								
Low	5190	16.15	20.15	17.00	13.89	13.55	16.73	-0.27
High	5230	16.2	20.20	17.00	13.62	13.65	16.65	-0.35

(802.11 HT40 MODE CHAIN 0)

LOW CH (802.11n HT40 mode chain 0)

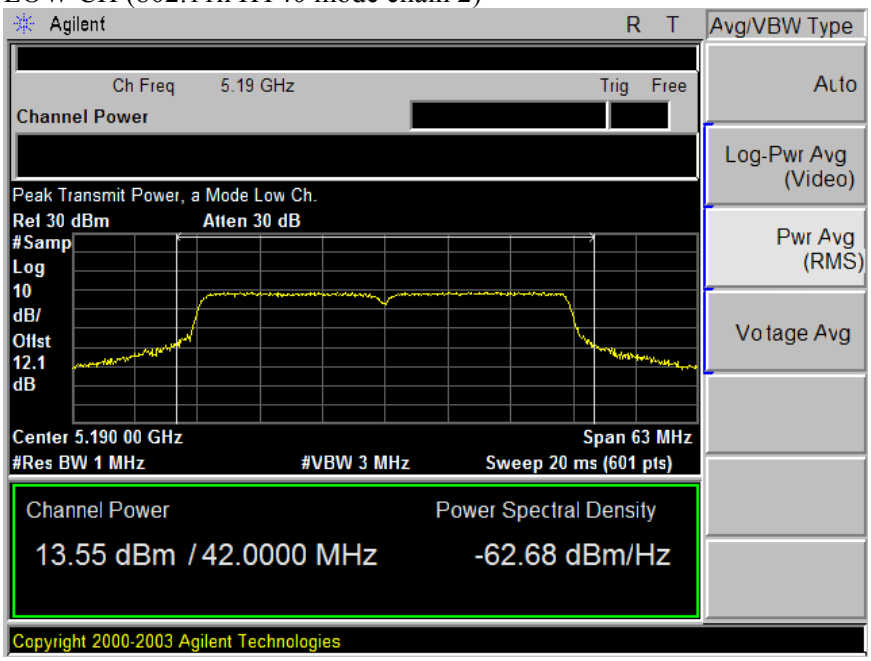


HIGH CH (802.11n HT40 mode chain 0)

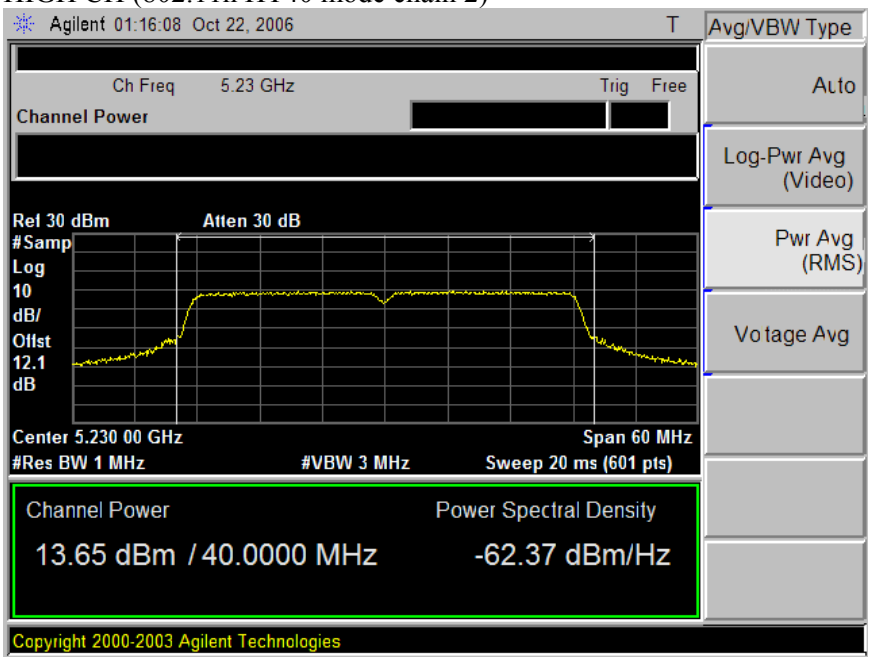


(802.11 HT40 MODE CHAIN 2)

LOW CH (802.11n HT40 mode chain 2)



HIGH CH (802.11n HT40 mode chain 2)



7.1.3. 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 12.1 dB (including 10 dB pad and 2.1 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)
802.11n HT40 Mode				
Low	5190	14.0	13.1	16.6
High	5230	13.8	13.6	16.7

7.1.4. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.407 (a) (1) For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407 (a) (1) For the band 5.25-5.35 GHz, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

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:

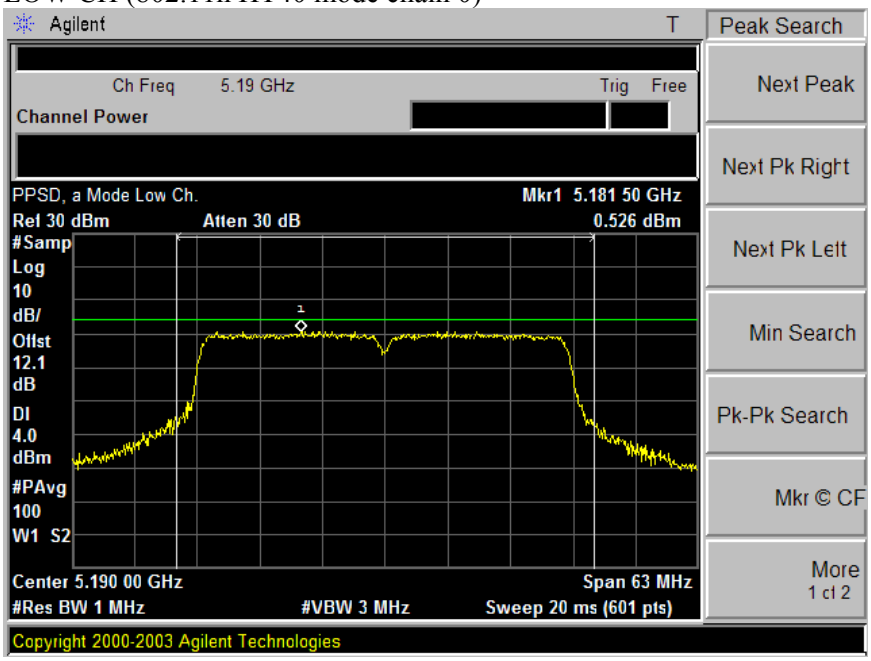
5150 to 5250 Band

Antenna Gain (dBi)	-0.2
10 Log (# Tx Chains)	3.01
Effective Legacy Gain	2.81

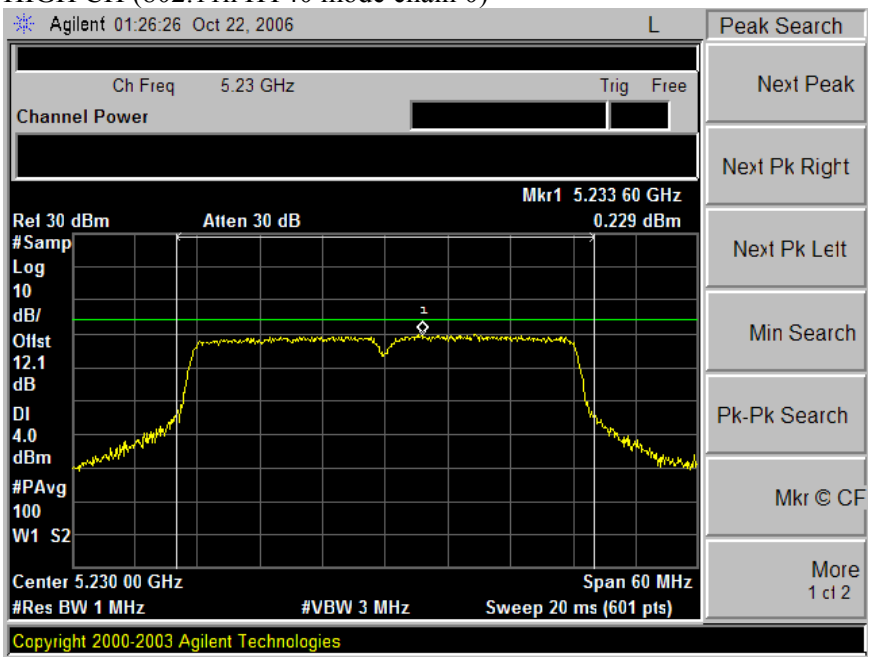
Mode Channel	Frequency (MHz)	PPSD Chain 0 (dBm)	PPSD Chain 2 (dBm)	PPSD Total (dBm)	Limit (dBm)	Margin (dB)
802.11n HT40 Mode						
Low	5190	0.53	-0.58	3.02	4.00	-0.98
High	5230	0.23	-0.10	3.08	4.00	-0.92

(802.11 HT40 MODE CHAIN 0)

LOW CH (802.11n HT40 mode chain 0)

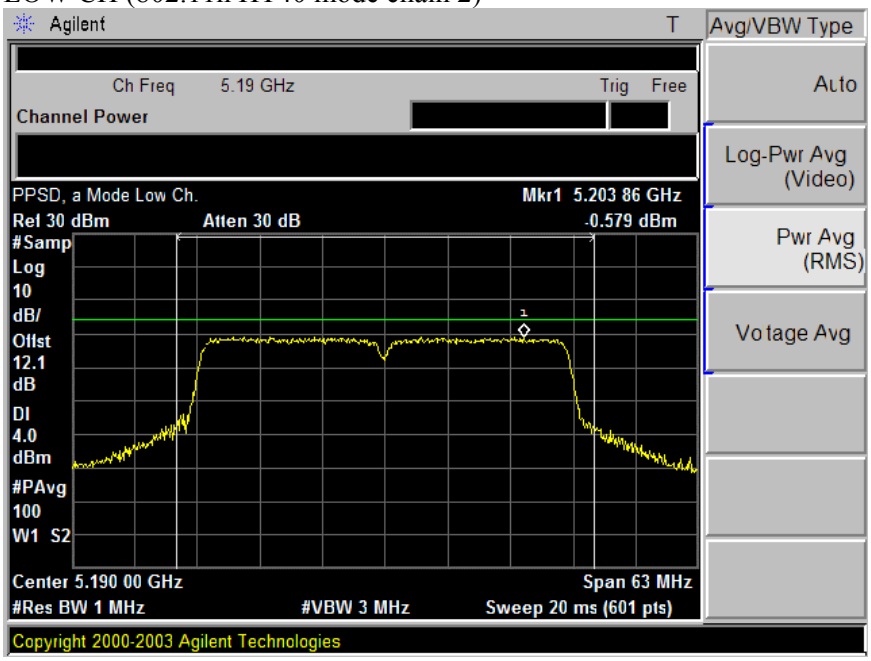


HIGH CH (802.11n HT40 mode chain 0)

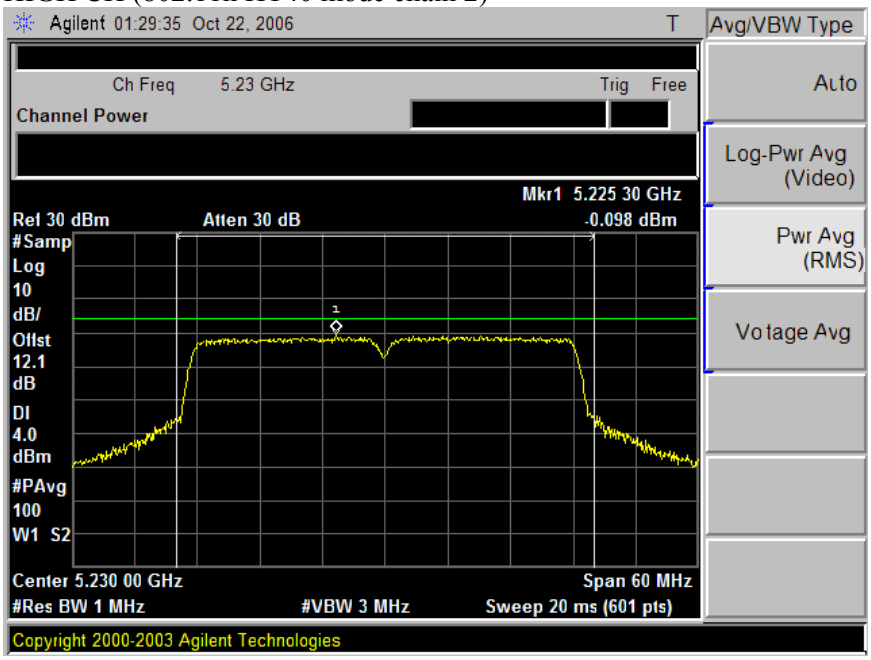


(802.11 HT40 MODE CHAIN 2)

LOW CH (802.11n HT40 mode chain 2)



HIGH CH (802.11n HT40 mode chain 2)



7.1.5. PEAK EXCURSION

LIMIT

§15.407 (a) (6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

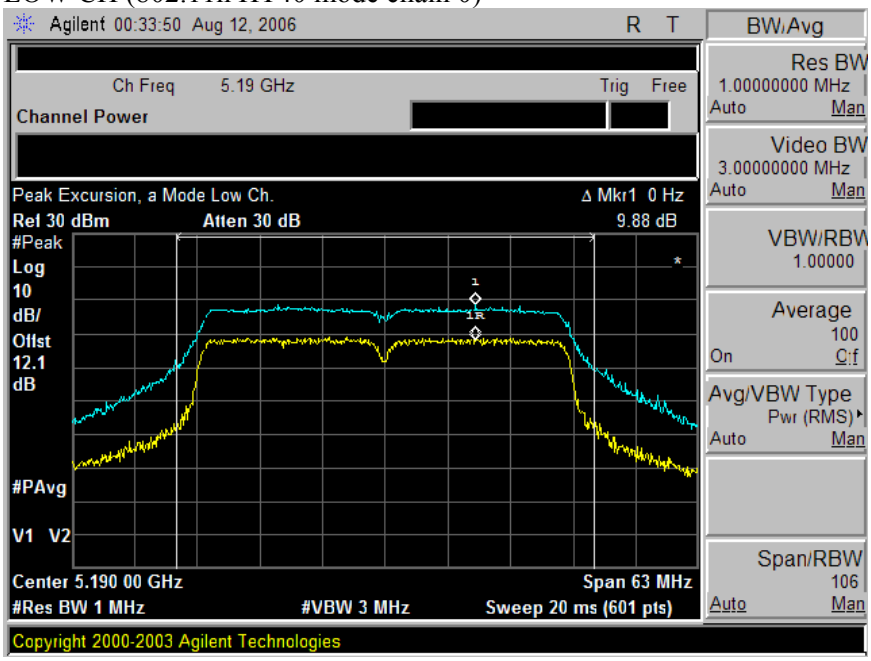
RESULTS

No non-compliance noted:

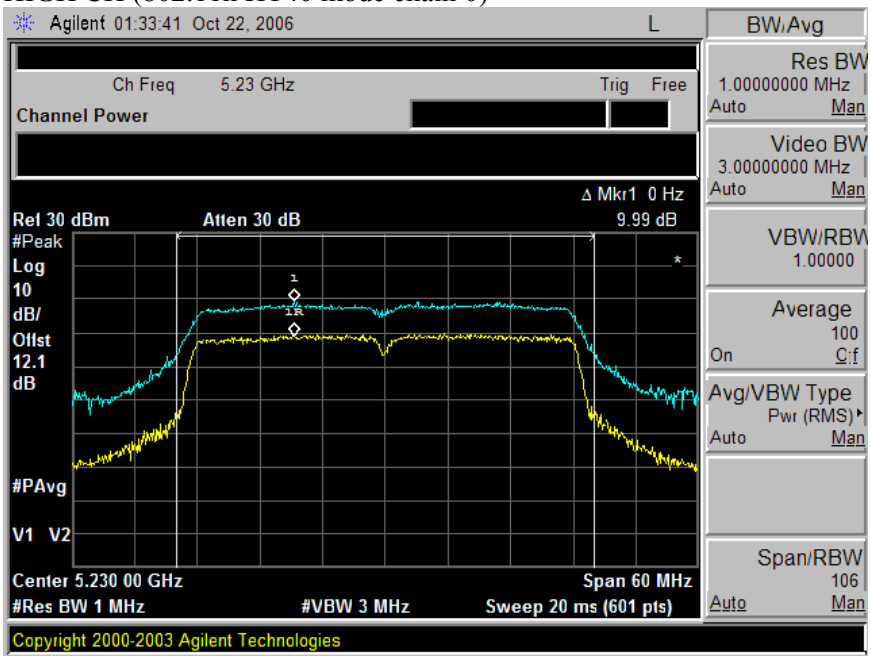
Mode Channel	Frequency (MHz)	Peak Excursion Chain 0 (dBm)	Peak Excursion Chain 2 (dBm)	Limit (dBm)	Worst Case Margin (dB)
802.11n HT40 Mode					
Low	5190	9.88	10.13	13	-2.87
High	5230	9.99	10.47	13	-2.53

(802.11 HT40 MODE CHAIN 0)

LOW CH (802.11n HT40 mode chain 0)

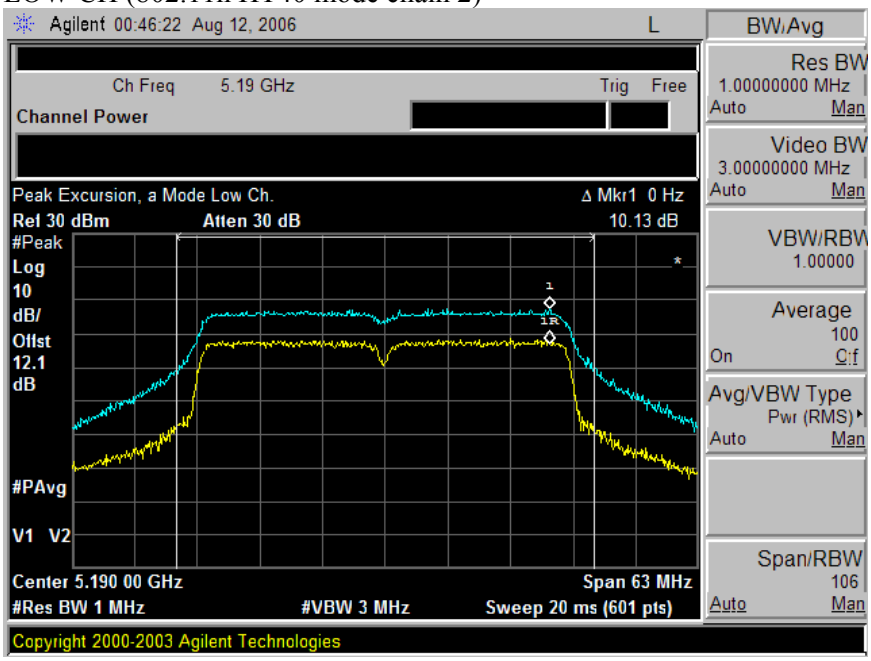


HIGH CH (802.11n HT40 mode chain 0)

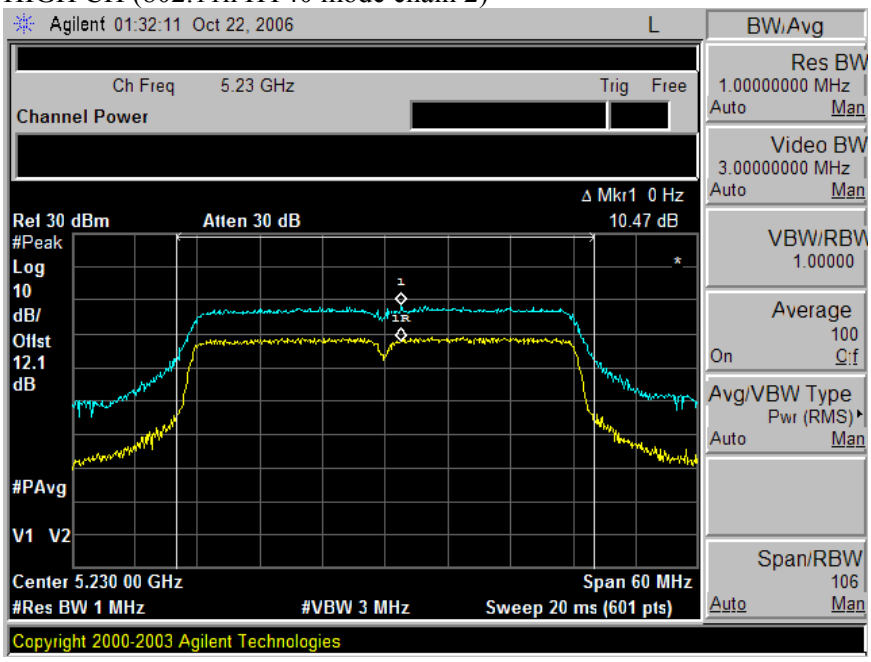


(802.11 HT40 MODE CHAIN 2)

LOW CH (802.11n HT40 mode chain 2)



HIGH CH (802.11n HT40 mode chain 2)



7.1.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.407 (b) (1 & 2) For transmitters operating in the 5.15-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27dBm / MHz.

TEST PROCEDURE

Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

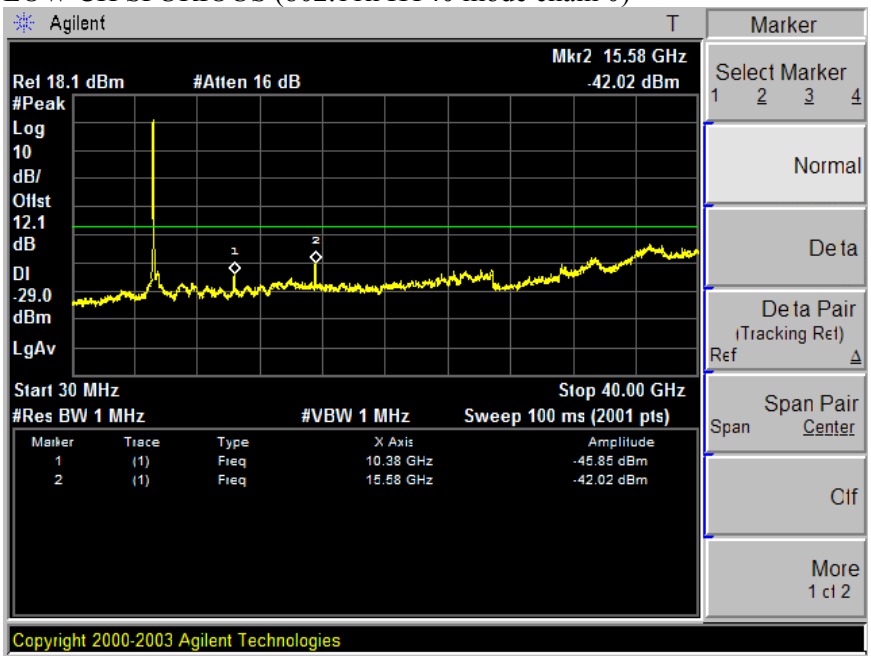
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

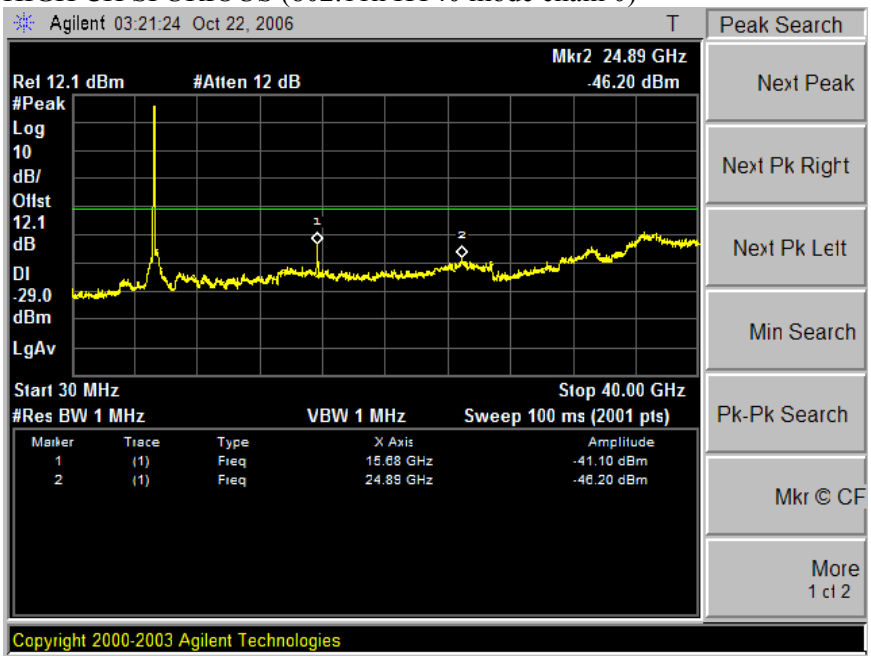
No non-compliance noted:

SPURIOUS EMISSIONS (802.11 HT40 MODE CHAIN 0)

LOW CH SPURIOUS (802.11n HT40 mode chain 0)

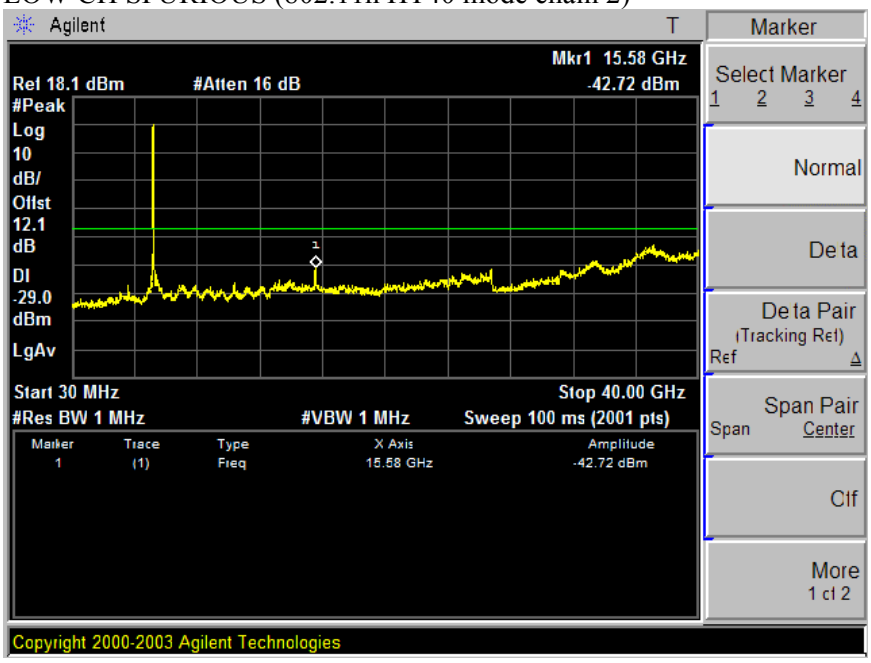


HIGH CH SPURIOUS (802.11n HT40 mode chain 0)

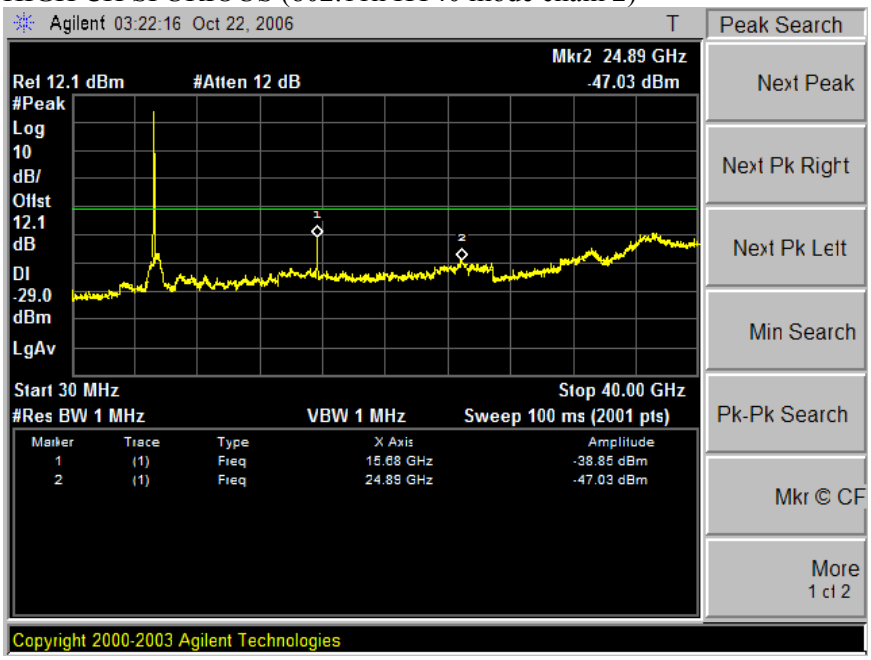


SPURIOUS EMISSIONS (802.11 HT40 MODE CHAIN 2)

LOW CH SPURIOUS (802.11n HT40 mode chain 2)

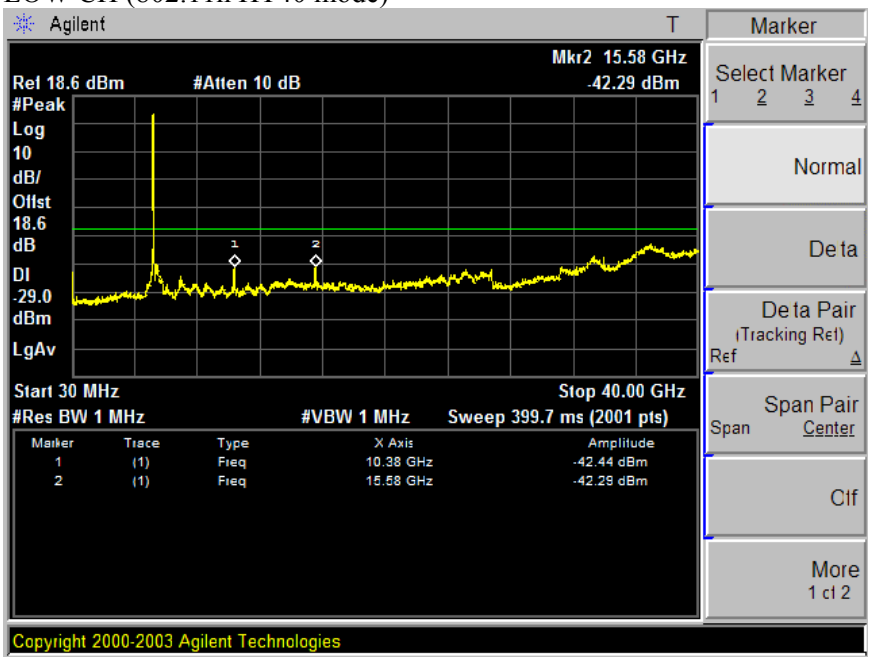


HIGH CH SPURIOUS (802.11n HT40 mode chain 2)

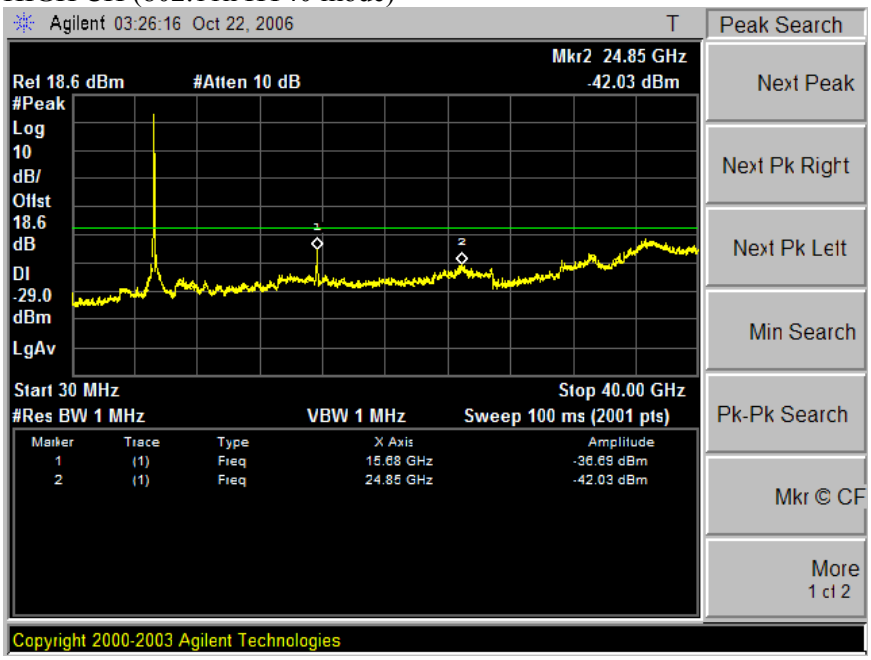


SPURIOUS EMISSIONS (802.11 HT40 MODE COMBINED)

LOW CH (802.11n HT40 mode)



HIGH CH (802.11n HT40 mode)



7.2. CHANNEL TESTS FOR THE 5150 TO 5350 MHz BAND

7.2.1. 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.

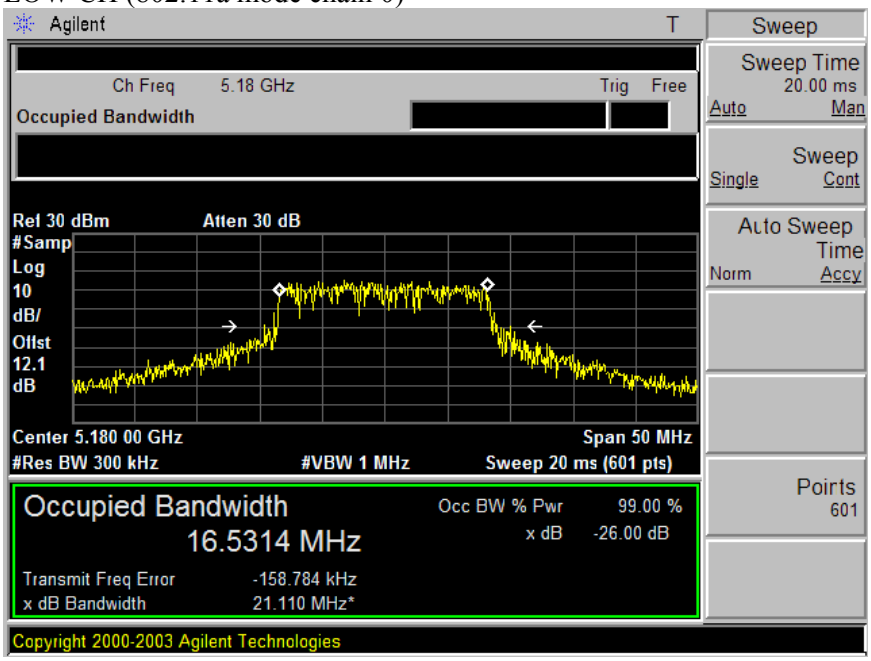
RESULTS

No non-compliance noted:

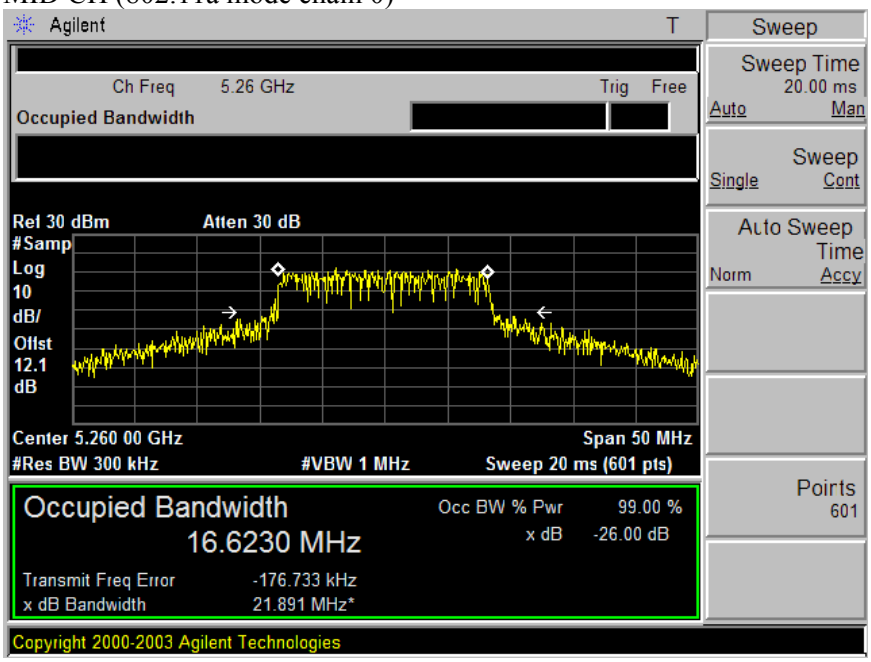
Mode Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 2 (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 2 (MHz)	Worst Case 10 Log B (dB)
802.11a Mode						
Low	5180	16.5314	16.483	21.11	21.505	13.33
Middle	5260	16.623	16.5094	21.891	20.622	13.40
High	5320	16.4876	16.4652	20.982	21.629	13.35
802.11n HT20 Mode						
Low	5180	17.6473	17.7936	20.067	21.172	13.26
Mid	5260	17.615	17.6594	21.212	21.204	13.27
High	5320	17.728	17.7429	21.52	21.499	13.33

(802.11a MODE CHAIN 0)

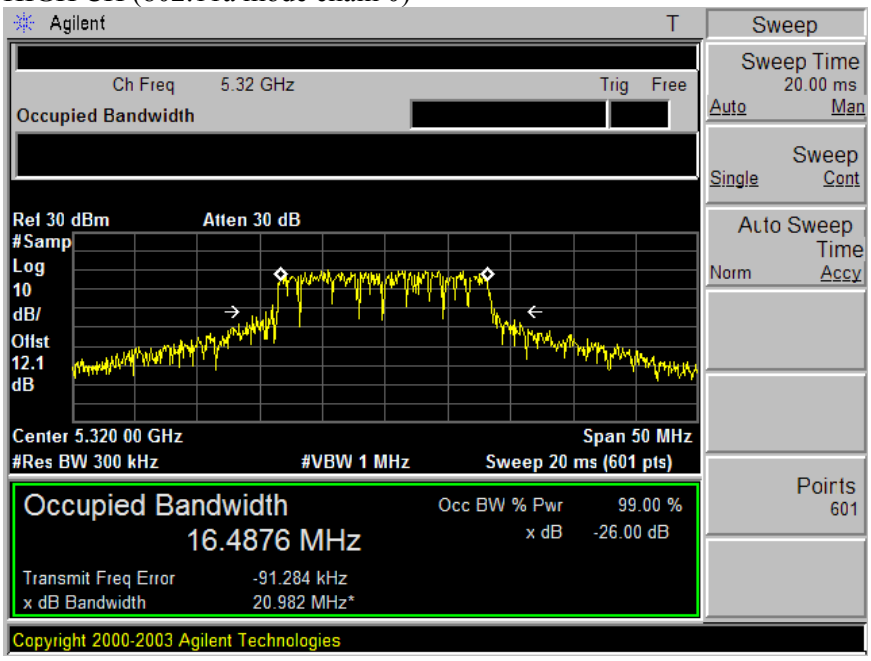
LOW CH (802.11a mode chain 0)



MID CH (802.11a mode chain 0)

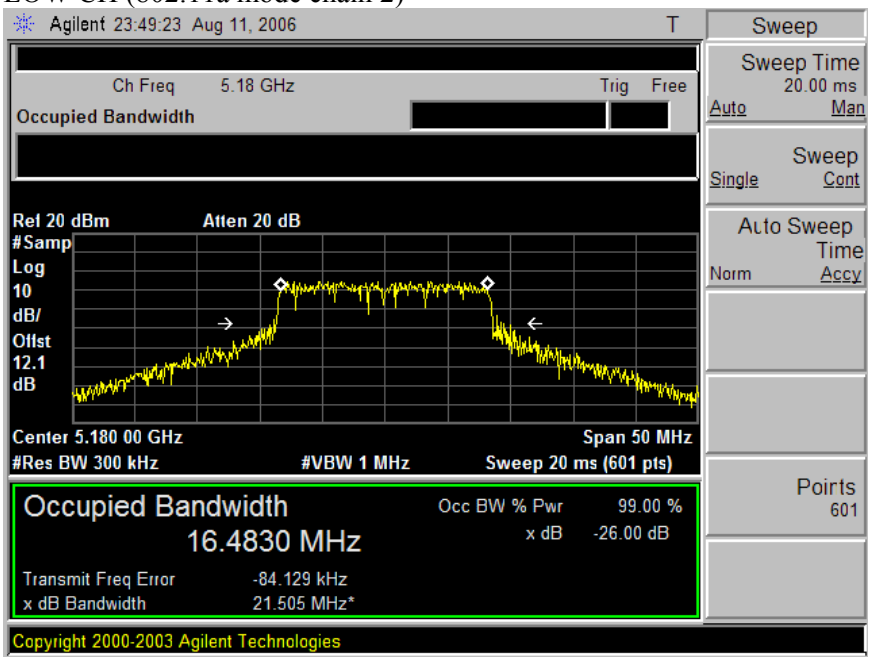


HIGH CH (802.11a mode chain 0)

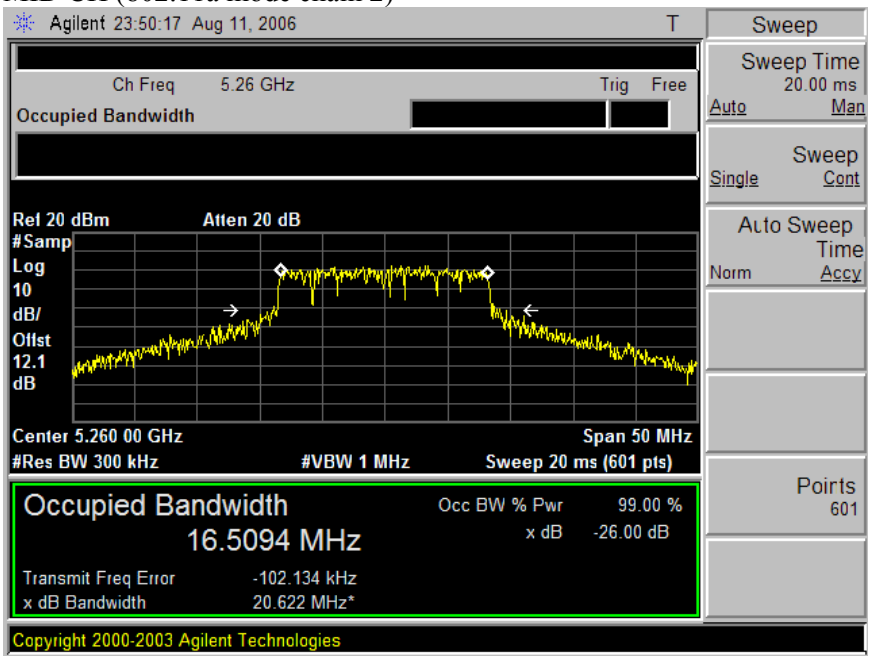


(802.11a MODE CHAIN 2)

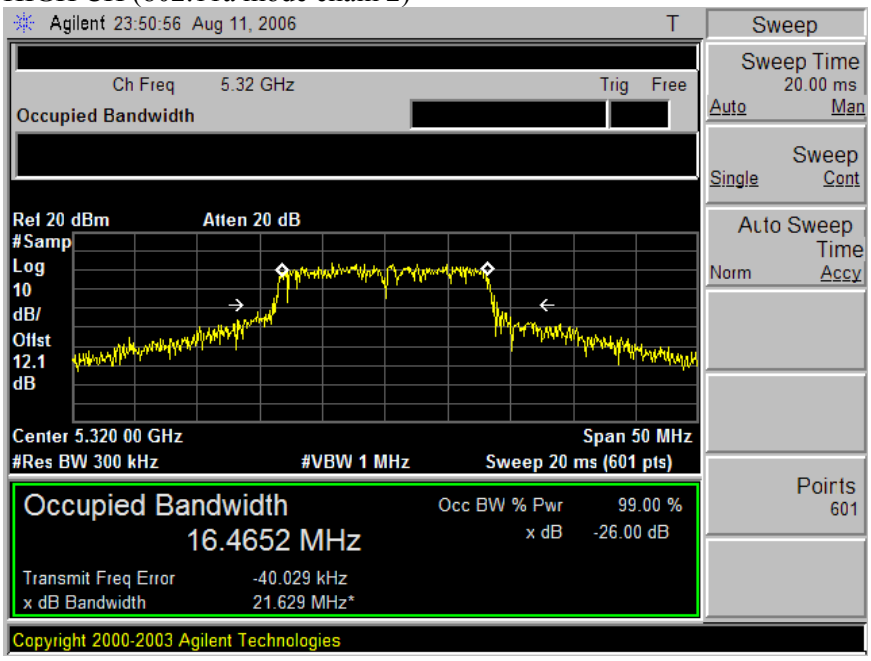
LOW CH (802.11a mode chain 2)



MID CH (802.11a mode chain 2)

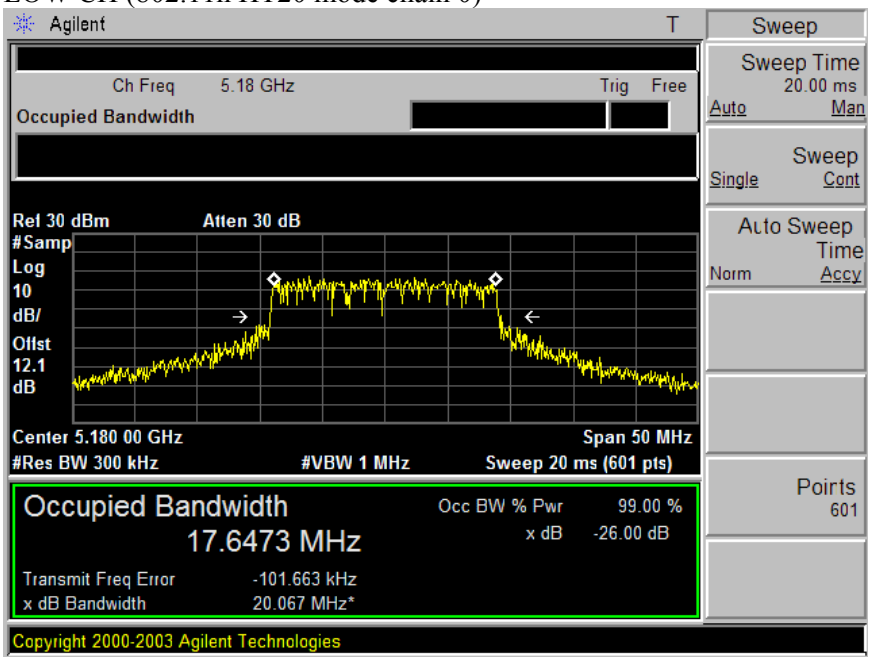


HIGH CH (802.11a mode chain 2)

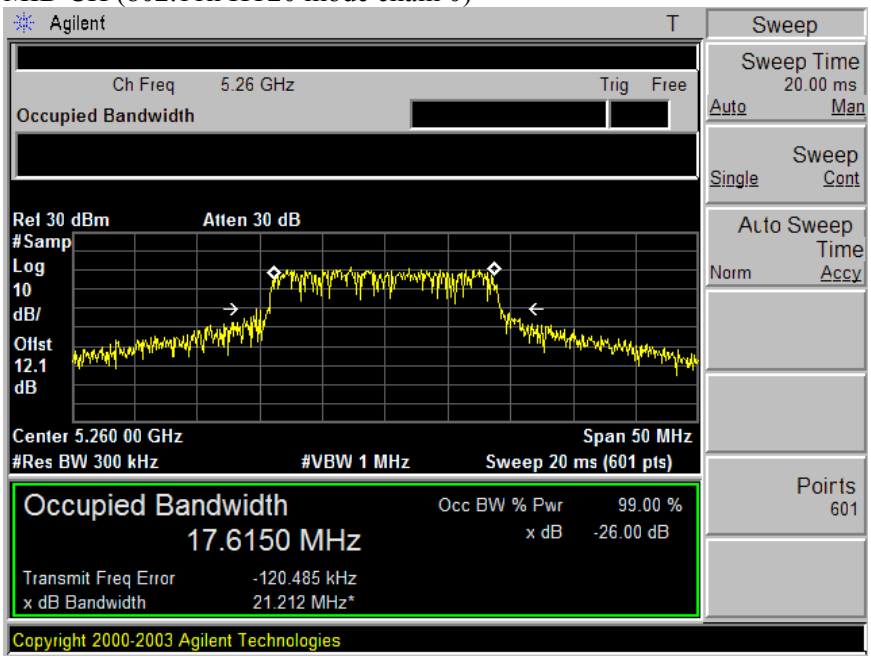


(802.11n HT20 MODE CHAIN 0)

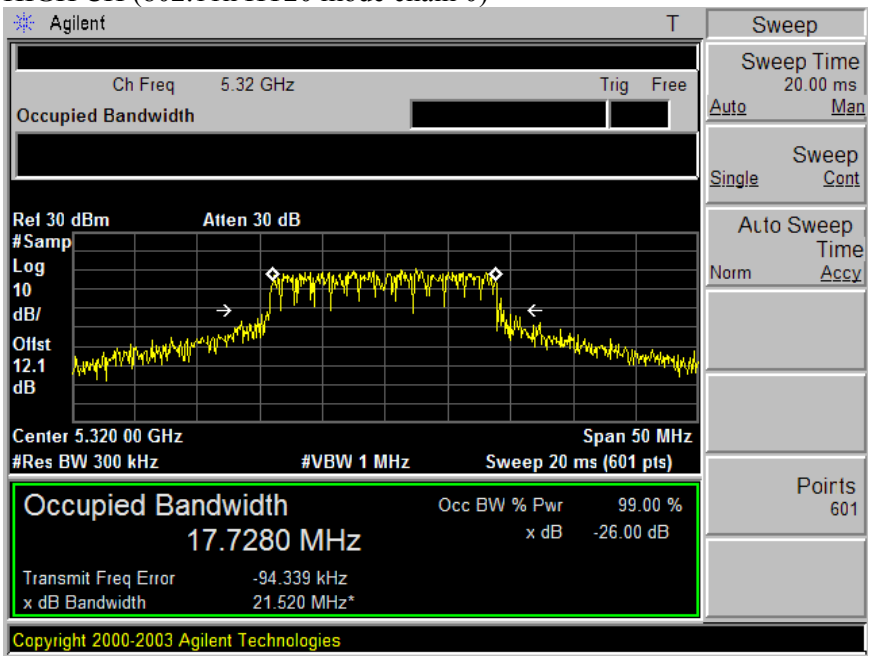
LOW CH (802.11n HT20 mode chain 0)



MID CH (802.11n HT20 mode chain 0)

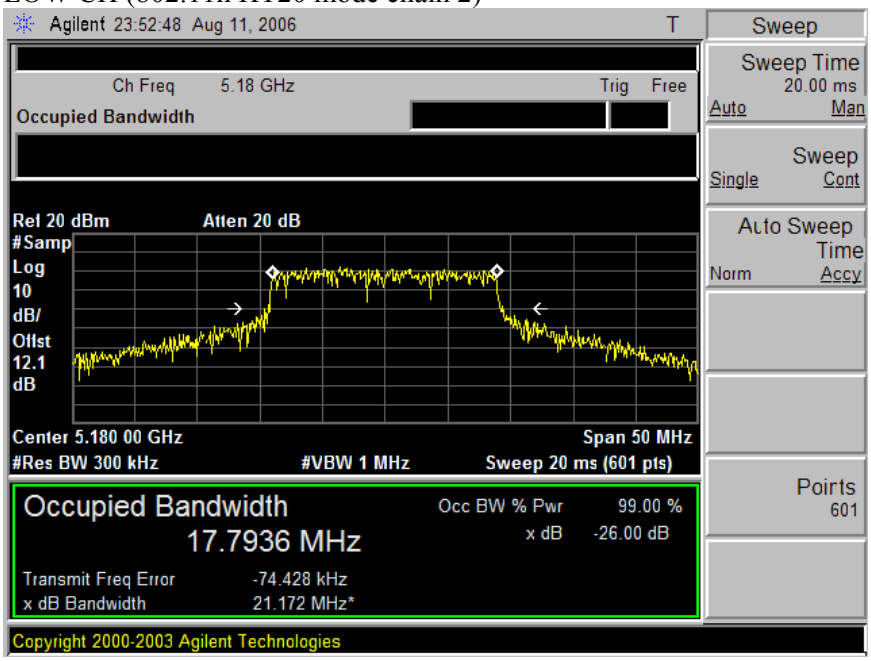


HIGH CH (802.11n HT20 mode chain 0)

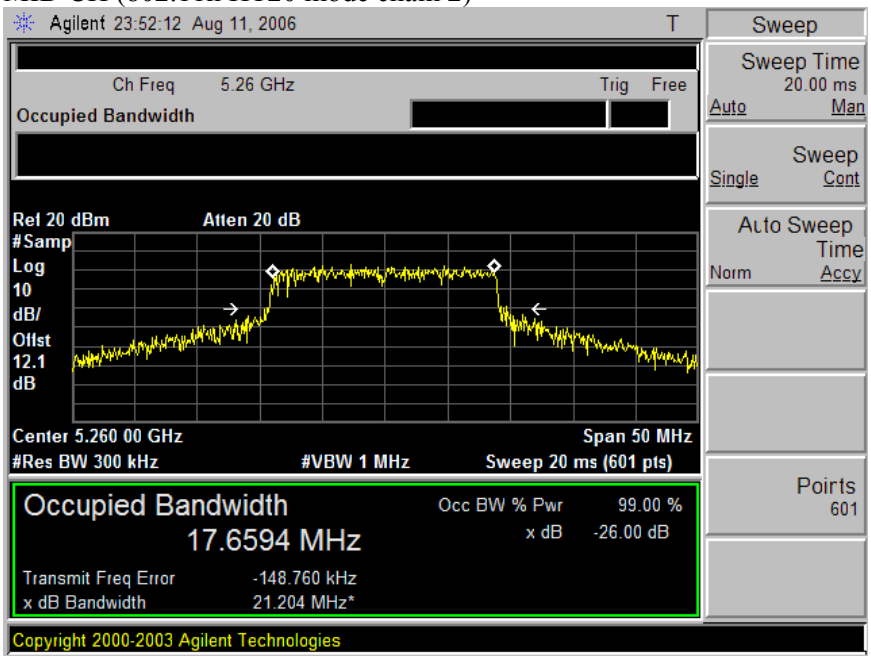


(802.11 HT20 MODE CHAIN 2)

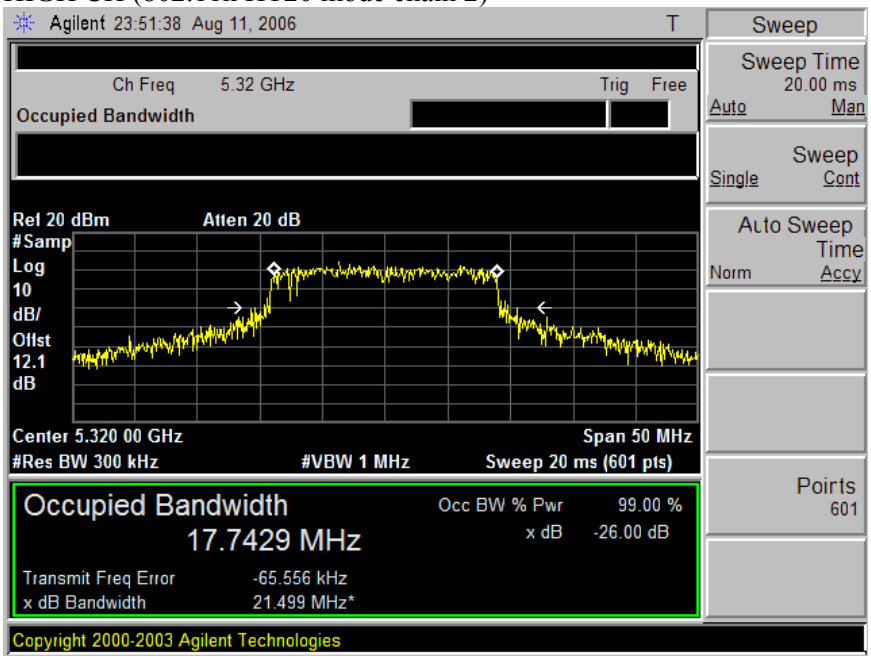
LOW CH (802.11n HT20 mode chain 2)



MID CH (802.11n HT20 mode chain 2)



HIGH CH (802.11n HT20 mode chain 2)



7.2.2. MAXIMUM POWER

LIMIT

§15.407 (a) (1) For the band 5.15-5.25 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407 (a) (1) For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output 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))

LIMITS AND RESULTS

No non-compliance noted:

5150 to 5250 Band

Fixed Limit (dBm)	17
Antenna Gain (dBi)	2
10 Log (# Tx Chains)	3.01
Effective Legacy Gain	5.01

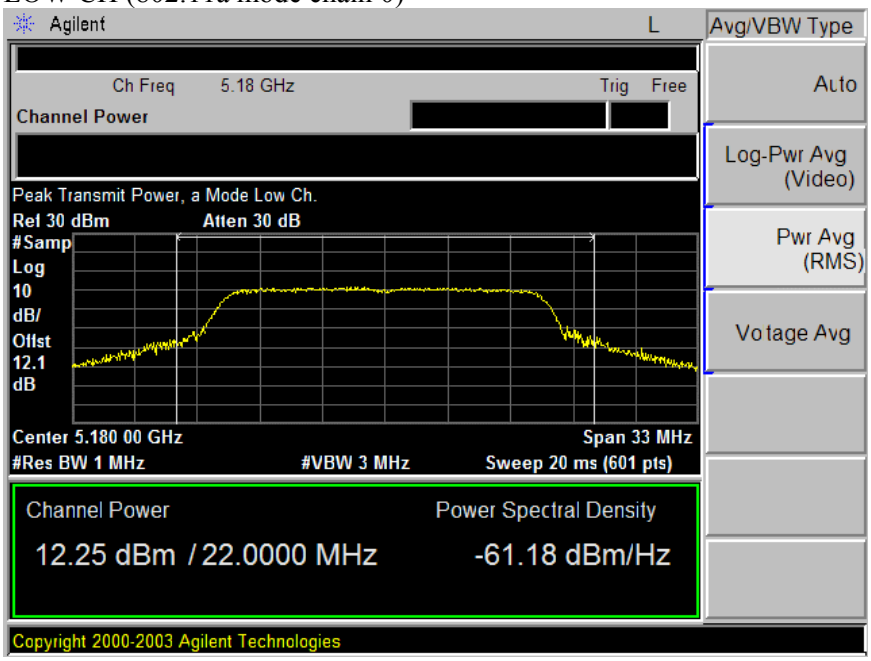
5250 to 5350 Band

Fixed Limit (dBm)	24
Antenna Gain (dBi)	2
10 Log (# Tx Chains)	3.01
Effective Legacy Gain	5.01

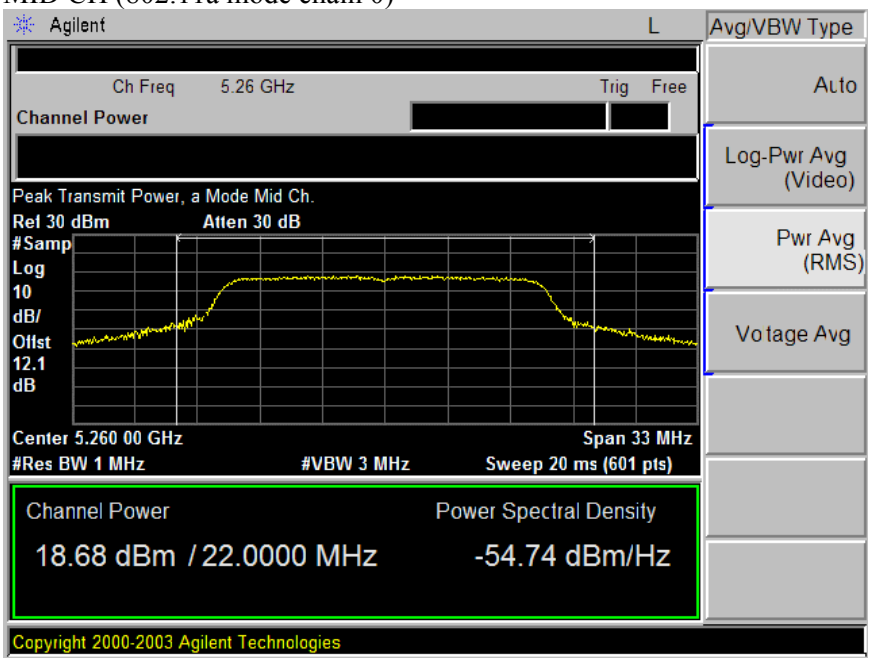
Mode Chan	Freq (MHz)	10LogB (dBm)	4+10LogB / 11+10LogB Limit (dBm)	Limit (dBm)	Chain 0 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Margin (dB)
802.11a Mode								
Low	5180	13.33	17.33	17.00	12.25	10.91	14.64	-2.36
Mid	5260	13.4	24.40	24.00	18.68	17.53	21.15	-2.85
High	5320	13.35	24.35	24.00	17.62	17.46	20.55	-3.45
802.11n HT20 Mode								
Low	5180	13.26	17.26	17.00	12.16	11.68	14.94	-2.06
Mid	5260	13.27	24.27	24.00	18.67	17.36	21.07	-2.93
High	5320	13.33	24.33	24.00	17.87	17.71	20.80	-3.20

(802.11a MODE CHAIN 0)

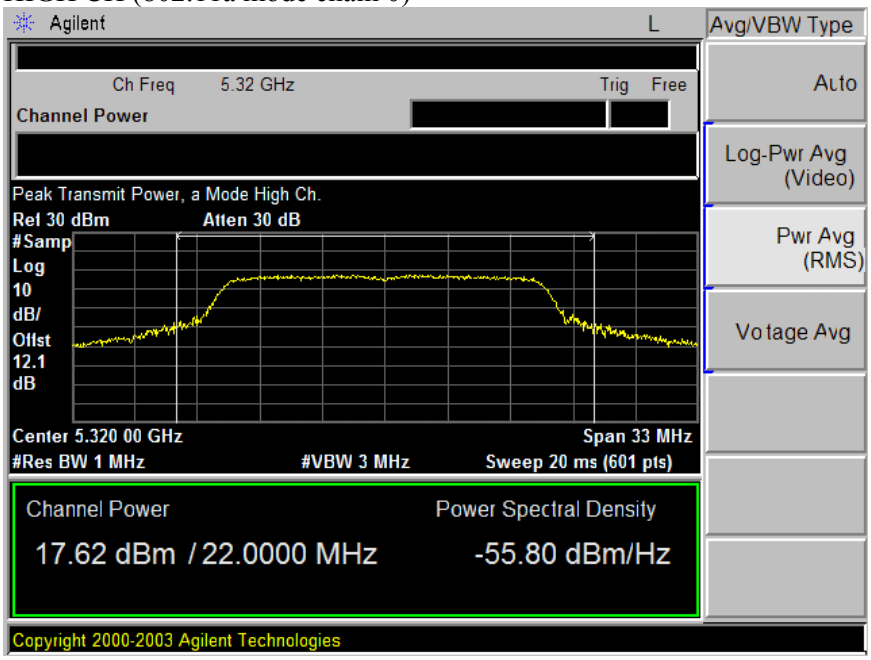
LOW CH (802.11a mode chain 0)



MID CH (802.11a mode chain 0)

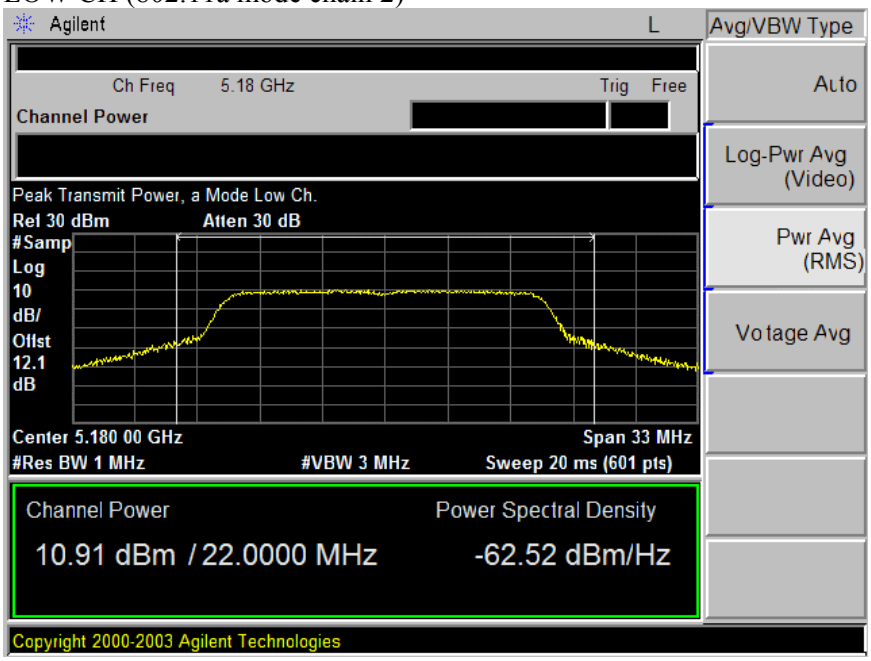


HIGH CH (802.11a mode chain 0)

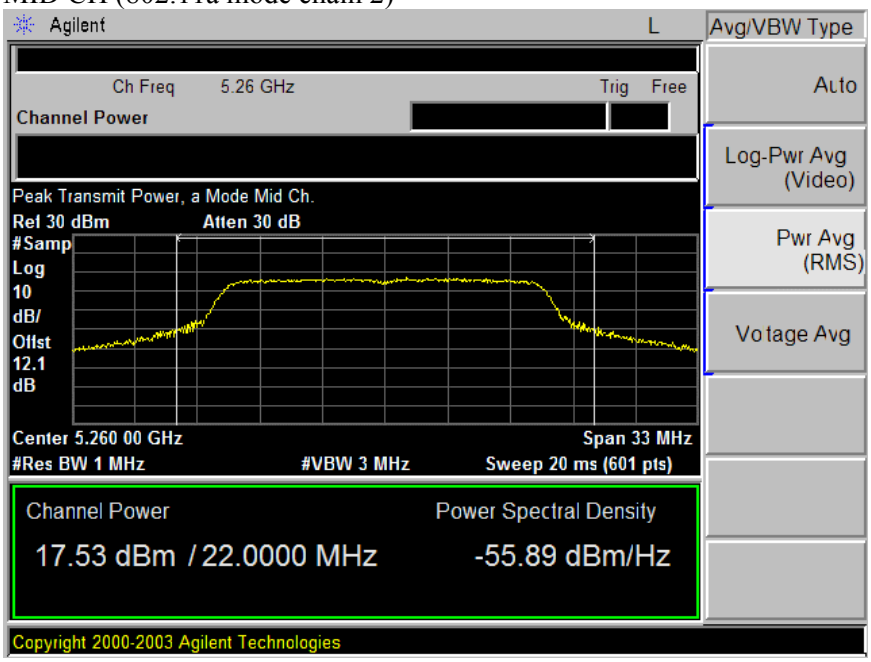


(802.11a MODE CHAIN 2)

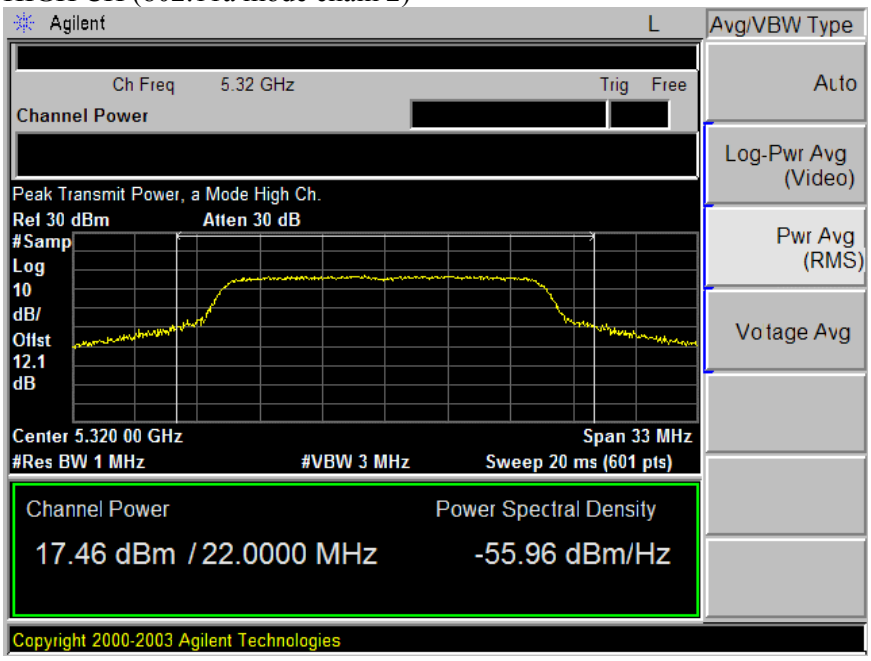
LOW CH (802.11a mode chain 2)



MID CH (802.11a mode chain 2)

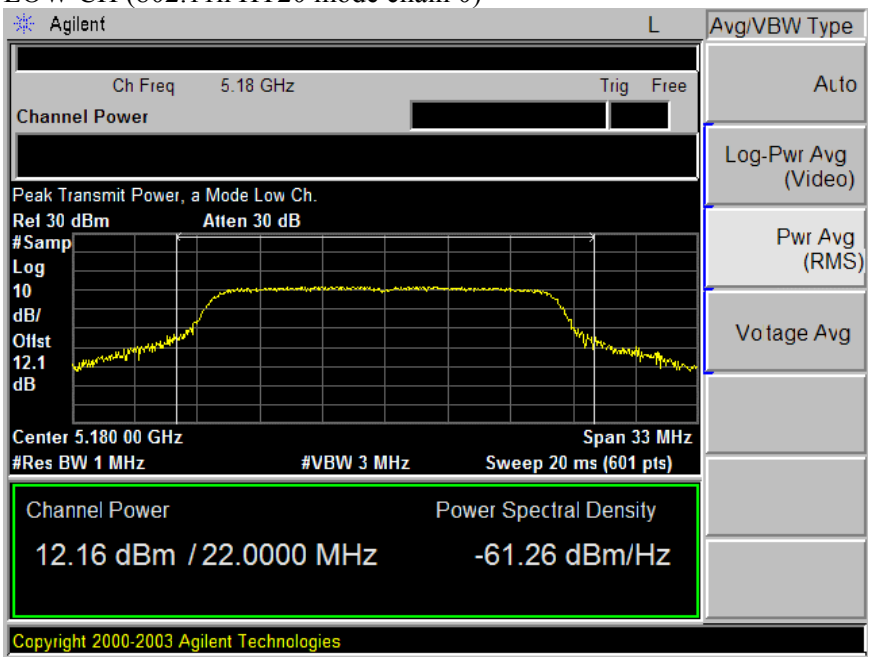


HIGH CH (802.11a mode chain 2)

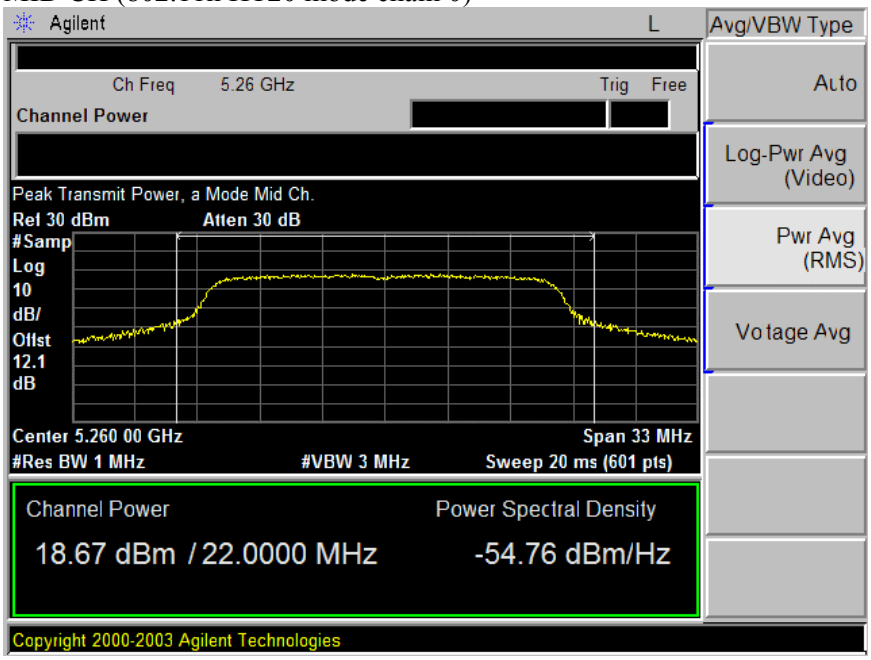


(802.11n HT20 MODE CHAIN 0)

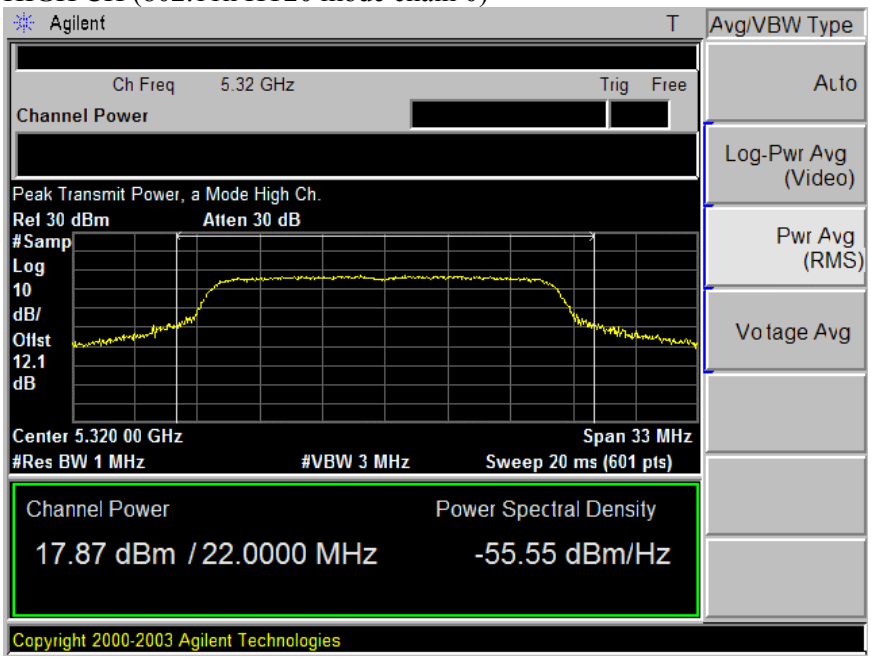
LOW CH (802.11n HT20 mode chain 0)



MID CH (802.11n HT20 mode chain 0)

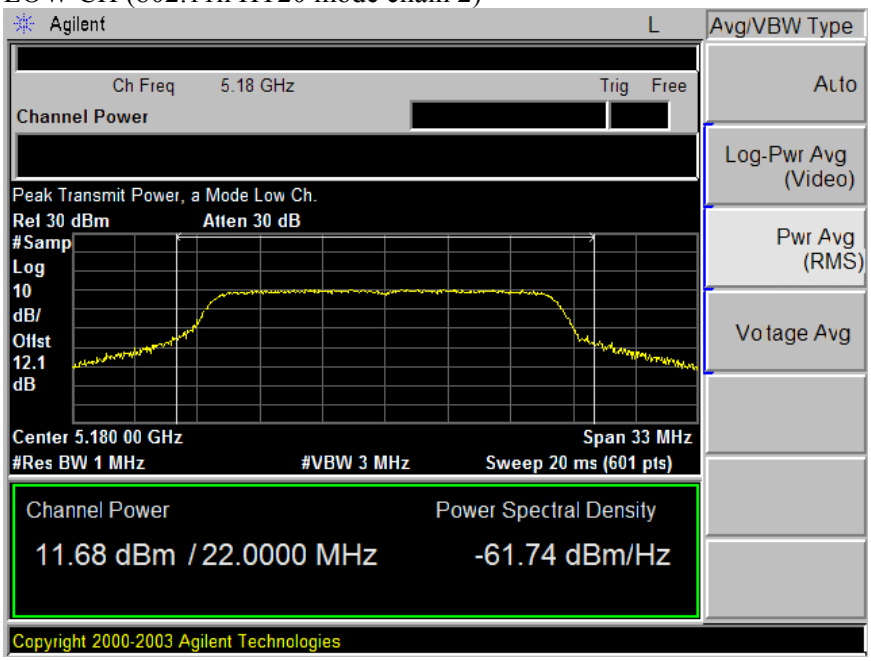


HIGH CH (802.11n HT20 mode chain 0)

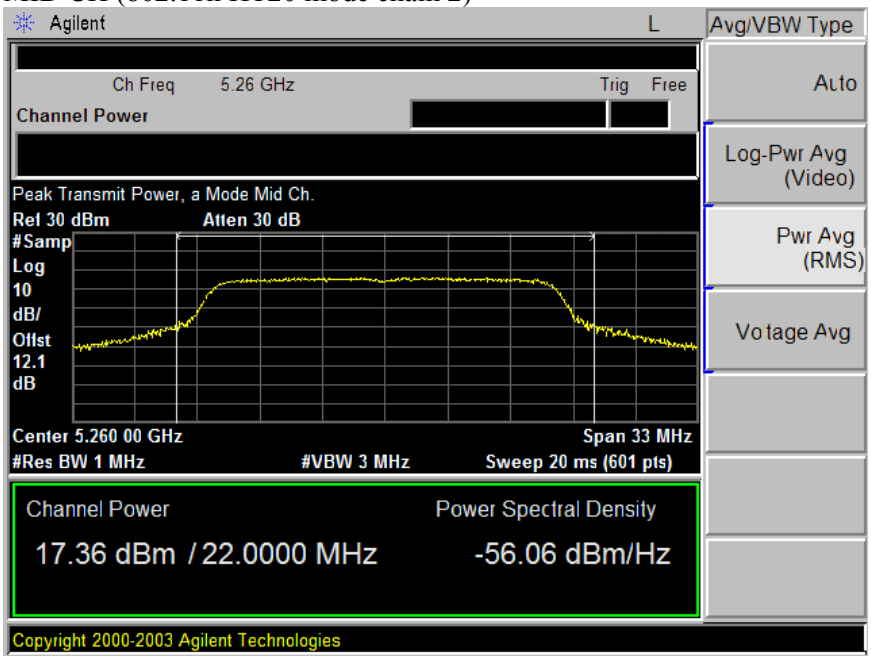


(802.11 HT20 MODE CHAIN 2)

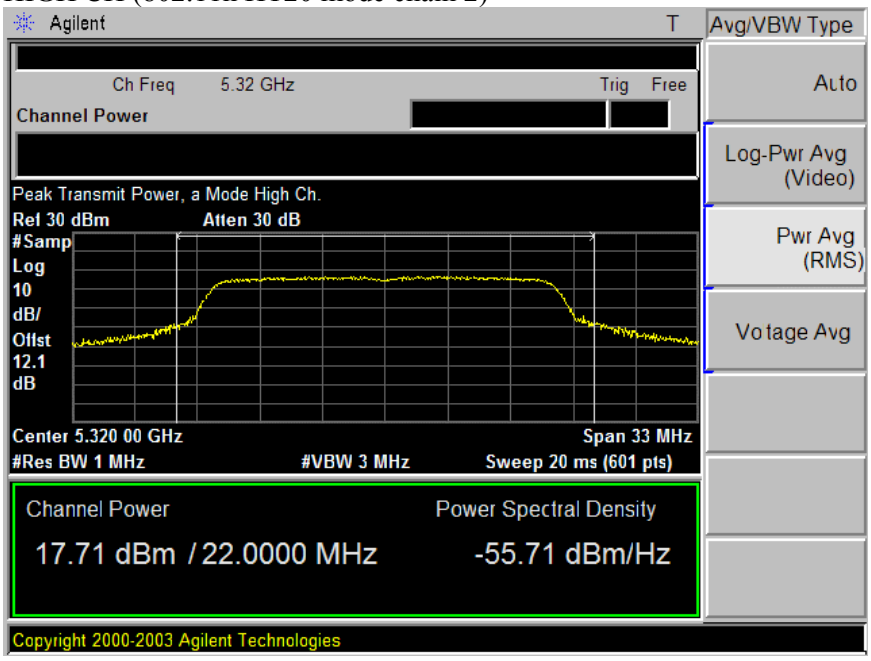
LOW CH (802.11n HT20 mode chain 2)



MID CH (802.11n HT20 mode chain 2)



HIGH CH (802.11n HT20 mode chain 2)



7.2.3. 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 12.1 dB (including 10 dB pad and 2.1 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)
802.11a Mode				
Low	5180	11.4	10.5	14.0
Middle	5260	18.6	17.0	20.9
High	5320	17.5	17.2	20.4
802.11n HT20 Mode				
Low	5180	11.8	11.0	14.4
Middle	5260	18.5	17.0	20.8
High	5320	17.4	17.1	20.3

7.2.4. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.407 (a) (1) For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407 (a) (1) For the band 5.25-5.35 GHz, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

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:

5150 to 5250 Band

Antenna Gain (dBi)	-0.2
10 Log (# Tx Chains)	3.01
Effective Legacy Gain	2.81

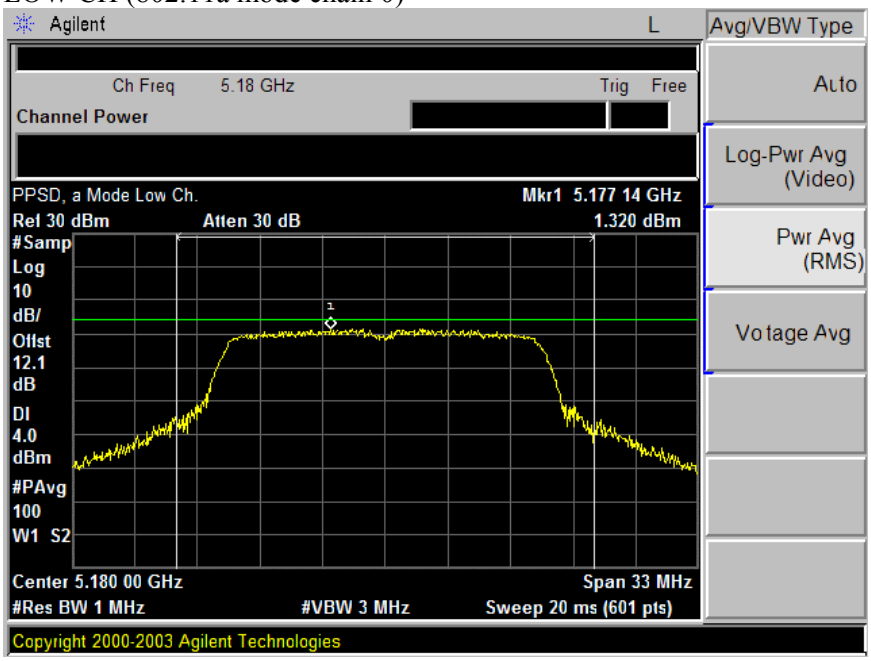
5250 to 5350 Band

Antenna Gain (dBi)	-0.2
10 Log (# Tx Chains)	3.01
Effective Legacy Gain	2.81

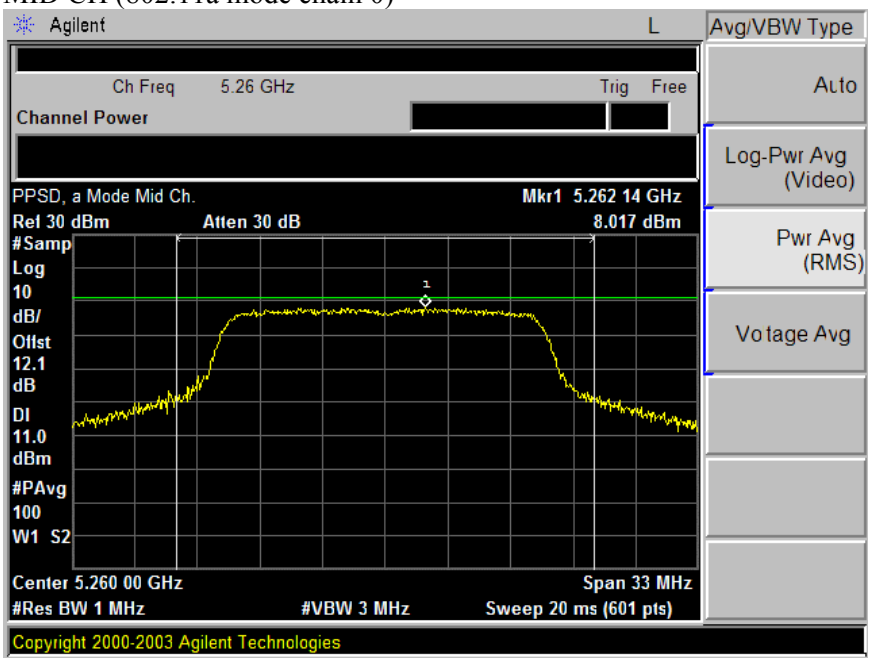
Mode Channel	Frequency (MHz)	PPSD Chain 0 (dBm)	PPSD Chain 2 (dBm)	PPSD Total (dBm)	Limit (dBm)	Margin (dB)
802.11a Mode						
Low	5180	1.32	-0.10	3.68	4.00	-0.32
Middle	5260	8.01	6.25	10.23	11.00	-0.77
High	5320	7.14	6.71	9.94	11.00	-1.06
802.11n HT20 Mode						
Low	5180	1.36	0.11	3.79	4.00	-0.21
Middle	5260	7.53	6.37	10.00	11.00	-1.00
High	5320	7.01	6.85	9.94	11.00	-1.06

(802.11a MODE CHAIN 0)

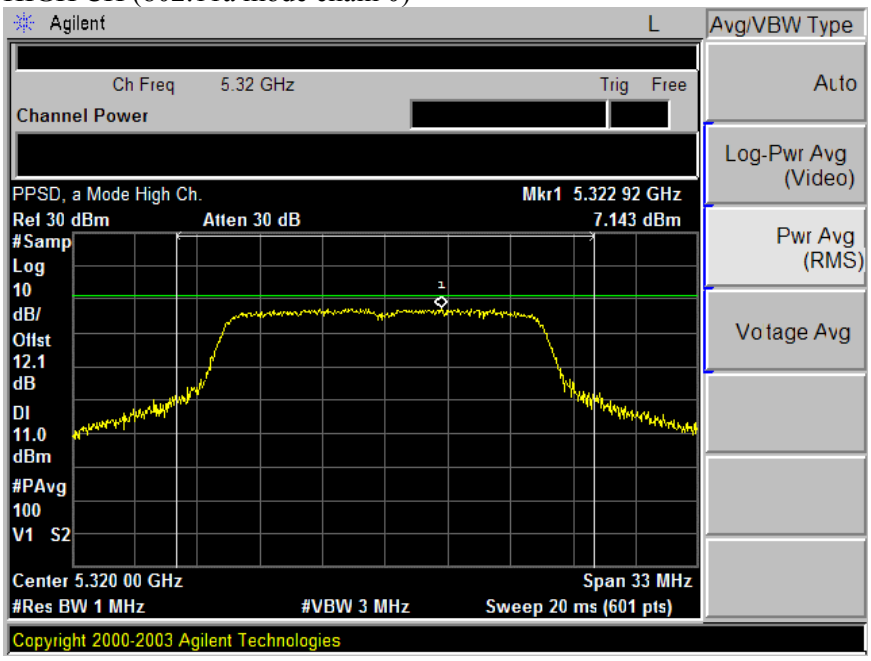
LOW CH (802.11a mode chain 0)



MID CH (802.11a mode chain 0)

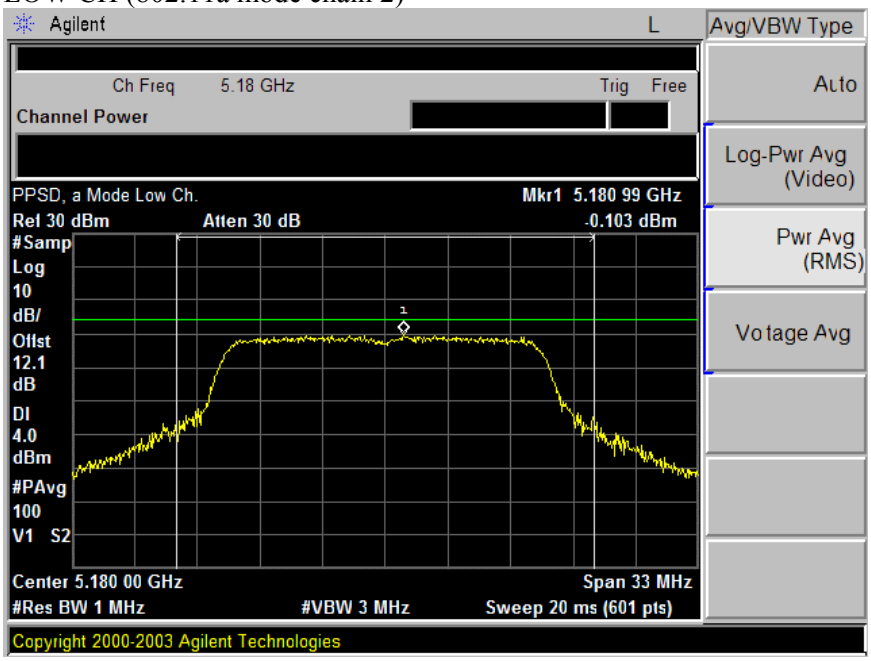


HIGH CH (802.11a mode chain 0)



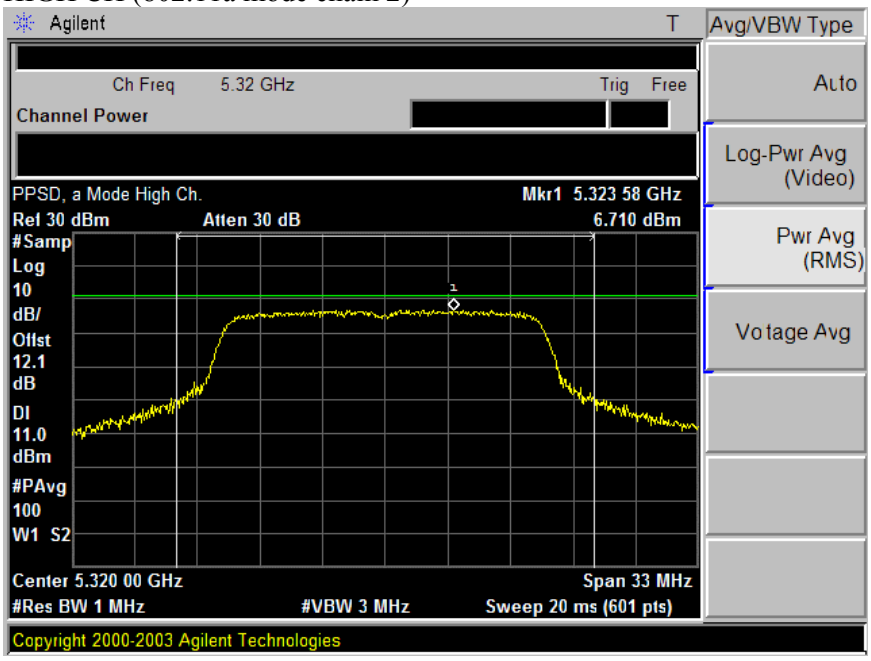
(802.11a MODE CHAIN 2)

LOW CH (802.11a mode chain 2)



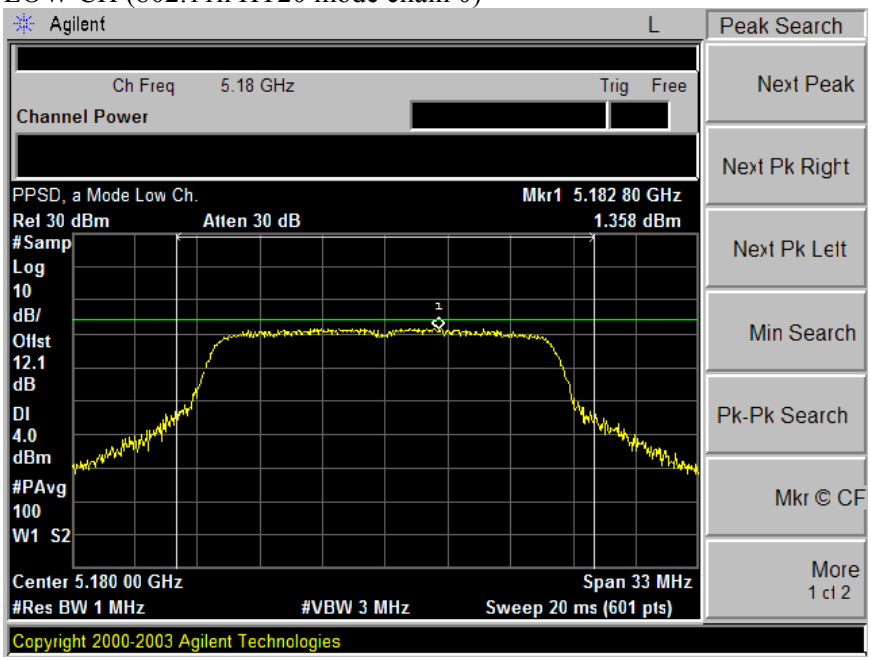
MID CH (802.11a mode chain 2)

HIGH CH (802.11a mode chain 2)

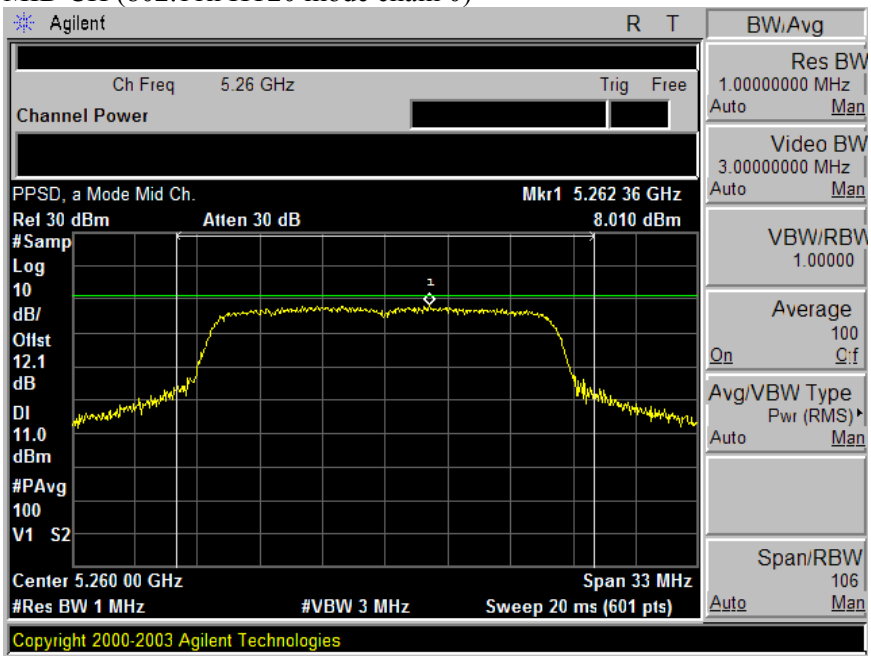


(802.11n HT20 MODE CHAIN 0)

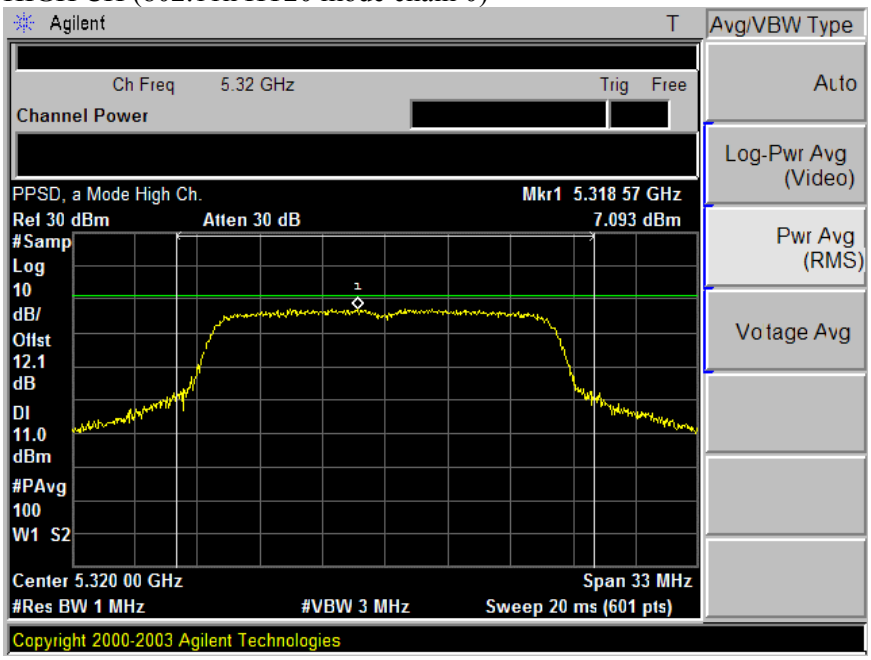
LOW CH (802.11n HT20 mode chain 0)



MID CH (802.11n HT20 mode chain 0)

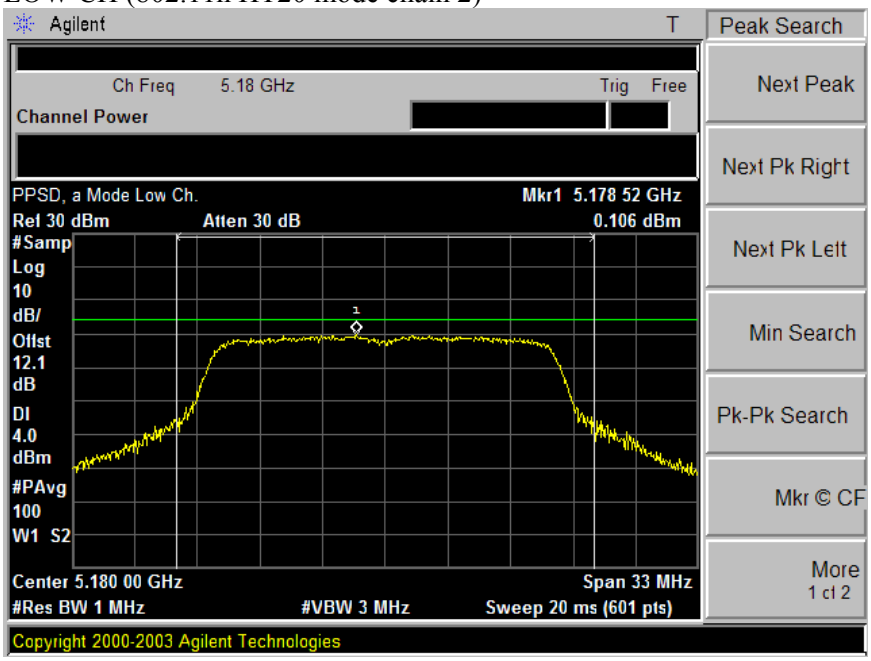


HIGH CH (802.11n HT20 mode chain 0)

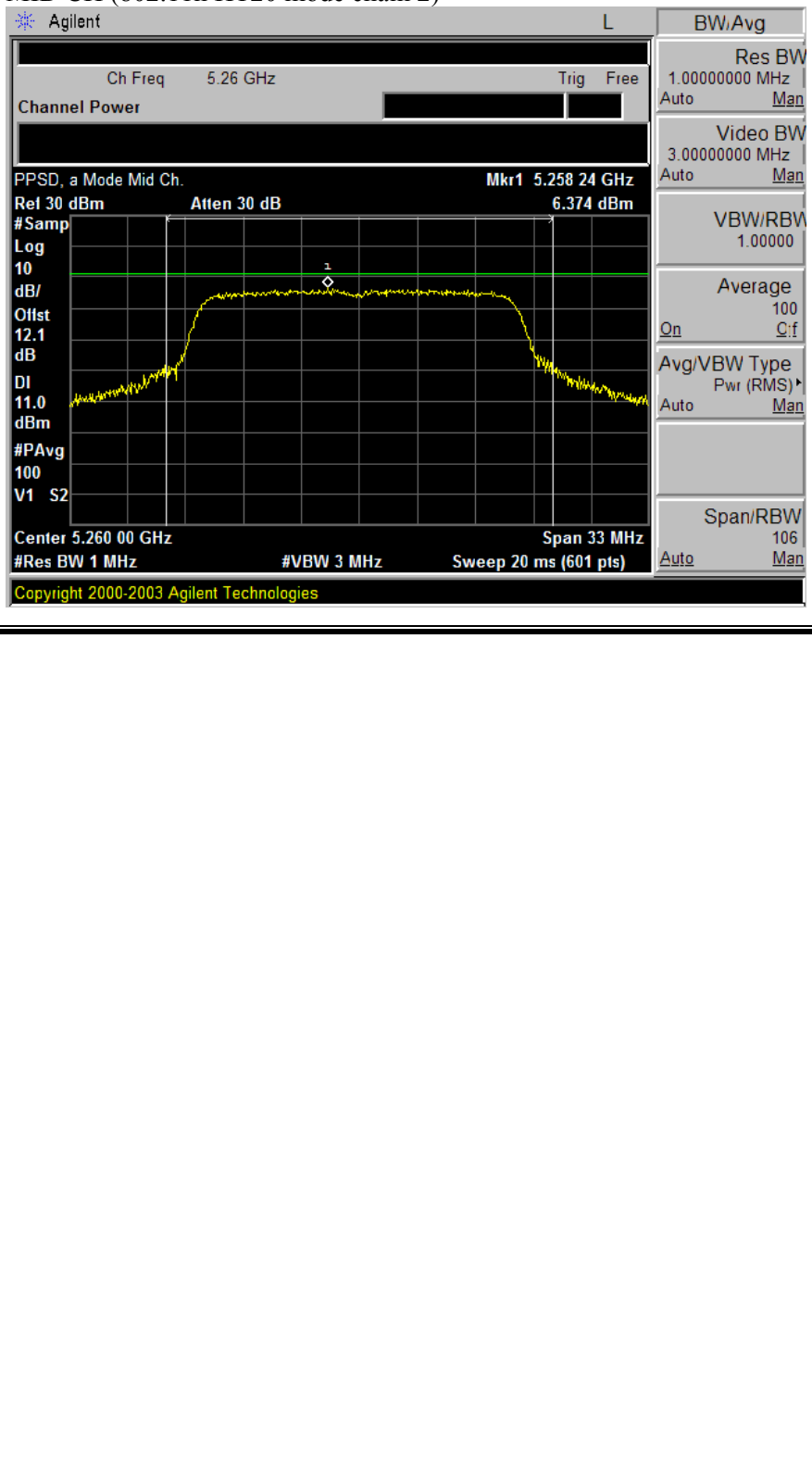


(802.11 HT20 MODE CHAIN 2)

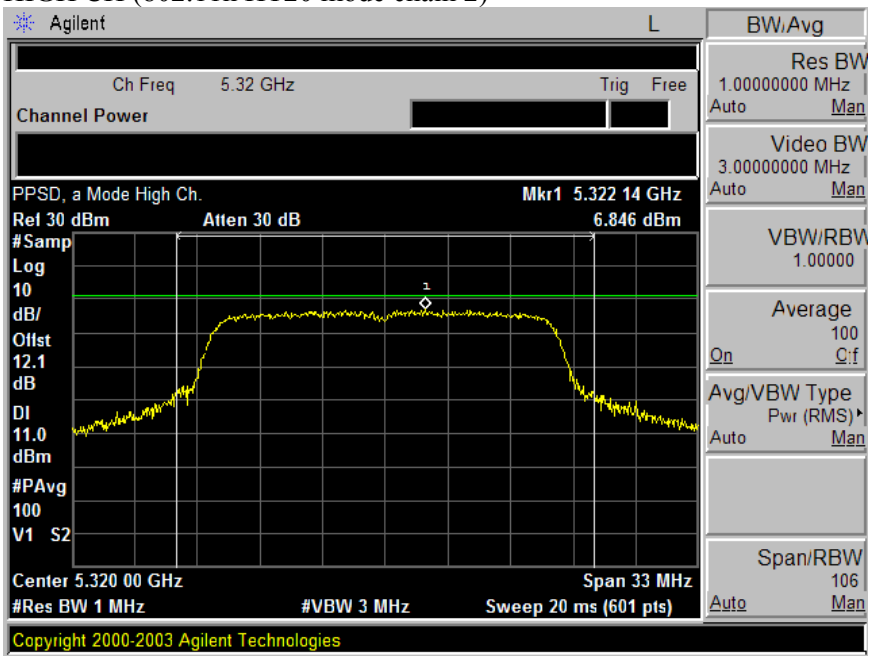
LOW CH (802.11n HT20 mode chain 2)



MID CH (802.11n HT20 mode chain 2)



HIGH CH (802.11n HT20 mode chain 2)



7.2.5. PEAK EXCURSION

LIMIT

§15.407 (a) (6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

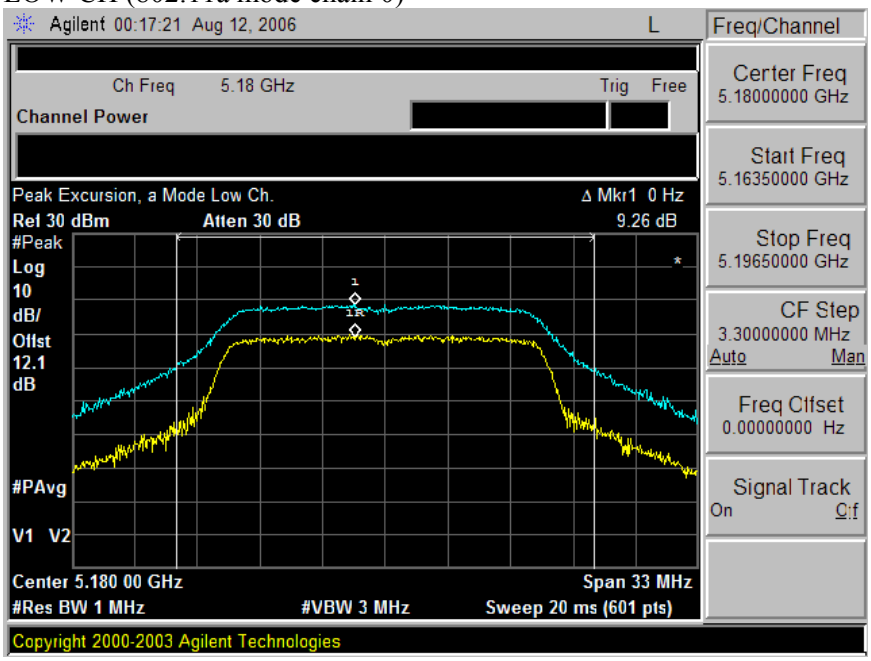
RESULTS

No non-compliance noted:

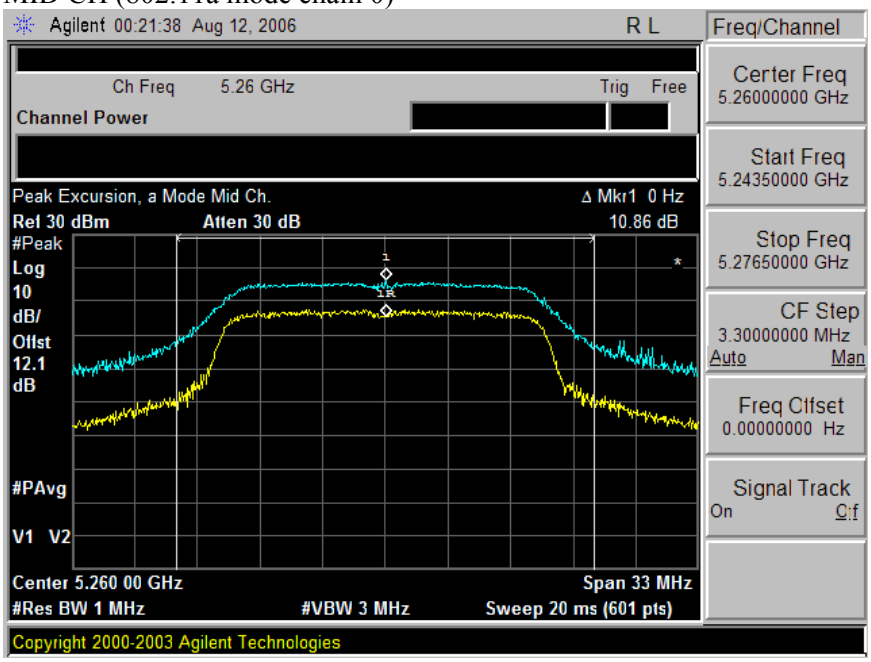
Mode Channel	Frequency (MHz)	Peak Excursion Chain 0 (dBm)	Peak Excursion Chain 2 (dBm)	Limit (dBm)	Worst Case Margin (dB)
802.11a Mode					
Low	5180	9.26	10.75	13	-2.25
Middle	5260	10.86	9.73	13	-2.14
High	5320	9.50	10.43	13	-2.57
802.11n HT20 Mode					
Low	5180	10.61	10.18	13	-2.39
Middle	5260	10.43	9.60	13	-2.57
High	5320	11.01	9.81	13	-1.99

(802.11a MODE CHAIN 0)

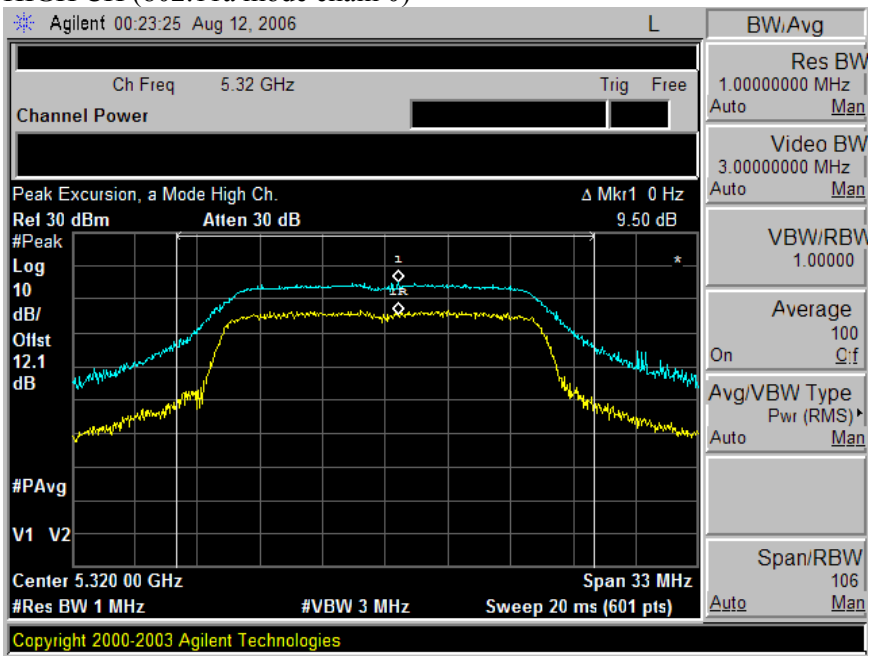
LOW CH (802.11a mode chain 0)



MID CH (802.11a mode chain 0)

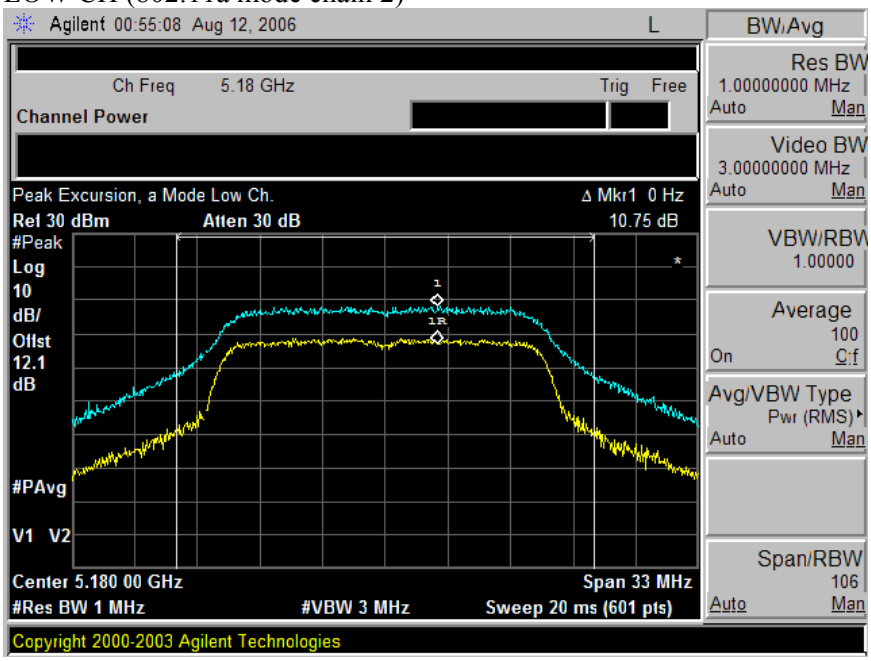


HIGH CH (802.11a mode chain 0)

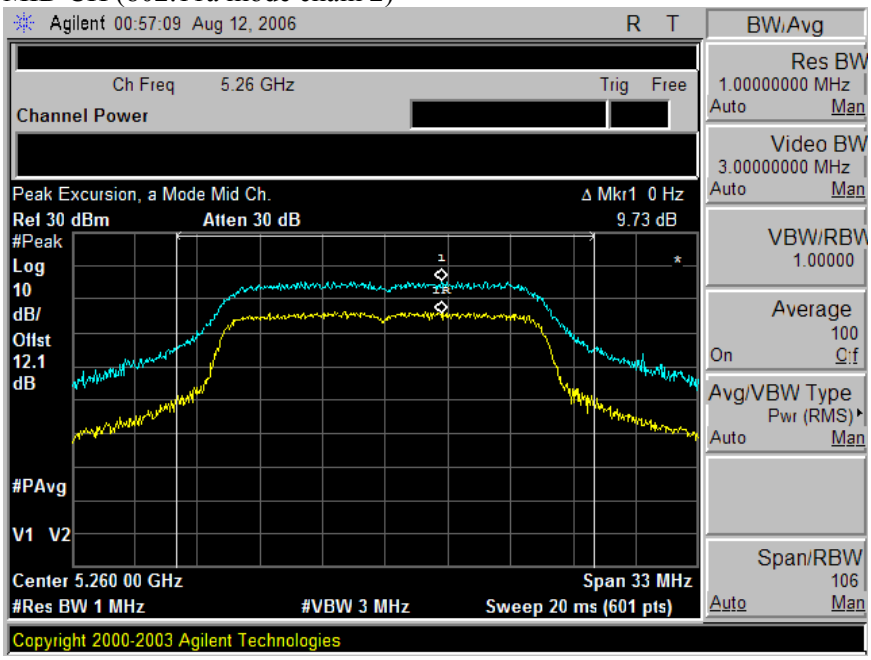


(802.11a MODE CHAIN 2)

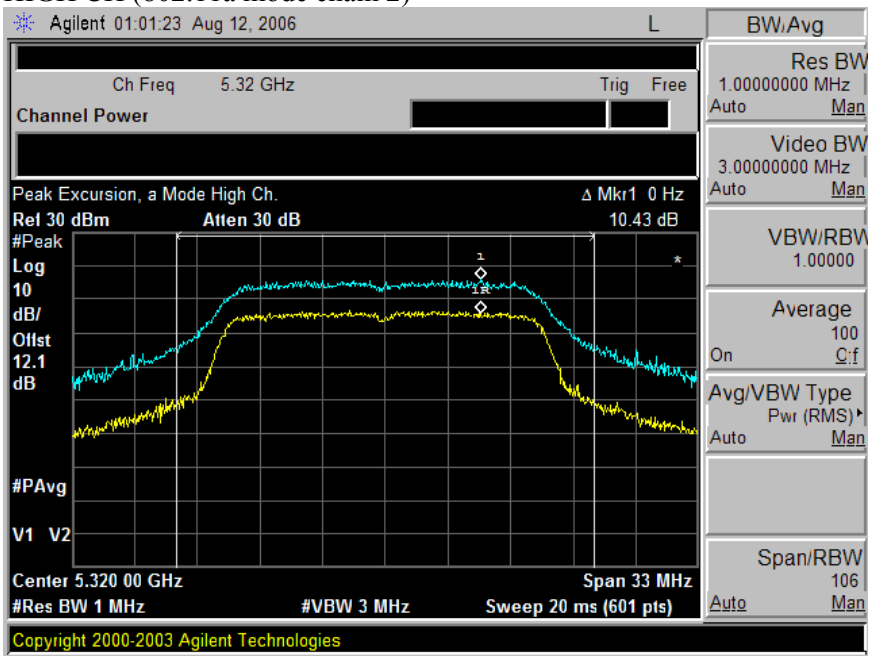
LOW CH (802.11a mode chain 2)



MID CH (802.11a mode chain 2)

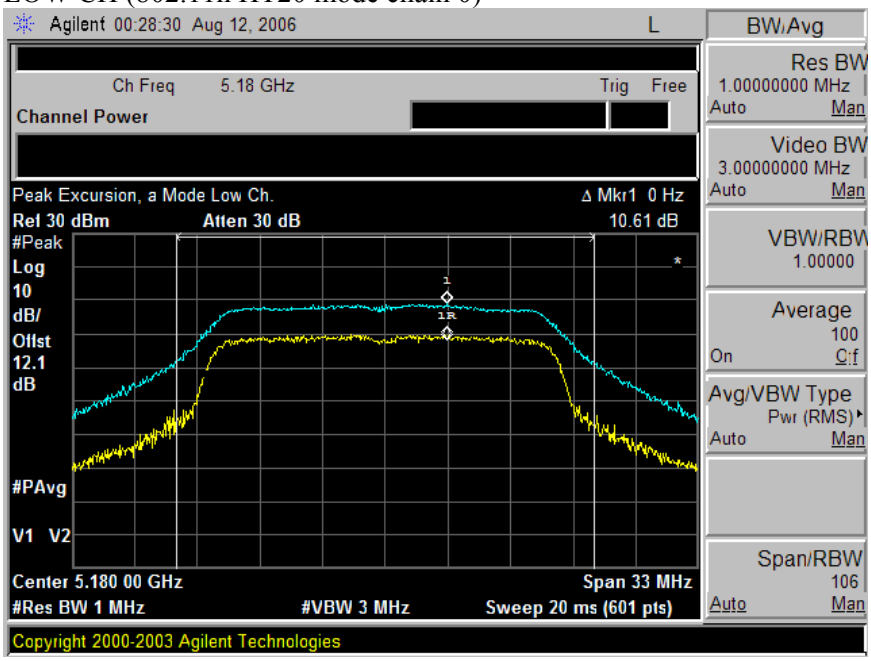


HIGH CH (802.11a mode chain 2)

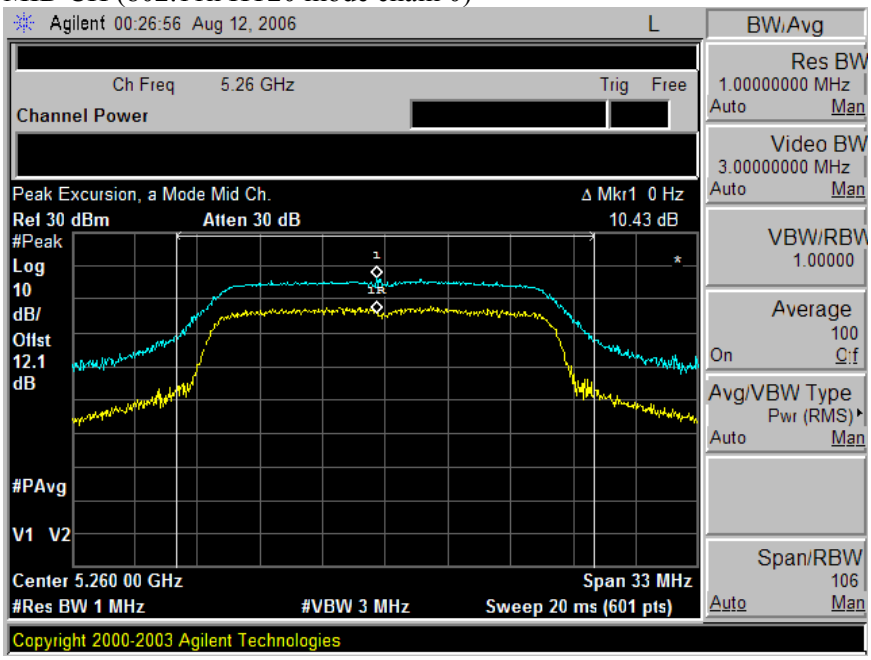


(802.11n HT20 MODE CHAIN 0)

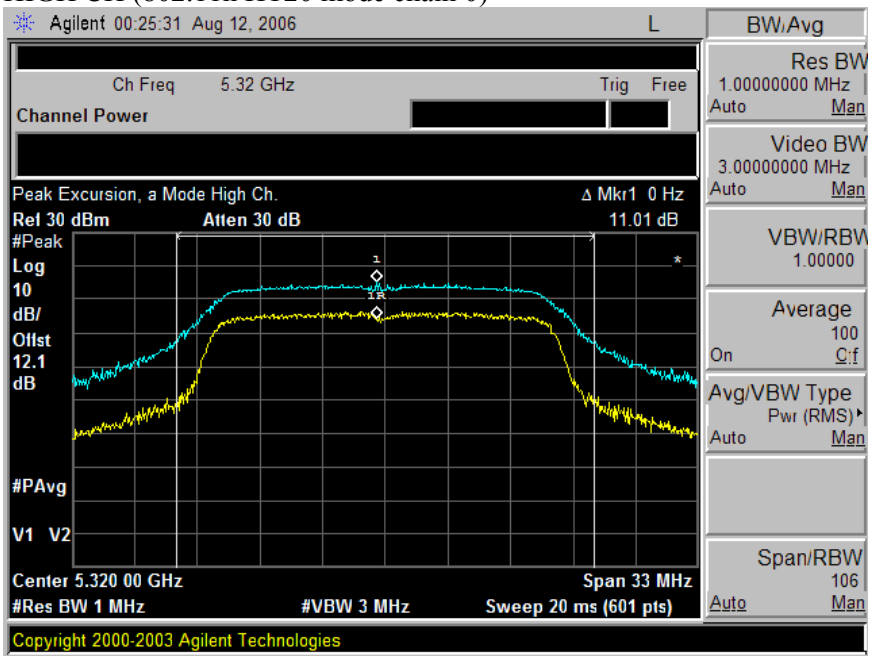
LOW CH (802.11n HT20 mode chain 0)



MID CH (802.11n HT20 mode chain 0)

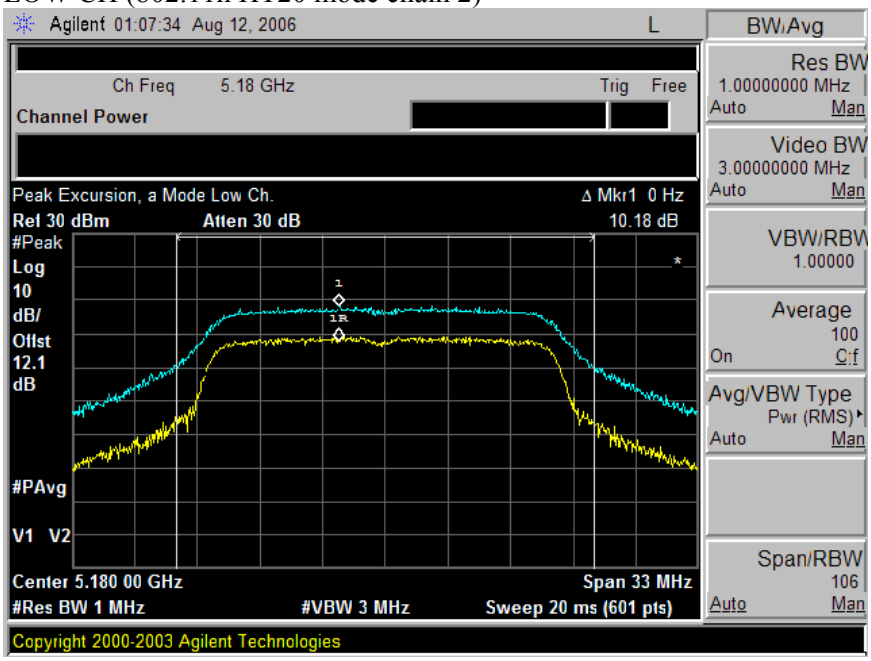


HIGH CH (802.11n HT20 mode chain 0)

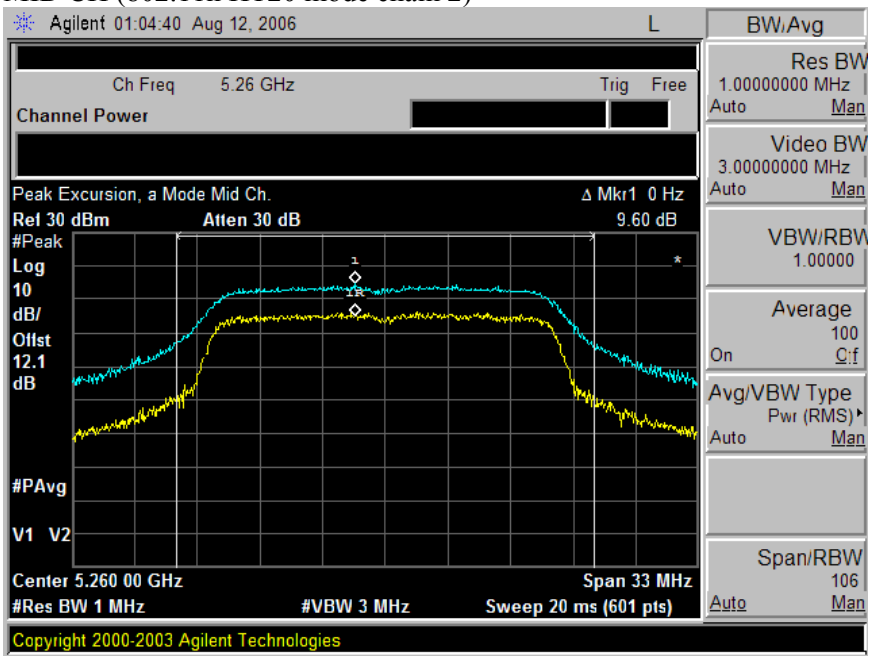


(802.11 HT20 MODE CHAIN 2)

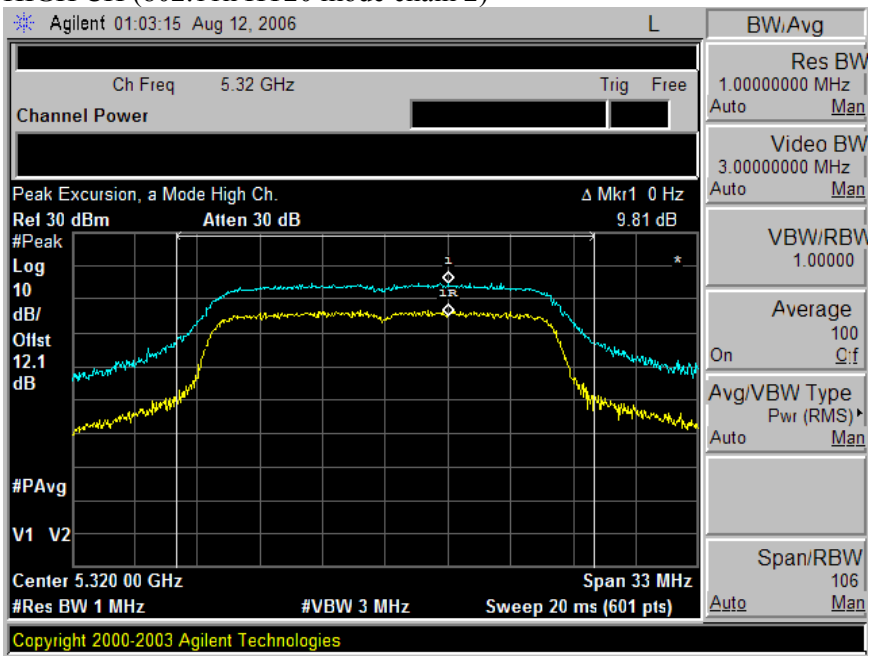
LOW CH (802.11n HT20 mode chain 2)



MID CH (802.11n HT20 mode chain 2)



HIGH CH (802.11n HT20 mode chain 2)



7.2.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.407 (b) (1 & 2) For transmitters operating in the 5.15-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27dBm / MHz.

TEST PROCEDURE

Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

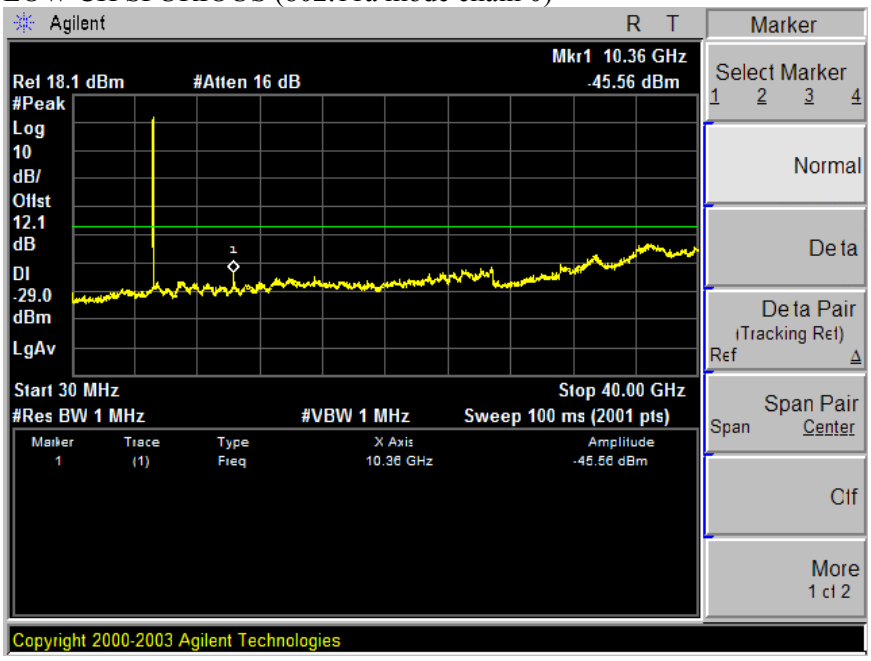
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

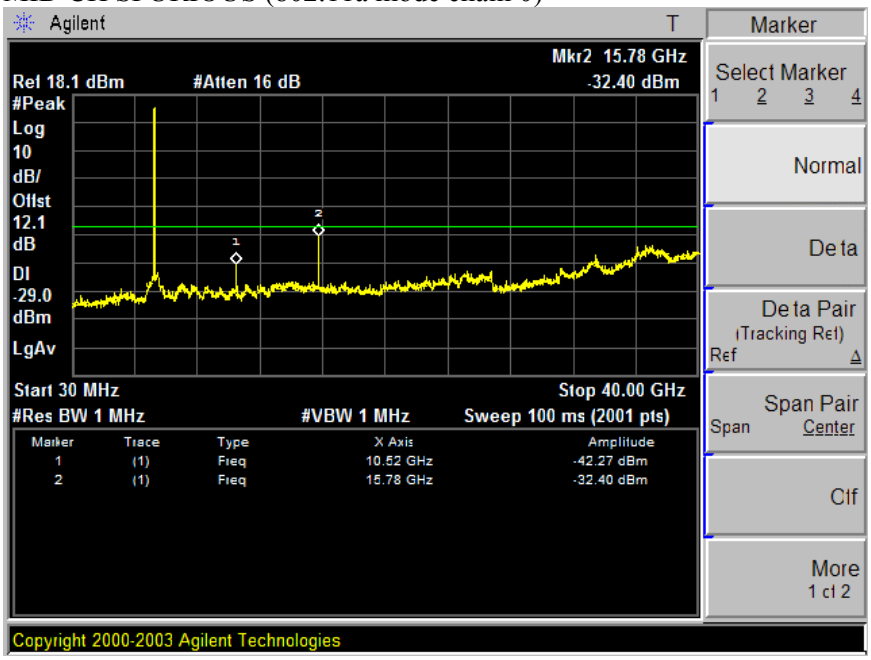
No non-compliance noted:

SPURIOUS EMISSIONS (802.11a MODE CHAIN 0)

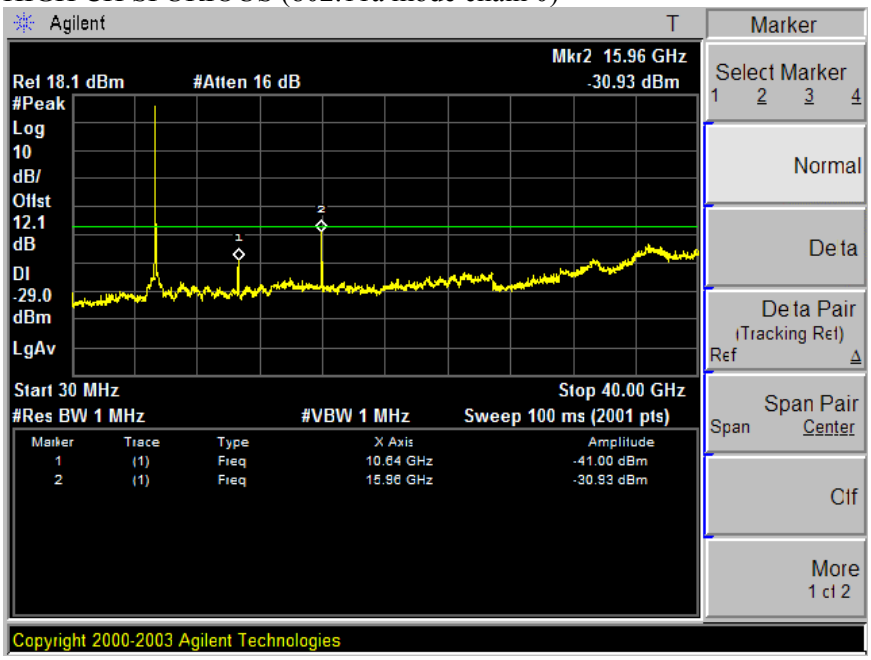
LOW CH SPURIOUS (802.11a mode chain 0)



MID CH SPURIOUS (802.11a mode chain 0)

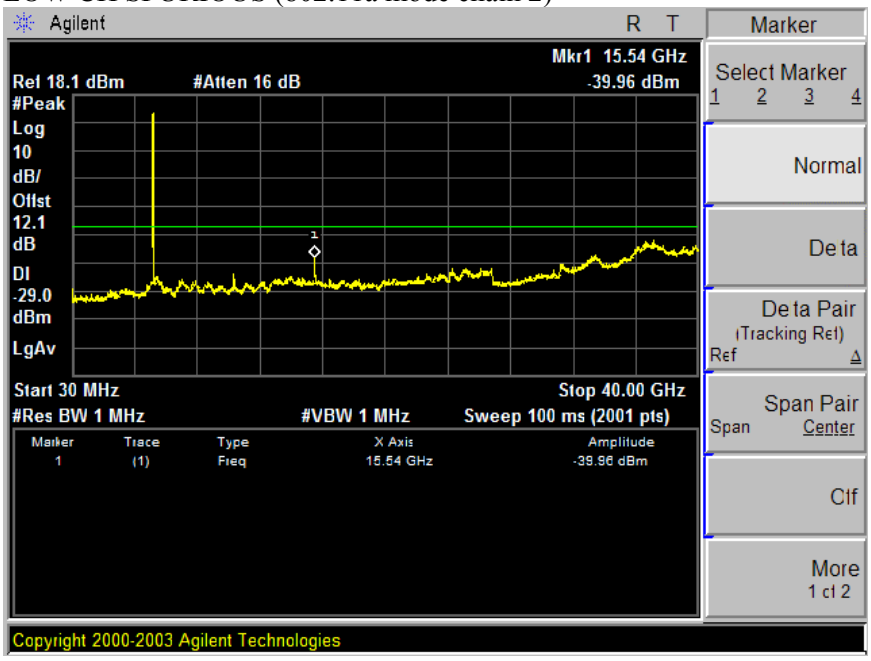


HIGH CH SPURIOUS (802.11a mode chain 0)

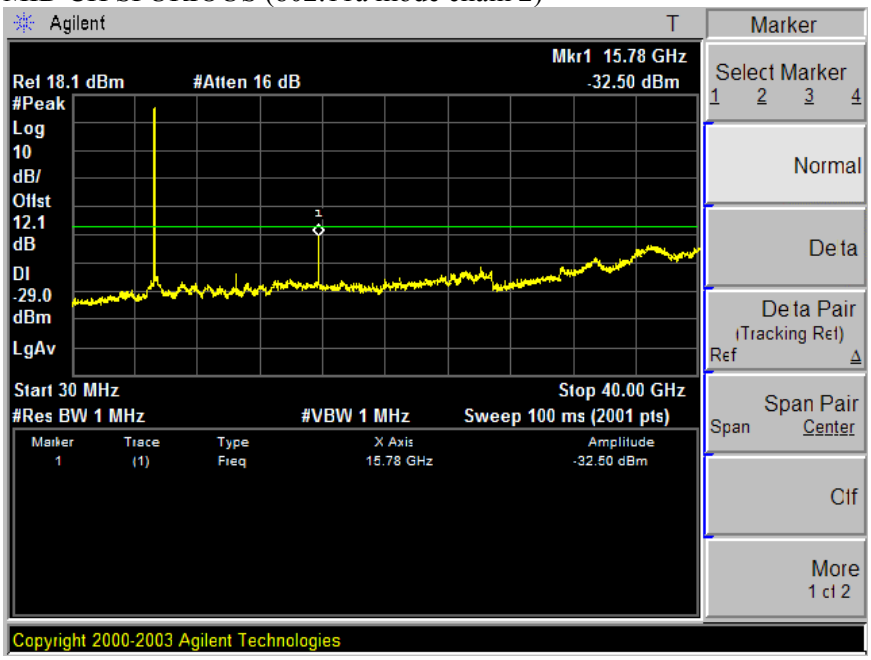


SPURIOUS EMISSIONS (802.11a MODE CHAIN 2)

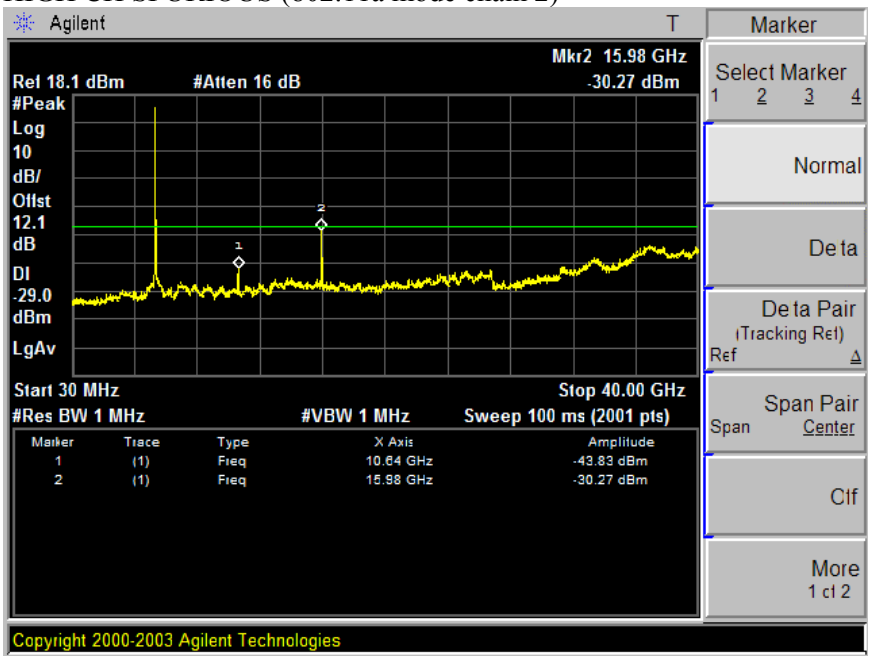
LOW CH SPURIOUS (802.11a mode chain 2)



MID CH SPURIOUS (802.11a mode chain 2)

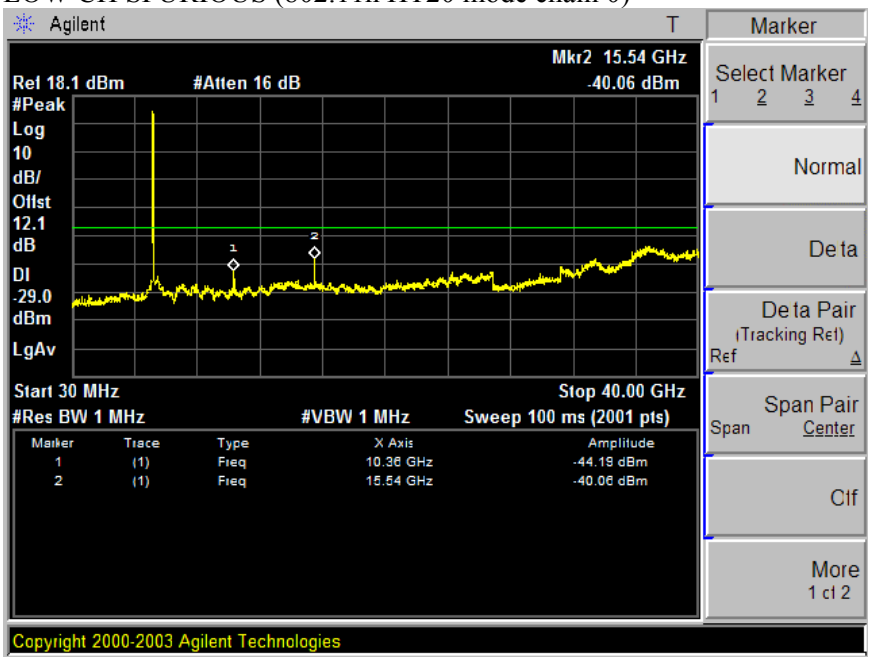


HIGH CH SPURIOUS (802.11a mode chain 2)

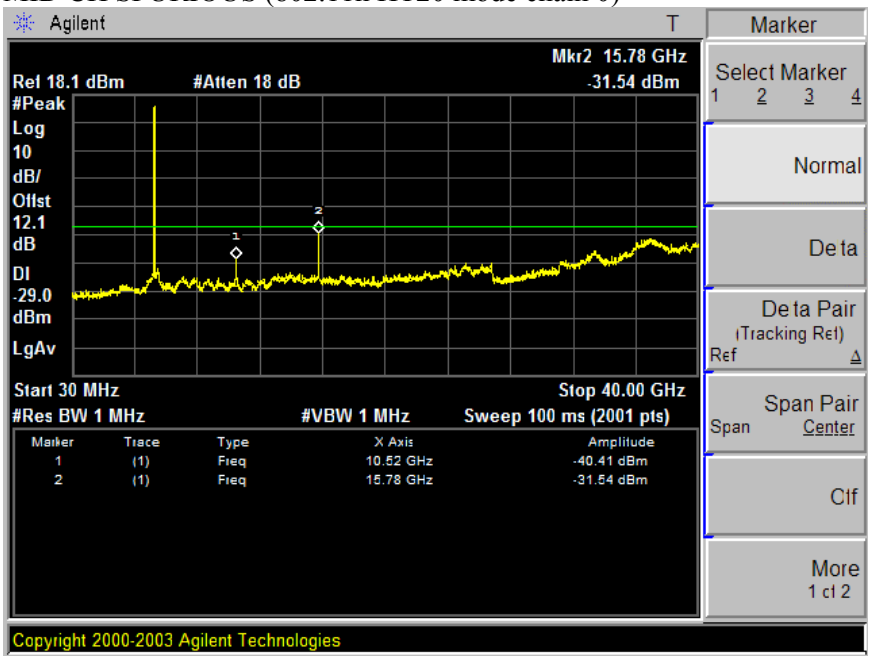


SPURIOUS EMISSIONS (802.11n HT20 MODE CHAIN 0)

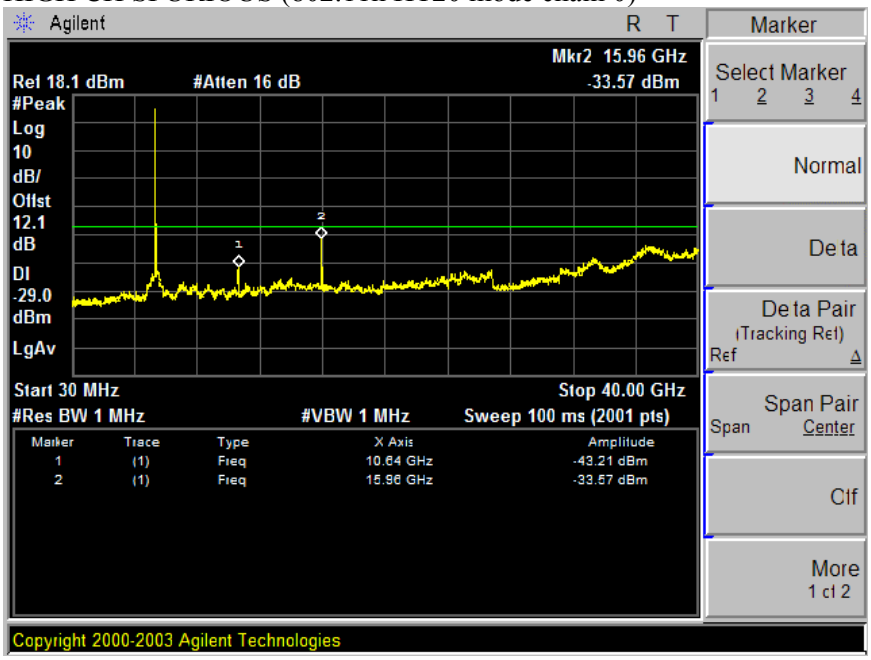
LOW CH SPURIOUS (802.11n HT20 mode chain 0)



MID CH SPURIOUS (802.11n HT20 mode chain 0)

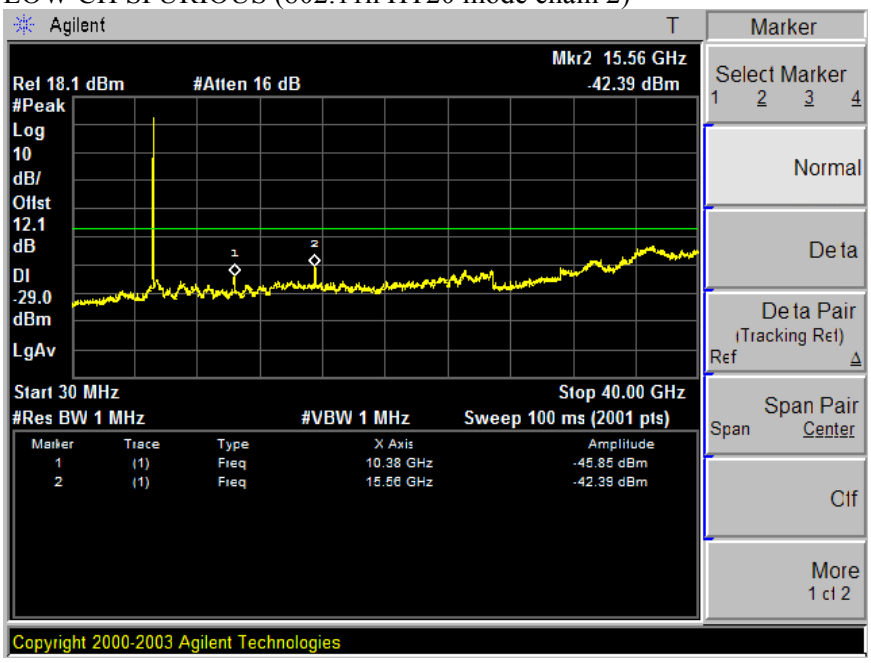


HIGH CH SPURIOUS (802.11n HT20 mode chain 0)

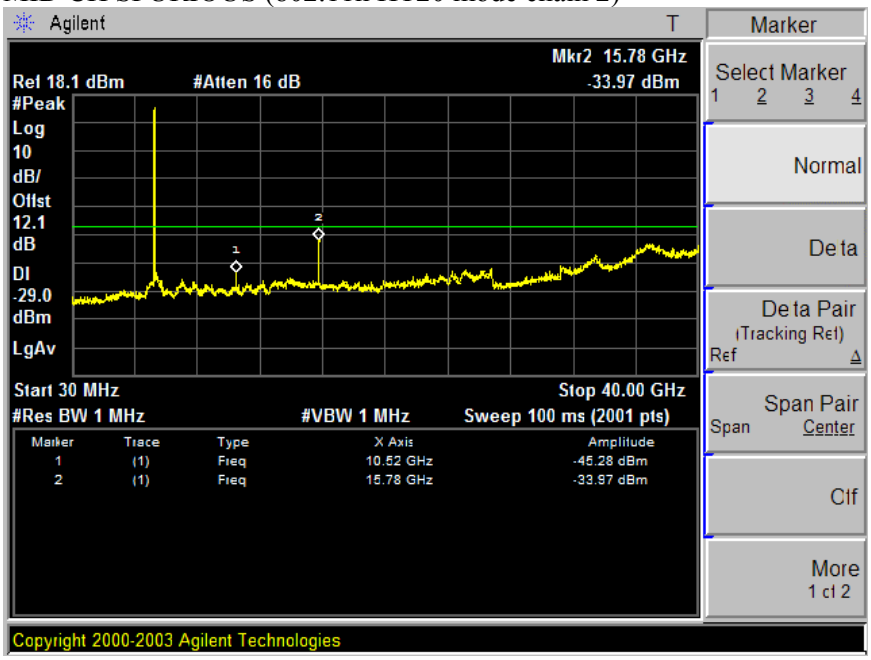


SPURIOUS EMISSIONS (802.11 HT20 MODE CHAIN 2)

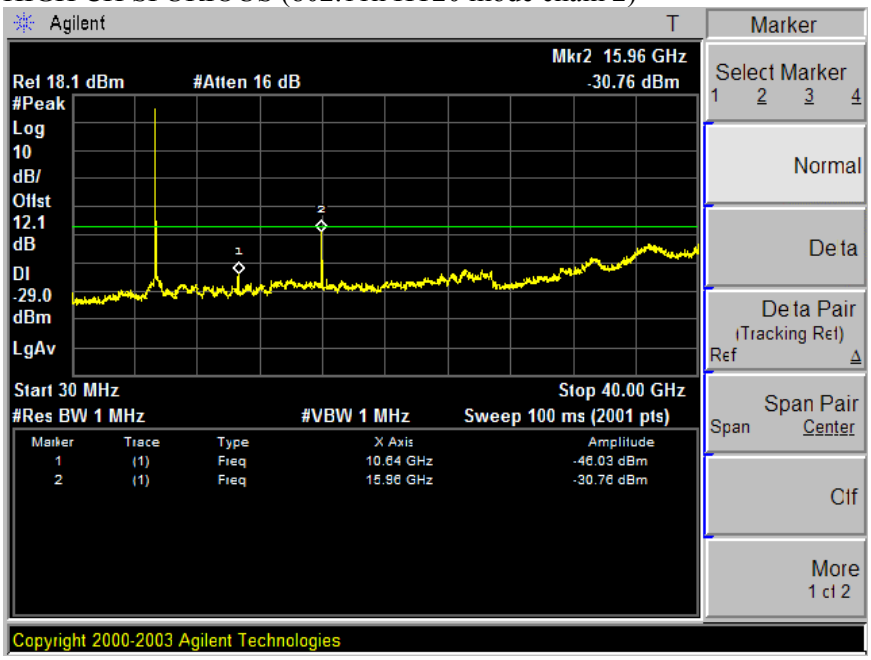
LOW CH SPURIOUS (802.11n HT20 mode chain 2)



MID CH SPURIOUS (802.11n HT20 mode chain 2)

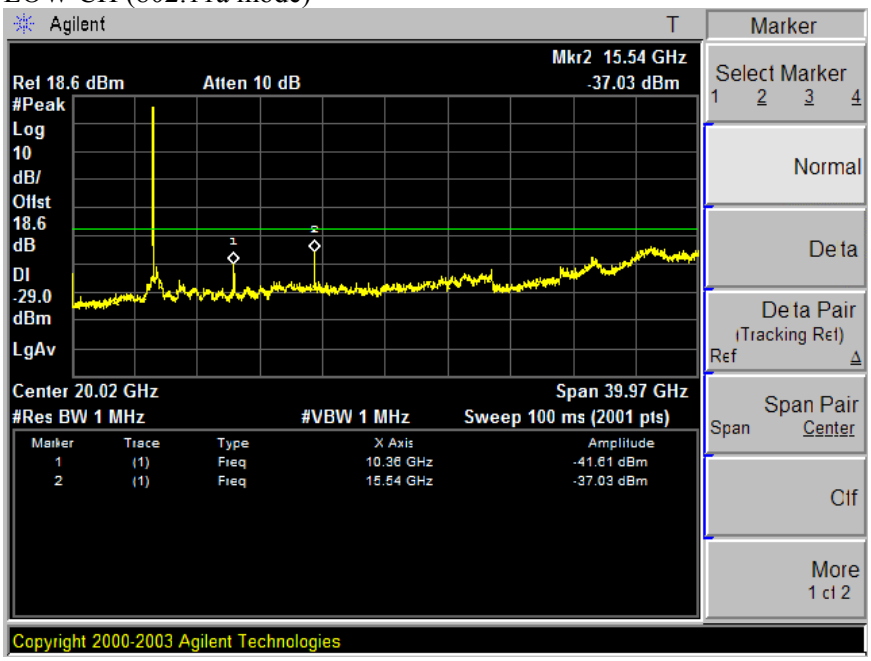


HIGH CH SPURIOUS (802.11n HT20 mode chain 2)

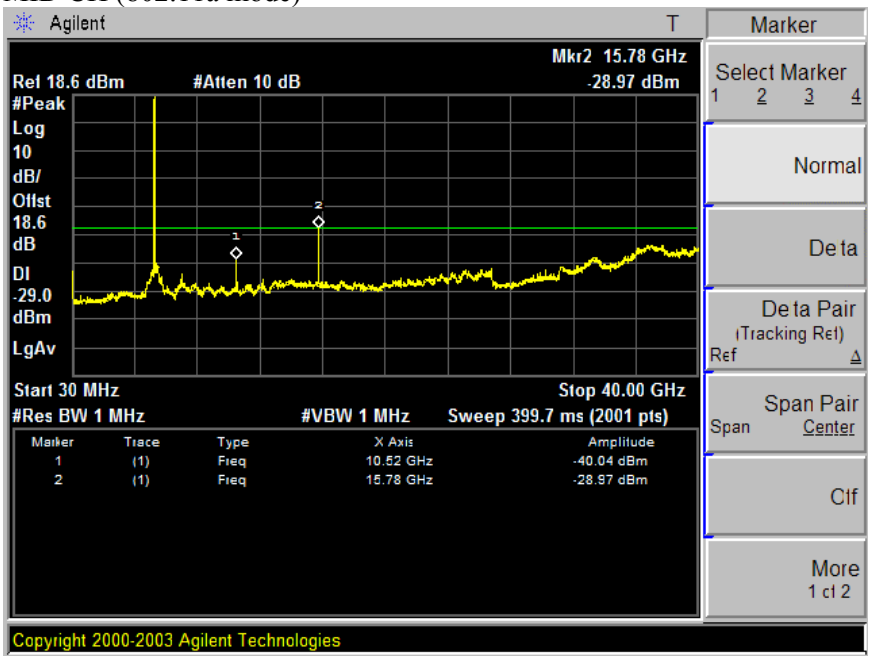


SPURIOUS EMISSIONS (802.11a MODE COMBINED)

LOW CH (802.11a mode)

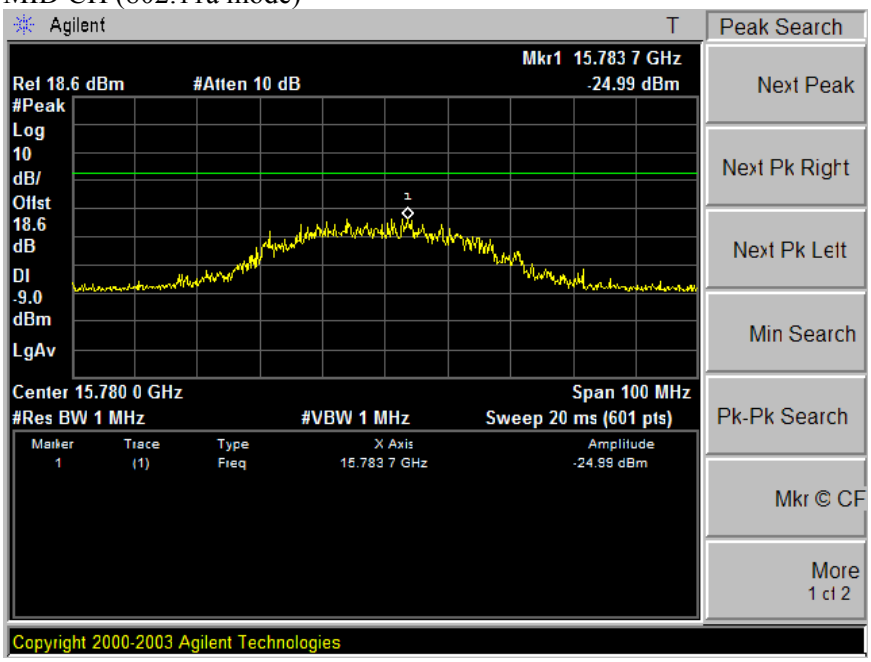


MID CH (802.11a mode)

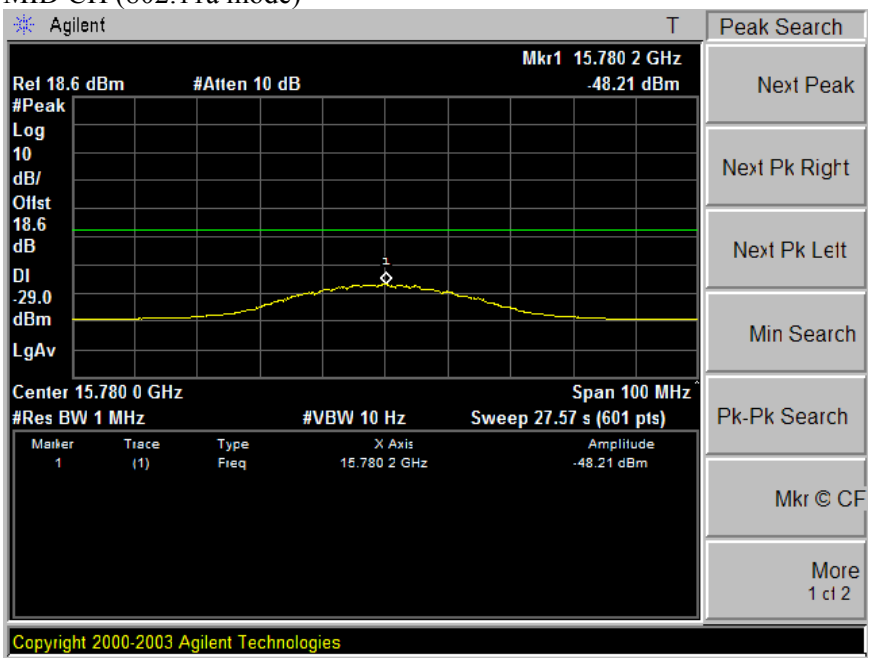


NOTE: PLEASE SEE ATTACHED ZOOM IN PLOTS BELOW

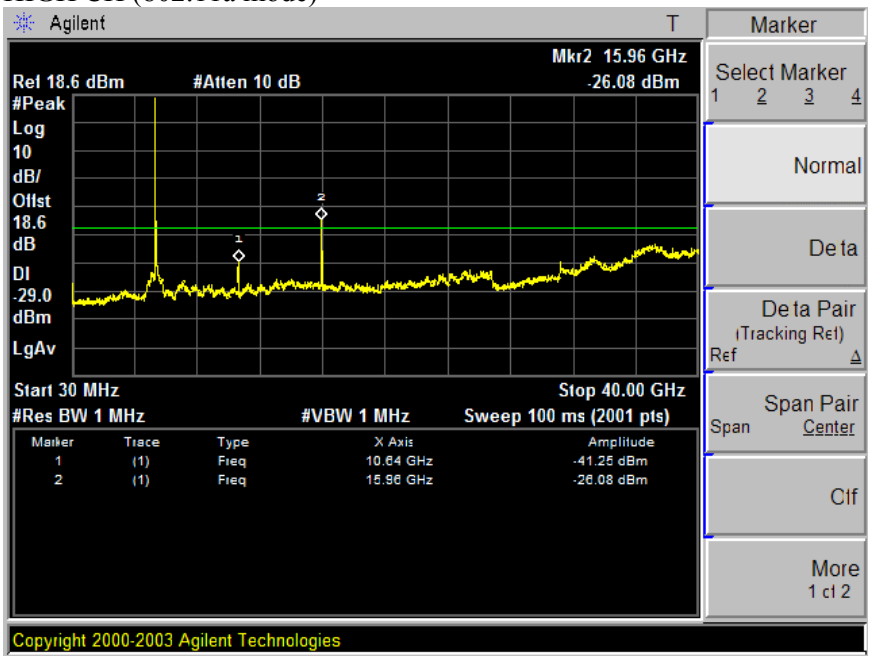
MID CH (802.11a mode)



MID CH (802.11a mode)

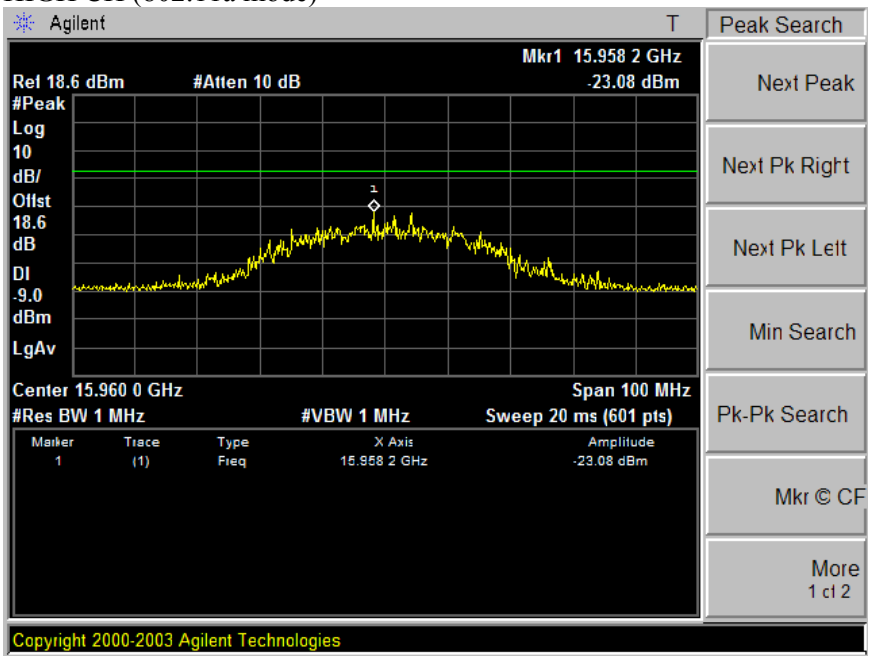


HIGH CH (802.11a mode)

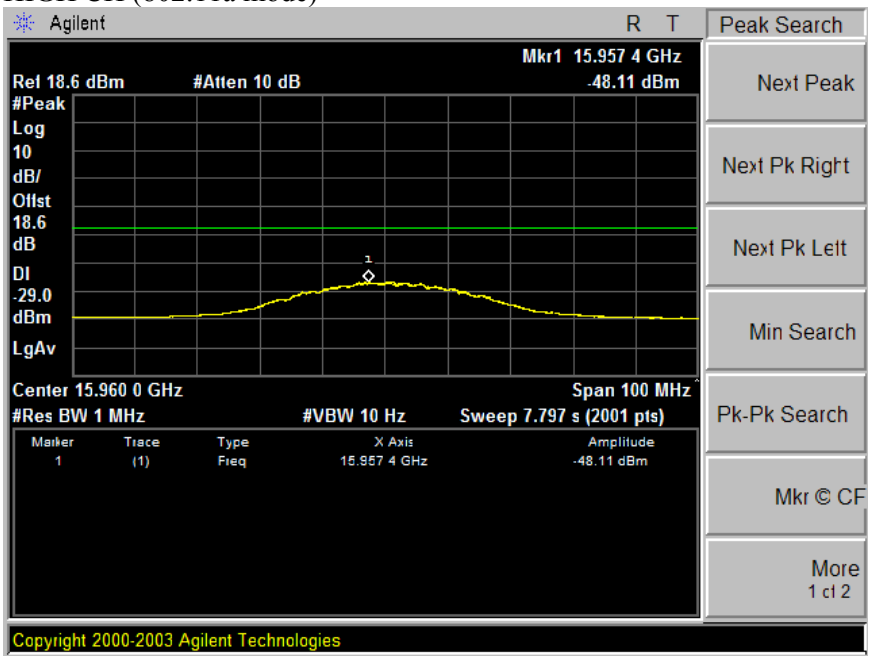


NOTE: PLEASE SEE ATTACHED ZOOM IN PLOTS BELOW

HIGH CH (802.11a mode)

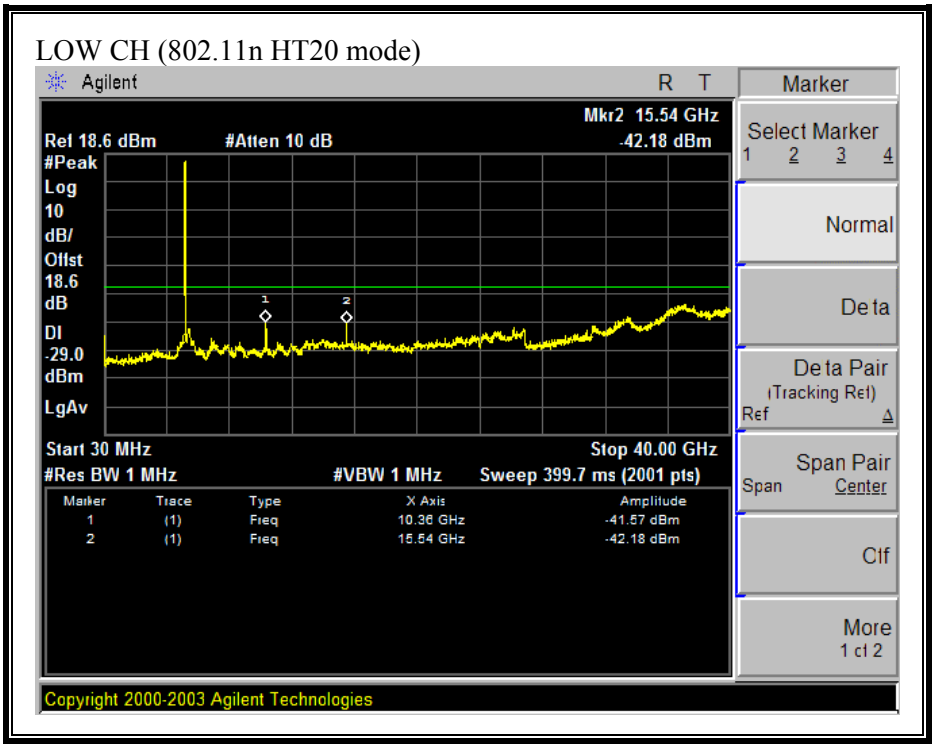


HIGH CH (802.11a mode)

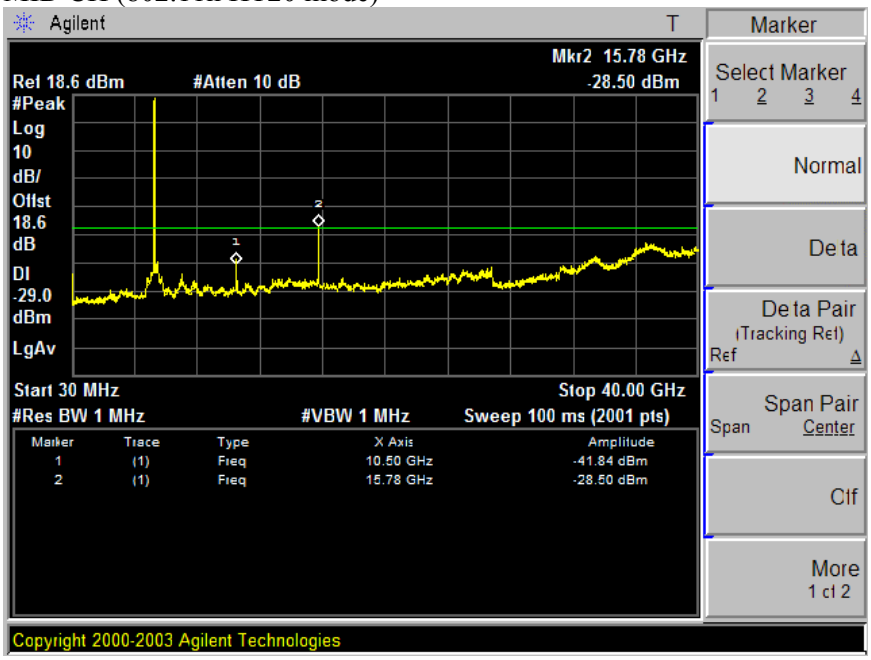


SPURIOUS EMISSIONS (802.11n HT20 MODE COMBINED)

LOW CH (802.11n HT20 mode)

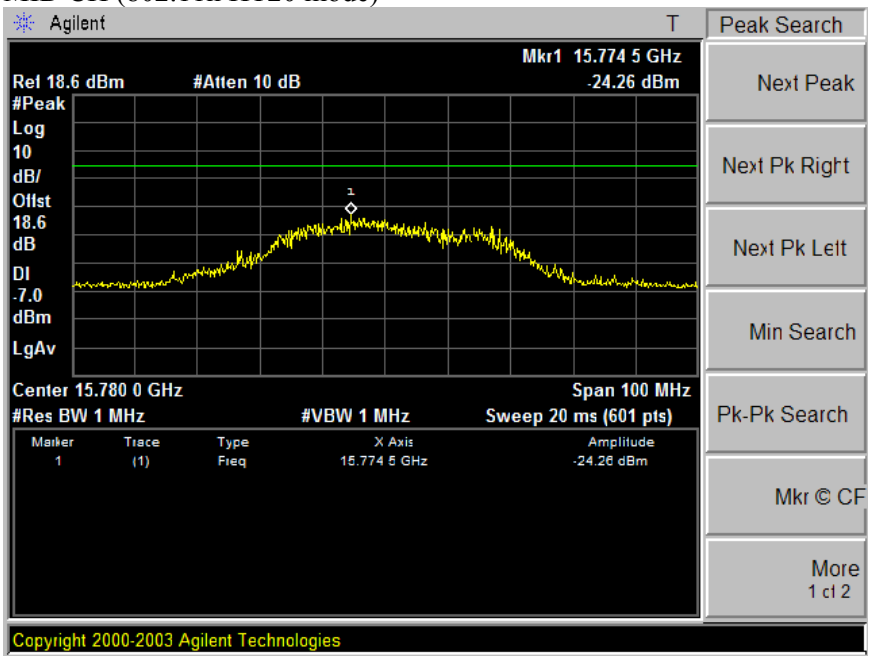


MID CH (802.11n HT20 mode)

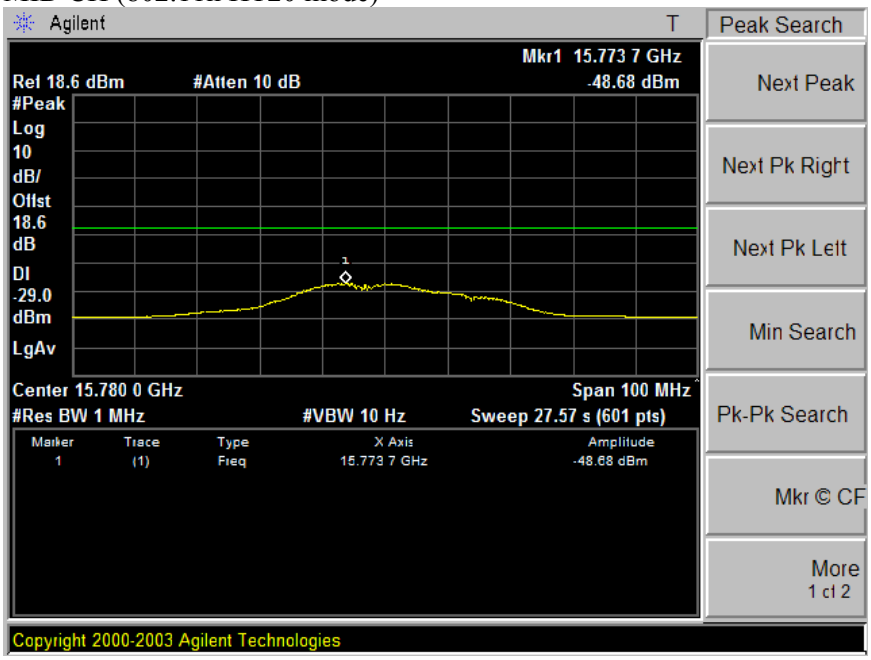


NOTE: PLEASE SEE ATTACHED ZOOM IN PLOTS BELOW

MID CH (802.11n HT20 mode)



MID CH (802.11n HT20 mode)



7.3. CHANNEL TESTS FOR THE 5470 TO 5725 MHz BAND

7.3.1. 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.

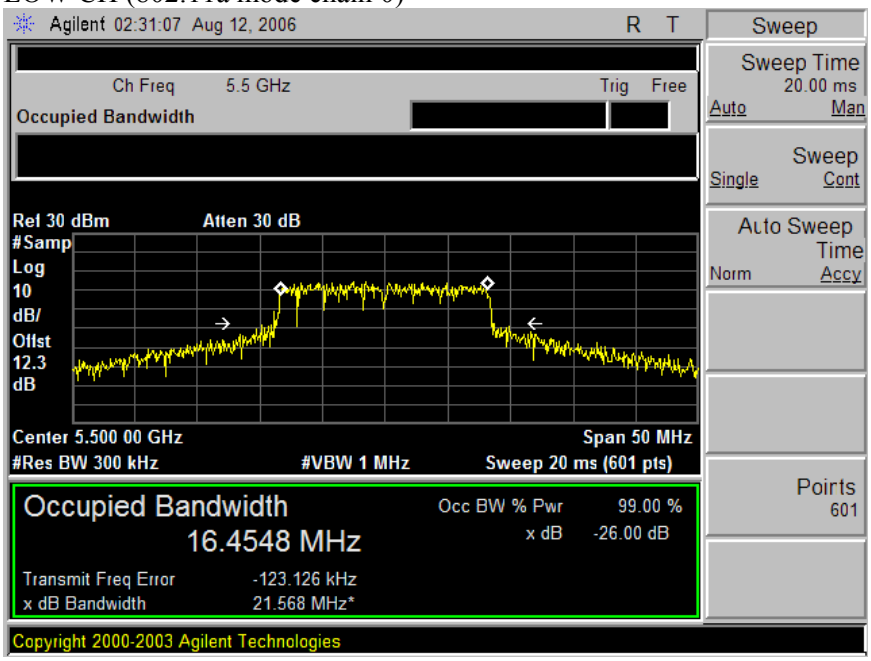
RESULTS

No non-compliance noted:

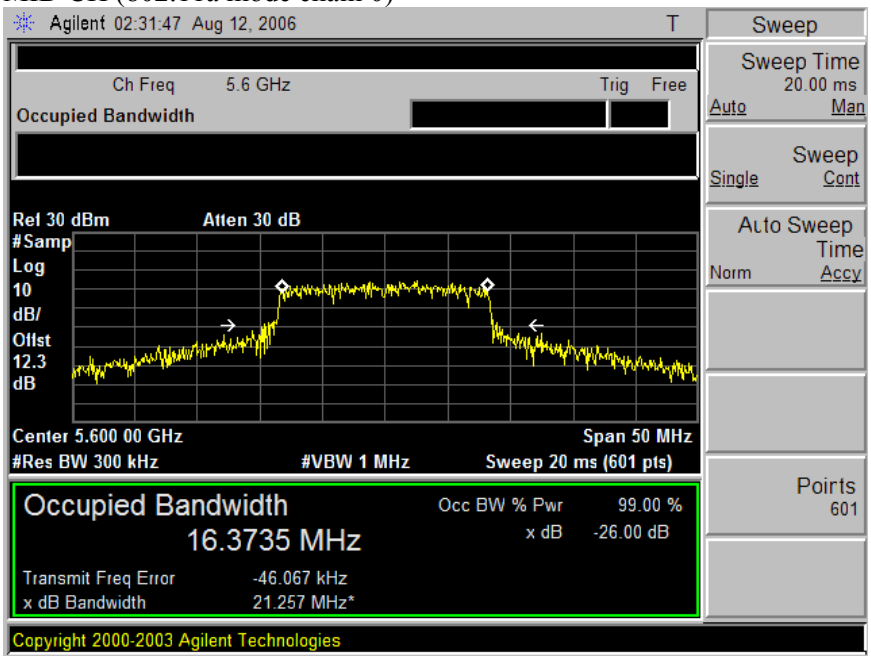
Mode Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 2 (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 2 (MHz)	Worst Case 10 Log B (dB)
802.11a Mode						
Low	5500	16.4548	16.529	21.568	21.616	13.35
Middle	5600	16.3735	16.456	21.257	20.6	13.28
High	5700	16.5633	16.5684	21.978	20.824	13.42
802.11n HT20 Mode						
Low	5500	17.594	17.5563	21.443	20.85	13.31
Mid	5600	17.6912	17.7162	21.848	21.883	13.40
High	5700	17.6862	17.7856	21.572	21.345	13.34

(802.11a MODE CHAIN 0)

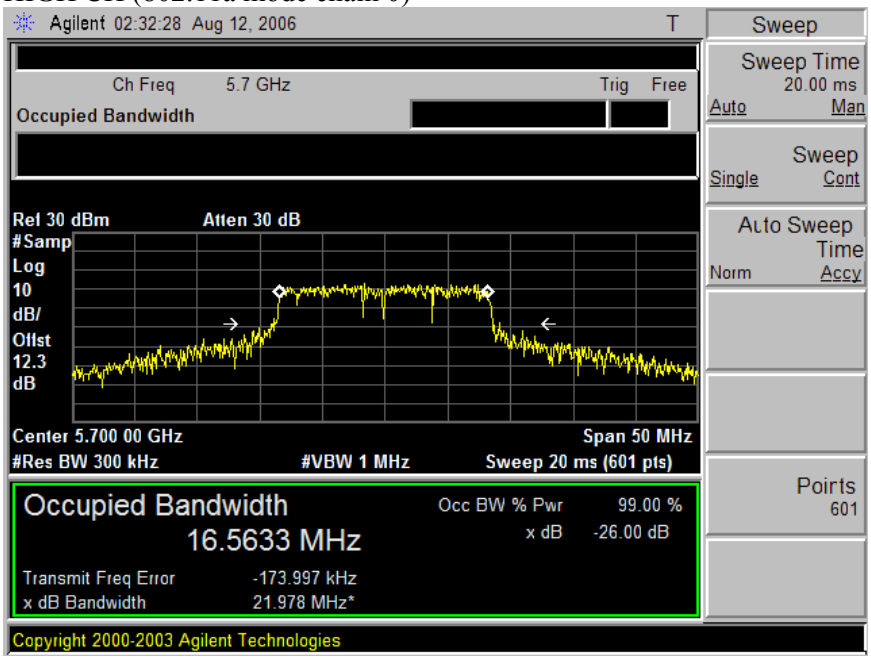
LOW CH (802.11a mode chain 0)



MID CH (802.11a mode chain 0)

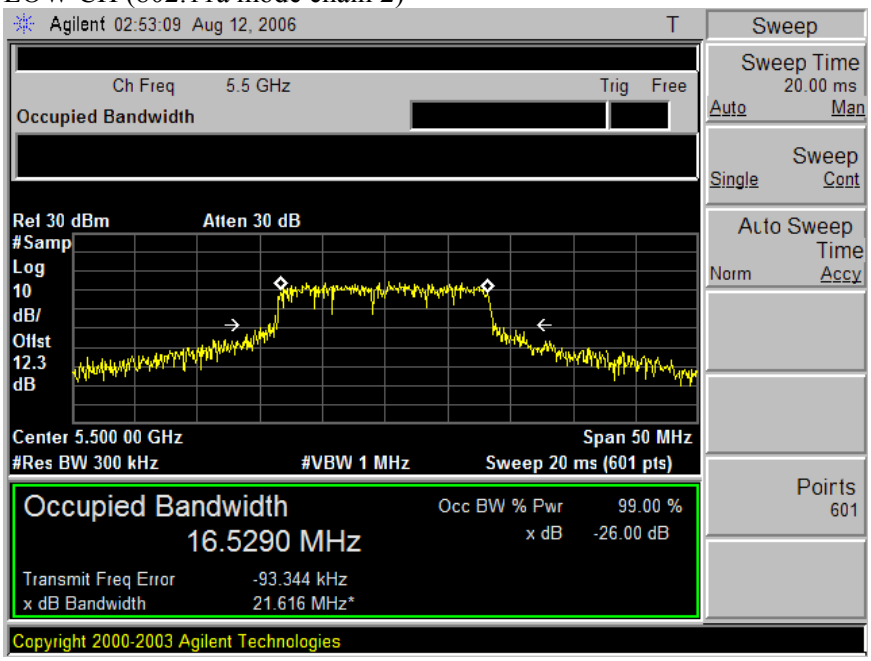


HIGH CH (802.11a mode chain 0)

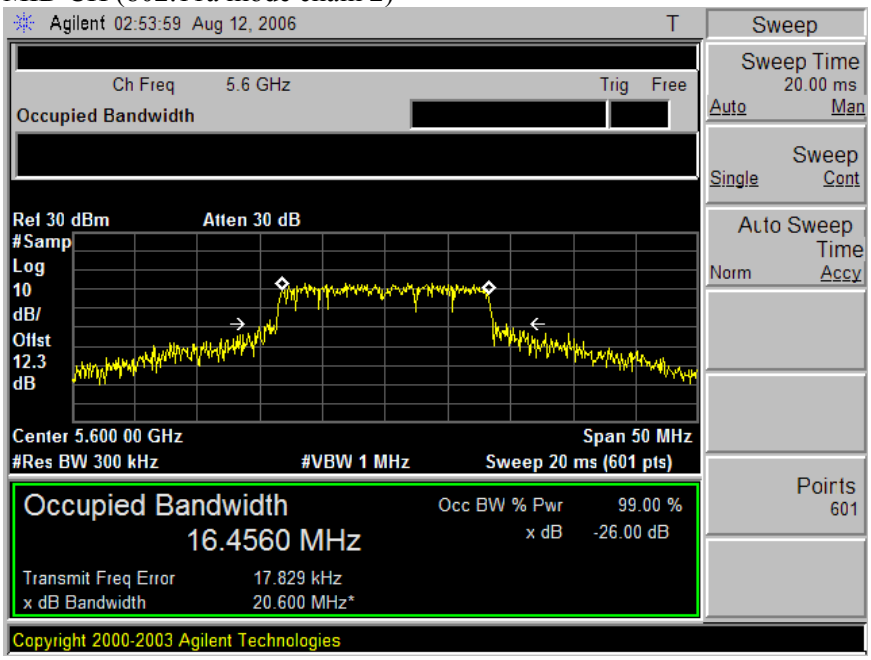


(802.11a MODE CHAIN 2)

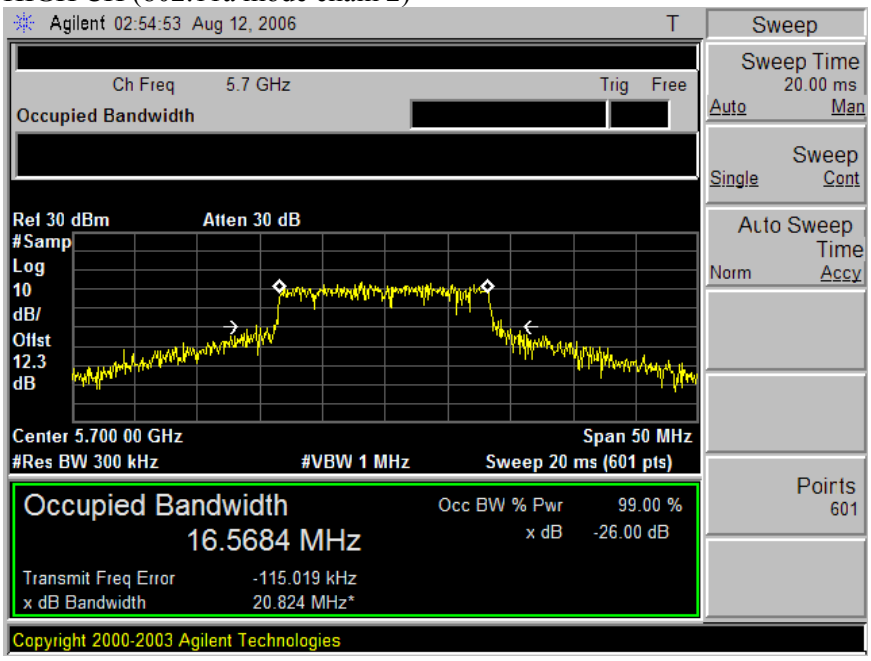
LOW CH (802.11a mode chain 2)



MID CH (802.11a mode chain 2)

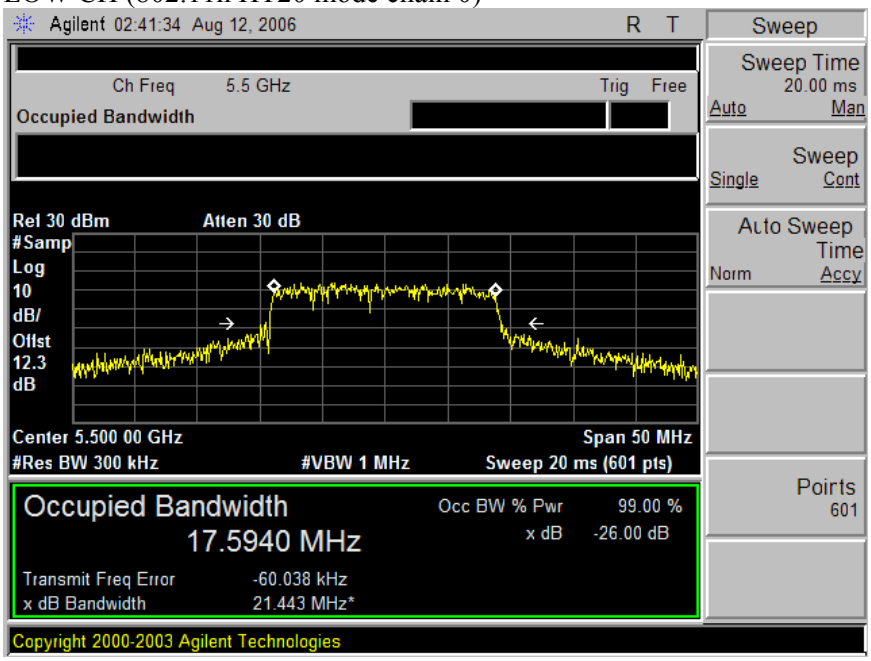


HIGH CH (802.11a mode chain 2)

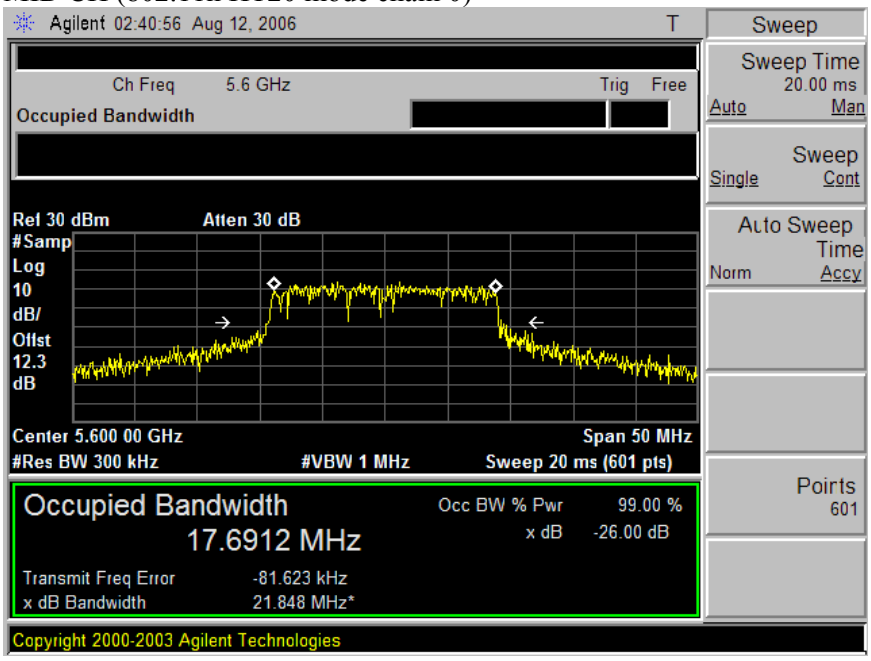


(802.11n HT20 MODE CHAIN 0)

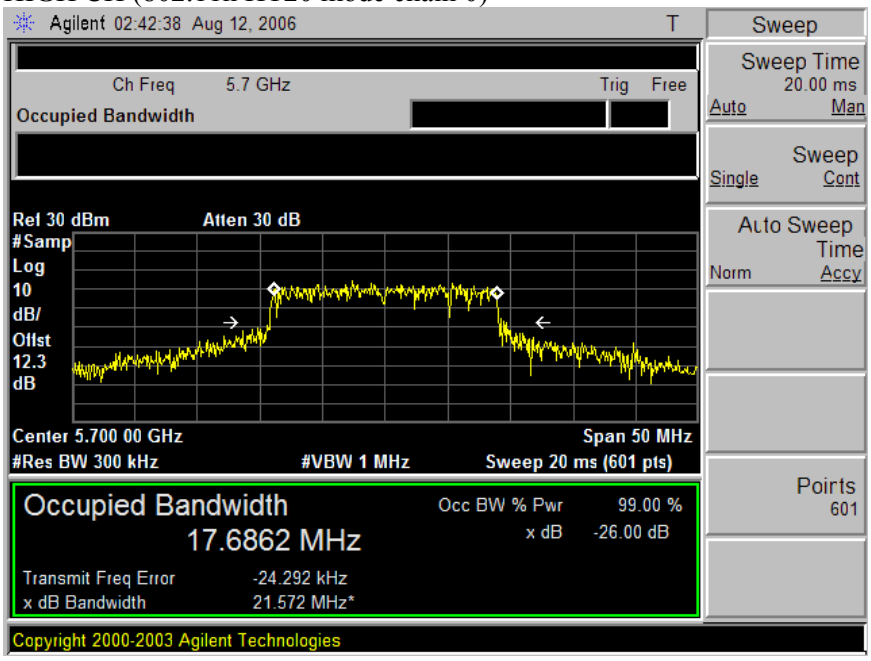
LOW CH (802.11n HT20 mode chain 0)



MID CH (802.11n HT20 mode chain 0)

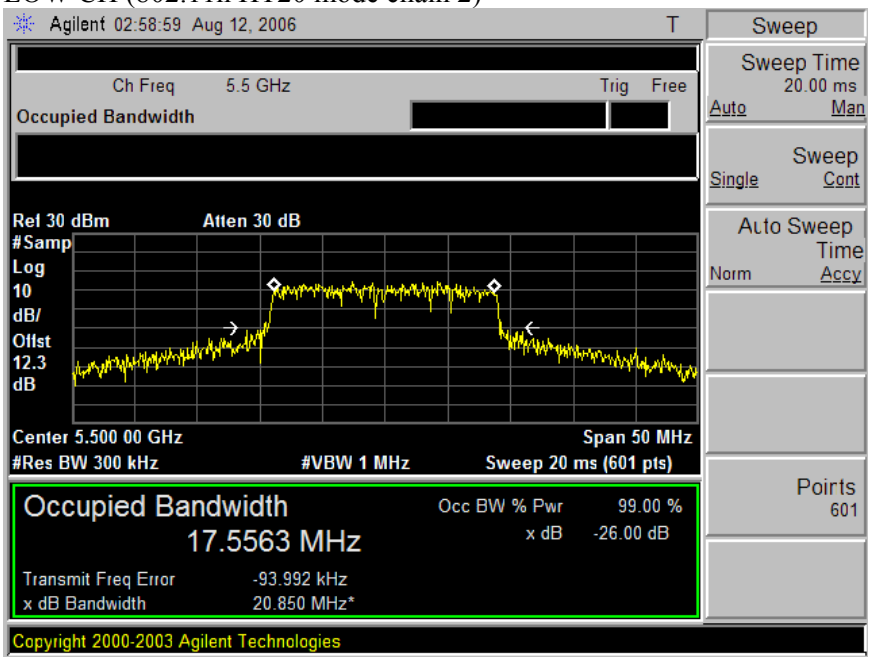


HIGH CH (802.11n HT20 mode chain 0)

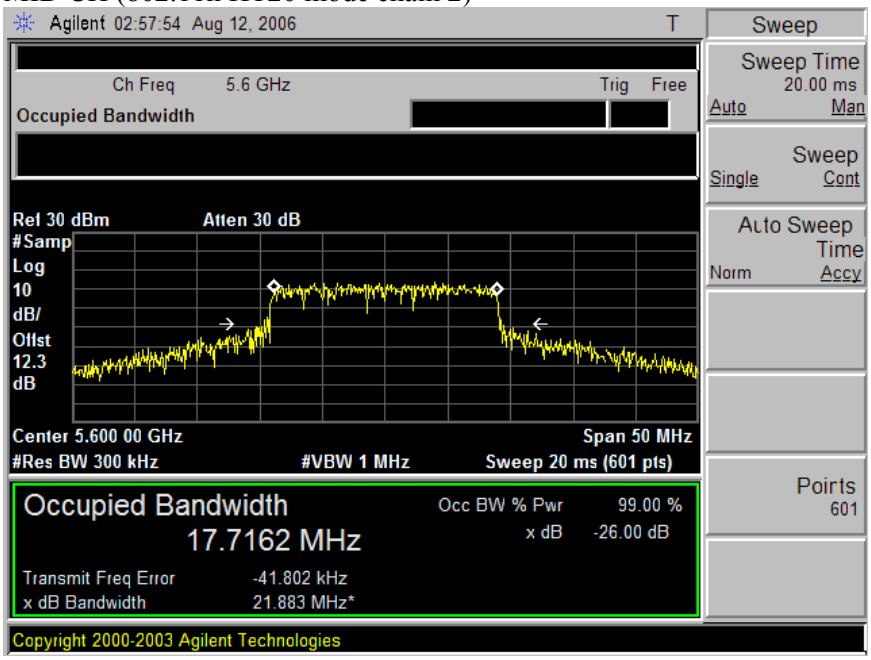


(802.11 HT20 MODE CHAIN 2)

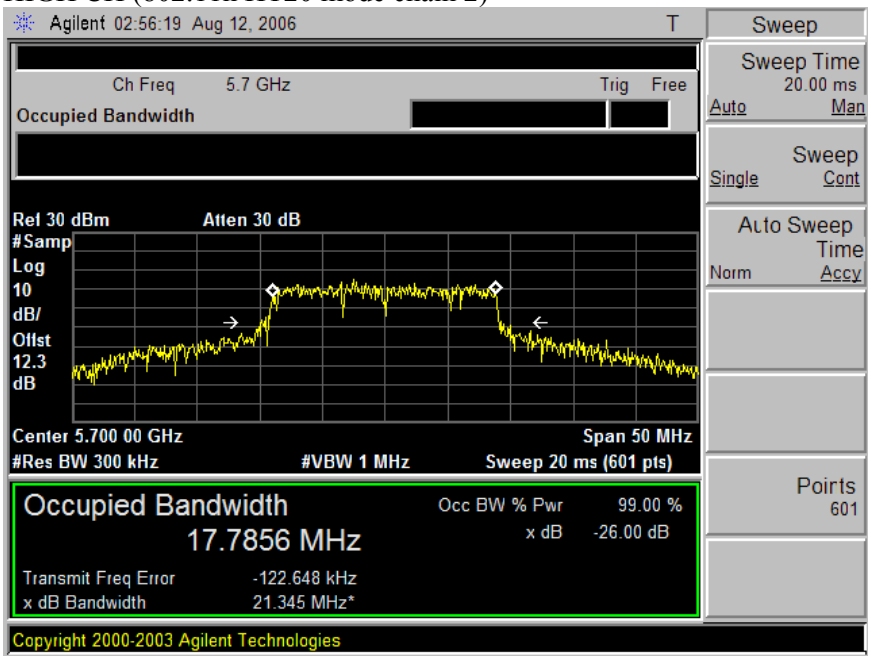
LOW CH (802.11n HT20 mode chain 2)



MID CH (802.11n HT20 mode chain 2)



HIGH CH (802.11n HT20 mode chain 2)



7.3.2. MAXIMUM POWER

LIMIT

§15.407 (a) (2) For the 5.47–5.725 GHz band, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output 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))

LIMITS AND RESULTS

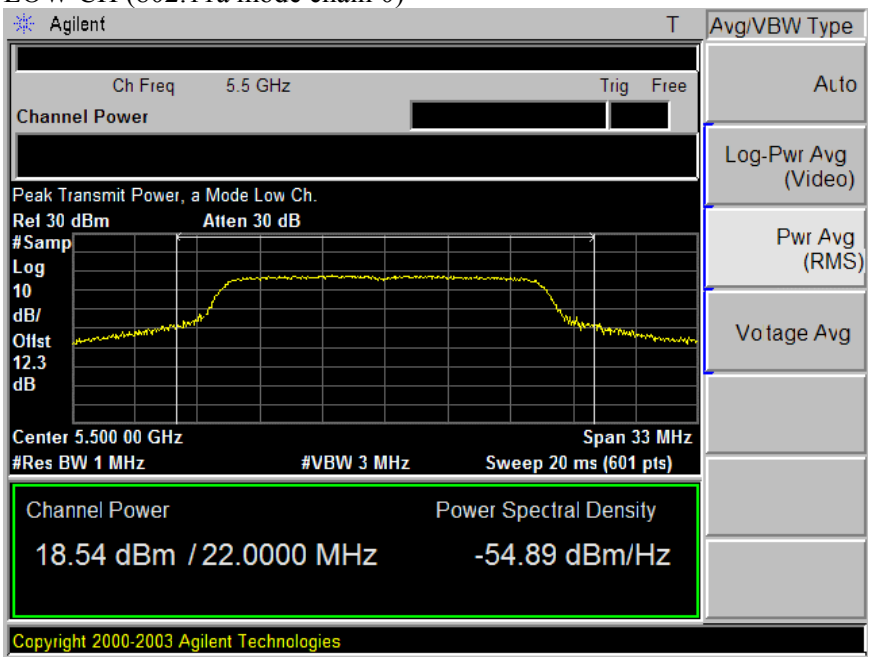
No non-compliance noted:

Fixed Limit (dBm)	24
Antenna Gain (dBi)	1
10 Log (# Tx Chains)	3.01
Effective Legacy Gain	4.01

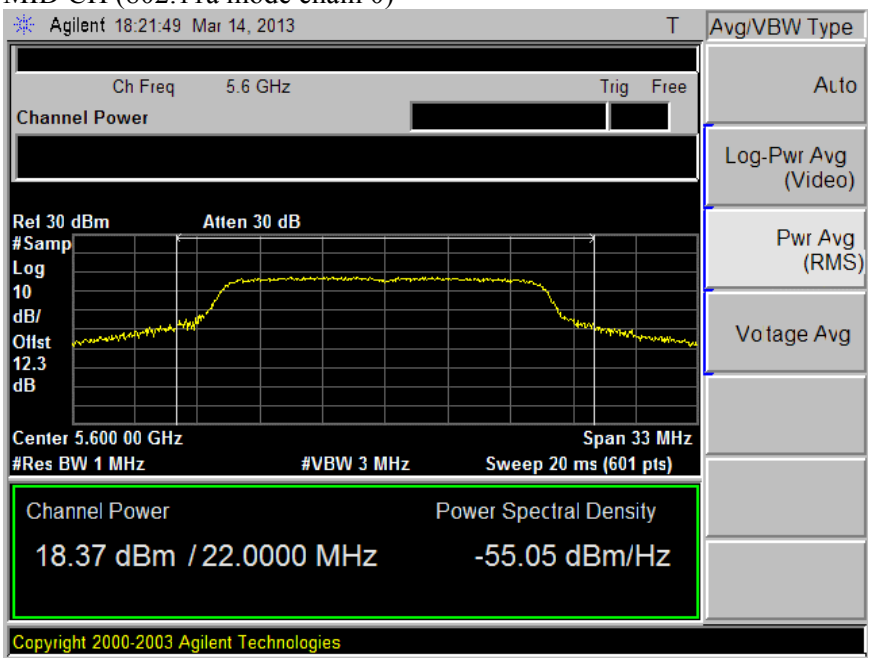
Mode Chan	Freq (MHz)	10LogB (dBm)	11+10LogB Limit (dBm)	Limit (dBm)	Chain 0 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Margin (dB)
802.11a Mode								
Low	5500	13.35	24.35	24.00	18.54	18.07	21.32	-2.68
Mid	5600	13.28	24.28	24.00	18.37	18.25	21.32	-2.68
High	5700	13.42	24.42	24.00	17.87	18.02	20.96	-3.04
802.11n HT20 Mode								
Low	5500	13.31	24.31	24.00	18.24	17.85	21.06	-2.94
Mid	5600	13.4	24.40	24.00	18.39	18.45	21.43	-2.57
High	5700	13.34	24.34	24.00	17.67	17.86	20.78	-3.22

(802.11a MODE CHAIN 0)

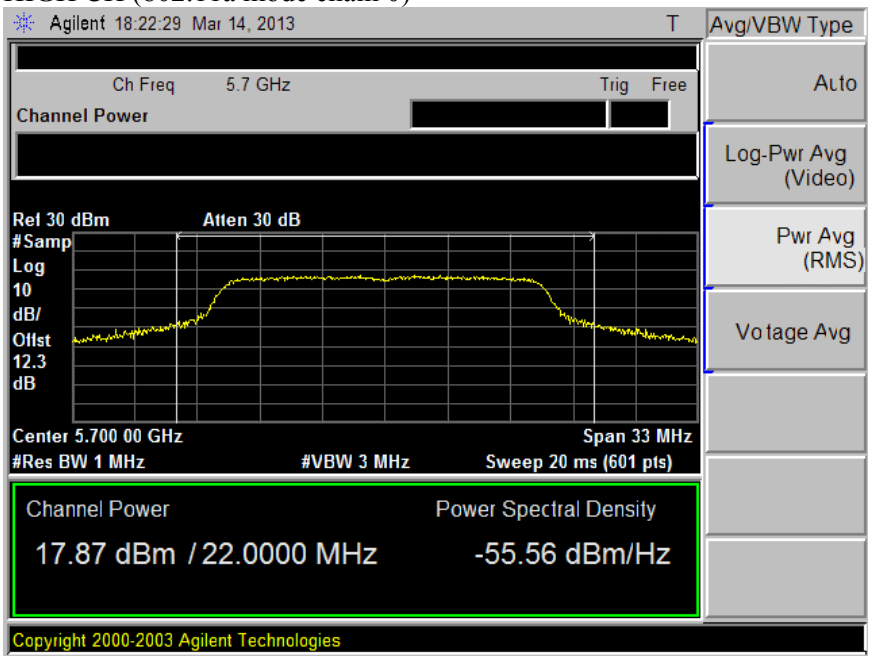
LOW CH (802.11a mode chain 0)



MID CH (802.11a mode chain 0)

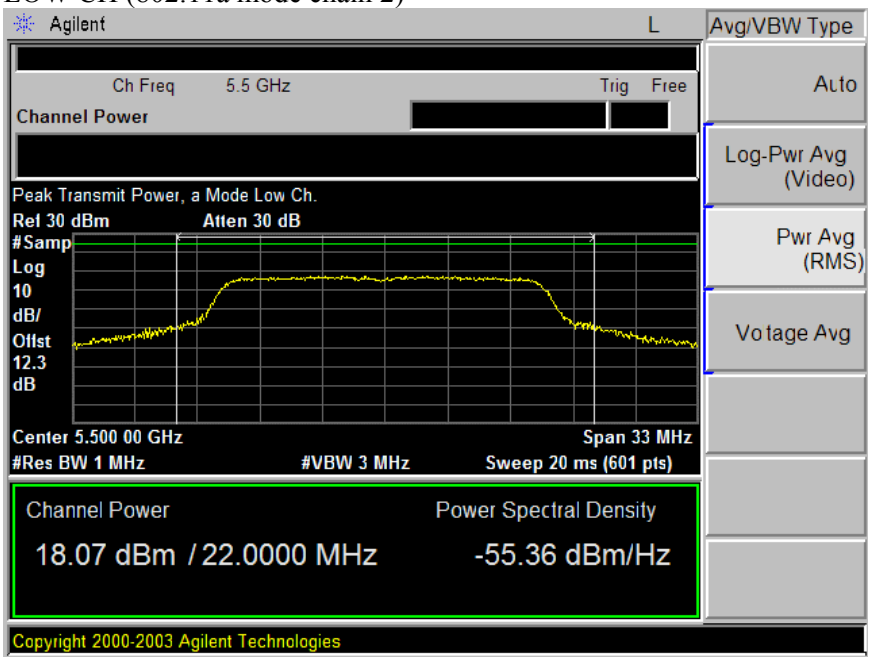


HIGH CH (802.11a mode chain 0)

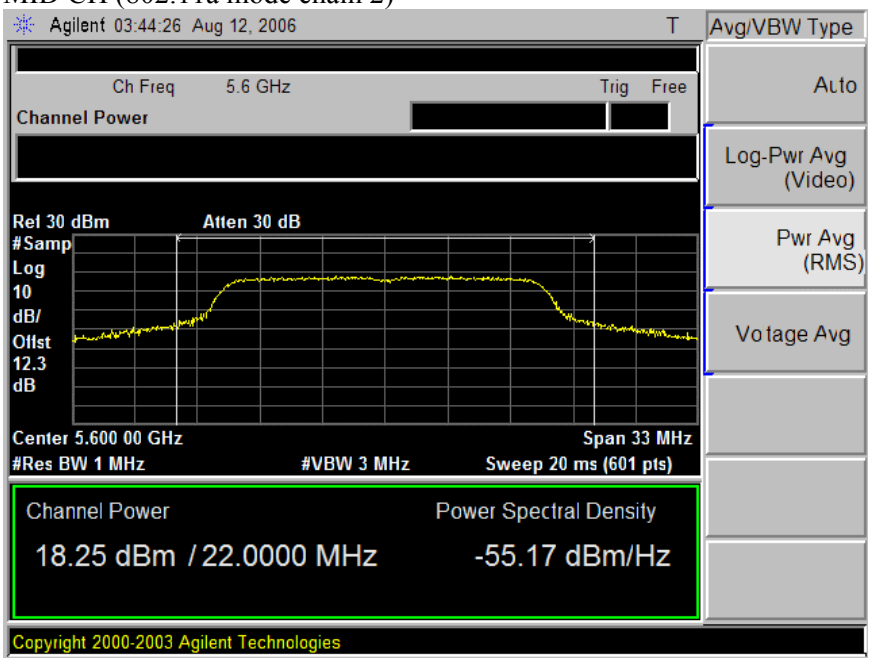


(802.11a MODE CHAIN 2)

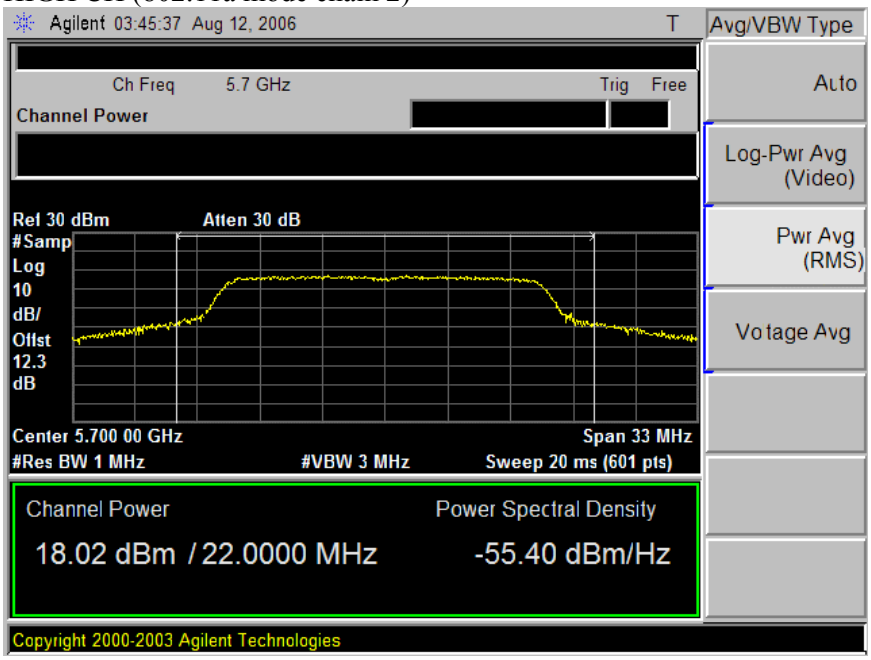
LOW CH (802.11a mode chain 2)



MID CH (802.11a mode chain 2)

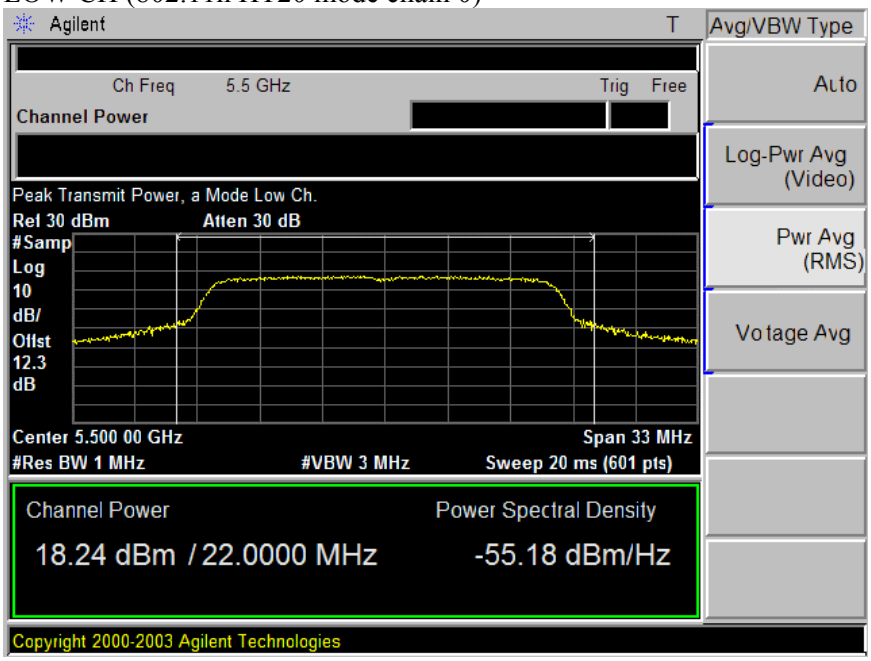


HIGH CH (802.11a mode chain 2)

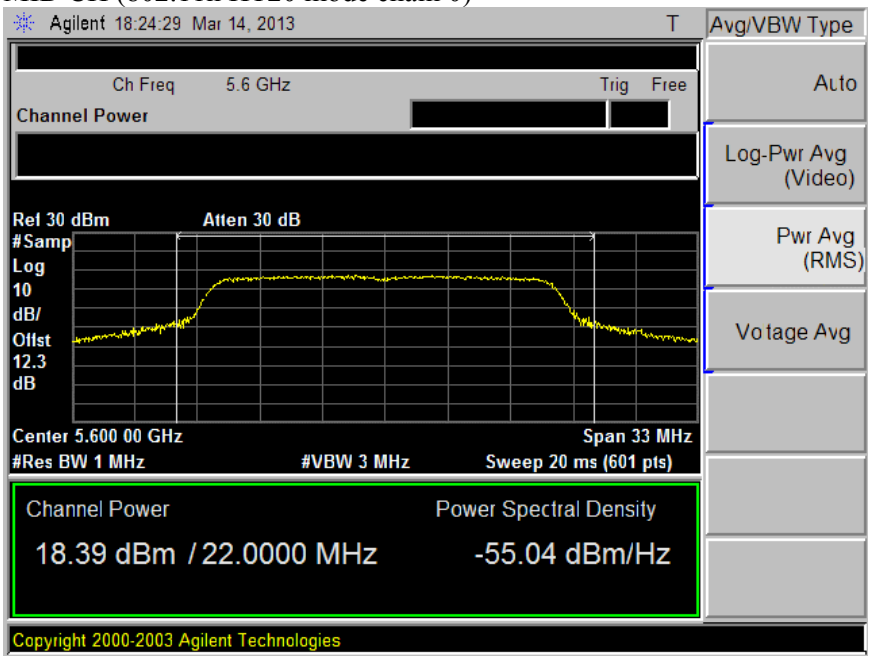


(802.11n HT20 MODE CHAIN 0)

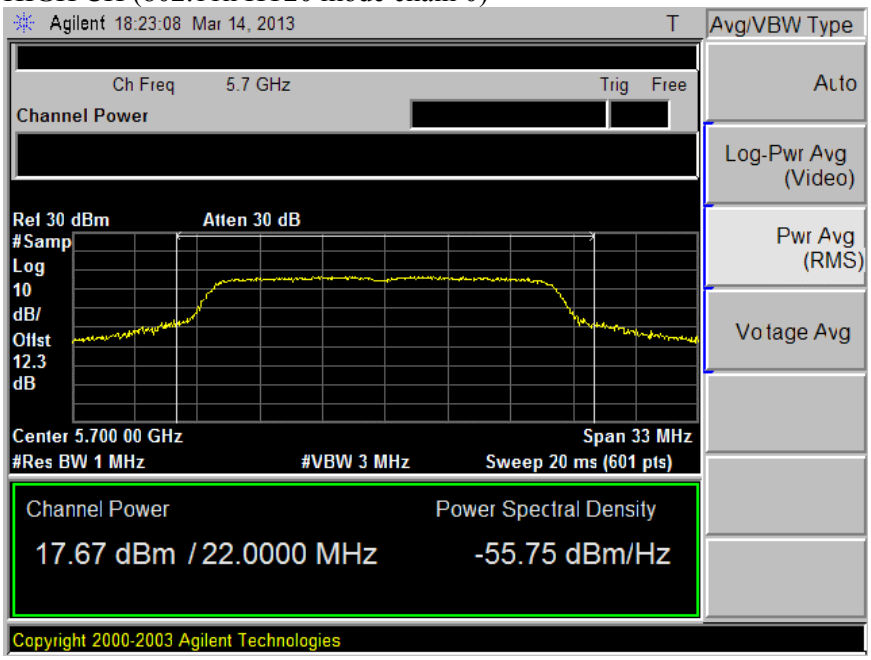
LOW CH (802.11n HT20 mode chain 0)



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)