FCC CFR47 PART 15 SUBPART E
CERTIFICATION
TEST REPORT

FOR

802.11 a/b/g/n ACCESS POINT

MODEL NUMBER: A1143

FCC ID: BCGA1143

REPORT NUMBER: 06U10333-2

ISSUE DATE: SEPTEMBER 29, 2006

Prepared for
APPLE COMPUTER, INC.
1 INFINITE LOOP, M/S 26A
CUPERTINO, CA 95014, USA

Prepared by
COMPLIANCE CERTIFICATION SERVICES
561F MONTEREY ROAD
MORGAN HILL, CA 95037, USA
TEL: (408) 463-0885
FAX: (408) 463-0888

LAB CODE:200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	9/29/2006	Initial Release	A. Ilarina

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE COMPUTER, INC.
1 INFINITE LOOP, M/S 26A
CUPERTINO, CA 95014
U.S.A.

EUT DESCRIPTION: 802.11 a/b/g/n ACCESS POINT

MODEL: A1143

SERIAL NUMBER: 6F619000KVYBE
6F6270010VV6E
6F61801FVZC

DATE TESTED: AUGUST 1-24, 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:

ALVIN ILARINA
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

FRANK IBRAHIM
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 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 EUT is an 802.11a/b/g/n Access Point.
The radio module is manufactured by Atheros Communications, Inc.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5150 to 5250 MHz Authorized Band			
5180 - 5240	802.11a 20MHz	12.94	19.68
5180 - 5240	802.11n HT20	14.14	25.94
5190 - 5230	802.11n HT40	16.94	49.43

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes three PCB Monopole Antennas, each antenna has a maximum gain of 3 dBi in the 5.2 GHz band.

5.4. SOFTWARE AND FIRMWARE

Software Version: ART BSD Build #4

Firmware Version: m28_0.0.1d1auto20060731T0200-M28_art.basebinary

5.5. WORST-CASE CONFIGURATION AND MODE

The 3x3 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 investigation by measuring the average power, peak power and PPSD across all data rates, bandwidths, and modulations.

The worst-case data rates for the 2GHz bands are: 1 Mbps for 802.11b; 6Mbps for 802.11g; MCS0 for 802.11n HT20; MCS0 for 802.11n HT40. These are based on baseline testing with this chipset.

The worst-case data rates for the 5GHz bands are: 6 Mbps for 802.11a 20MHz; MCS0 for 802.11n HT20 and 802.11n HT40. These are based on baseline testing with this chipset.

All emissions tests were made with the worst-case data rates.

5.6. MODIFICATIONS

There were no modifications made to the revision EUT during the testing.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop PC	Apple	PowerBook G4	PT346234	DoC
Power Adapter for PC	Apple	A1021	N/A	N/A
Power Adapter for EUT	Delta Electronics	EADP-20BB A	MV61505JVNPEVT1	N/A

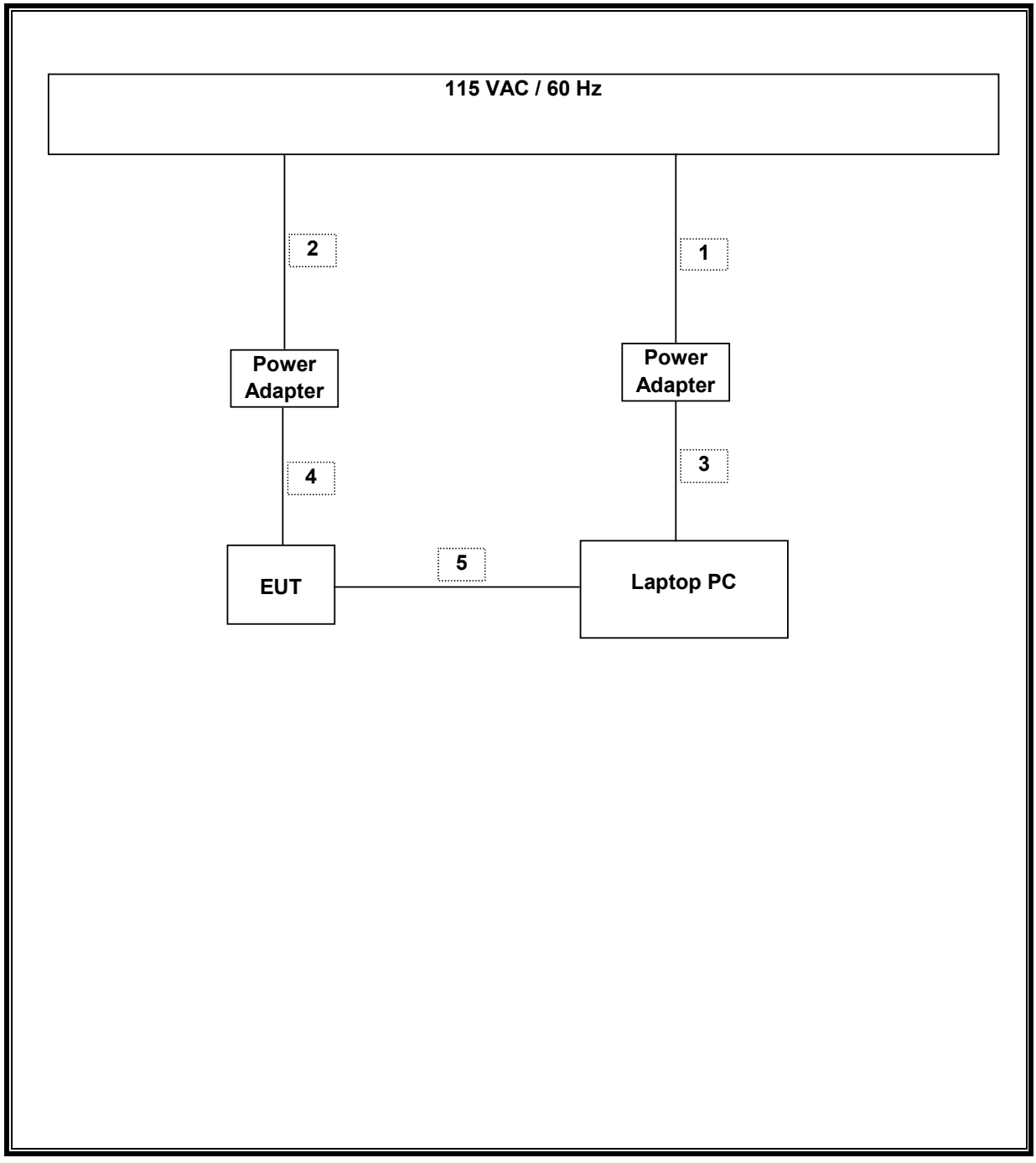
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	AC	Unshielded	1.8m	N/A
2	AC	1	AC	Unshielded	2m	N/A
3	DC	1	DC	Unshielded	1.8m	N/A
4	DC	1	DC	Unshielded	3m	N/A
5	Ethernet	1	RJ45	Unshielded	4.5m	N/A

TEST SETUP

The EUT is connected to a host laptop computer. Test software exercised the EUT.

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**
Spectrum Analyzer	Agilent	E4446A	US42510266	10/19/06
Power Meter	Agilent / HP	438A	3513U04320	01/12/07
Power Sensor 10MHz - 18GHz	Agilent / HP	8481A	2237A31744	01/11/07
Power Combiner	Picoseconds	5350-218	555645 1406	C.N.R
Power Combiner	Picoseconds	5350-218	555720 1806	C.N.R
Power Combiner	Picoseconds	5350-218	555642 1406	C.N.R
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	04/22/07
Antenna, Horn 18 ~ 26 GHz	ARA	MWH-1826/B	1049	09/12/06
Antenna, Horn 26 ~ 40 GHz	ARA	MWH-2640/B	1029	04/13/07
Preamplifier, 1 ~ 26 GHz	Miteq	NSP2600-SP	924342	09/02/06
Preamplifier, 26 ~ 40 GHz	Miteq	NSP4000-SP2	924343	08/18/07
5.15-5.35 GHz Reject Filter	Micro-Tronics	BRC13190	001	CNR
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	02/04/07
RF Filter Section	Agilent / HP	85420E	3705A00256	02/04/07
Antenna, Bilog 30 MHz ~ 2 GHz	Sunol Sciences	JB1	A121003	09/03/06
EMI Test Receiver	R & S	ESHS 20	827129/006	11/03/06
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	08/30/06
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	837990	08/30/06
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	04/22/07
Environmental Chamber	Thermotron	SE 600-10-10	29800	06/12/07

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.

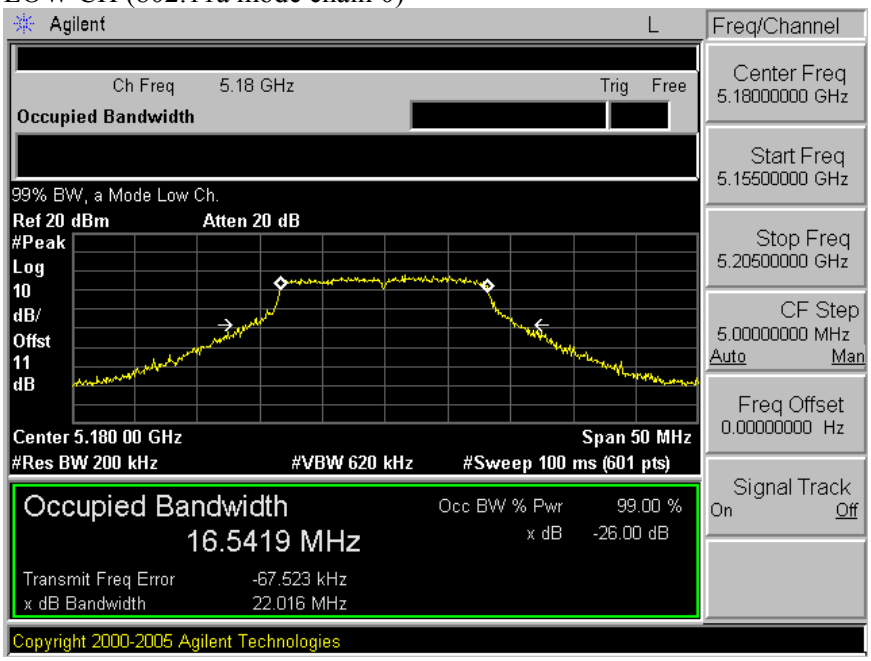
RESULTS

No non-compliance noted:

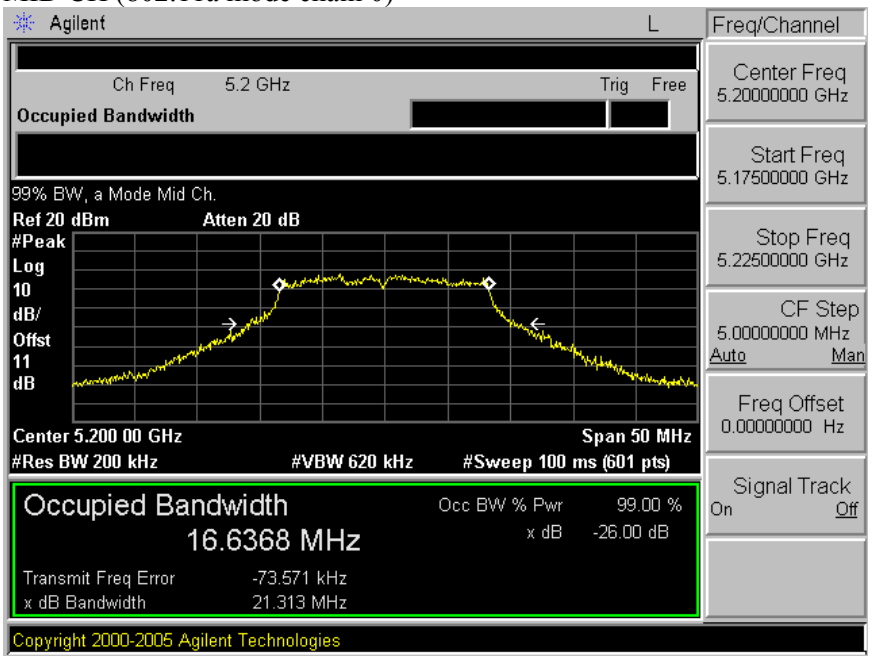
Mode Channel	Frequen (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)	Worst Case 10 Log B (dB)
802.11a Mode								
Low	5180	16.5419	16.5556	16.5252	22.016	21.799	20.993	13.43
Middle	5200	16.6368	16.5689	16.5007	21.313	21.146	21.091	13.29
High	5240	6.5546	16.5732	16.4913	20.613	22.054	21.618	13.43
802.11n HT20 Mode								
Low	5180	17.8144	17.6234	17.7292	23.800	22.712	22.365	13.77
Mid	5200	17.7649	17.7116	17.6975	22.543	21.629	22.777	13.57
High	5240	17.7276	18.7504	17.7373	22.866	24.818	22.549	13.95
802.11n HT40 Mode								
Low	5190	36.3642	36.2871	36.3532	45.258	45.400	45.074	16.57
Mid	5210	36.5432	36.4113	36.3997	46.185	44.536	43.983	16.65
High	5230	36.7364	36.4682	36.3436	46.321	45.054	44.189	16.66

(802.11a MODE CHAIN 0)

LOW CH (802.11a mode chain 0)



MID CH (802.11a mode chain 0)



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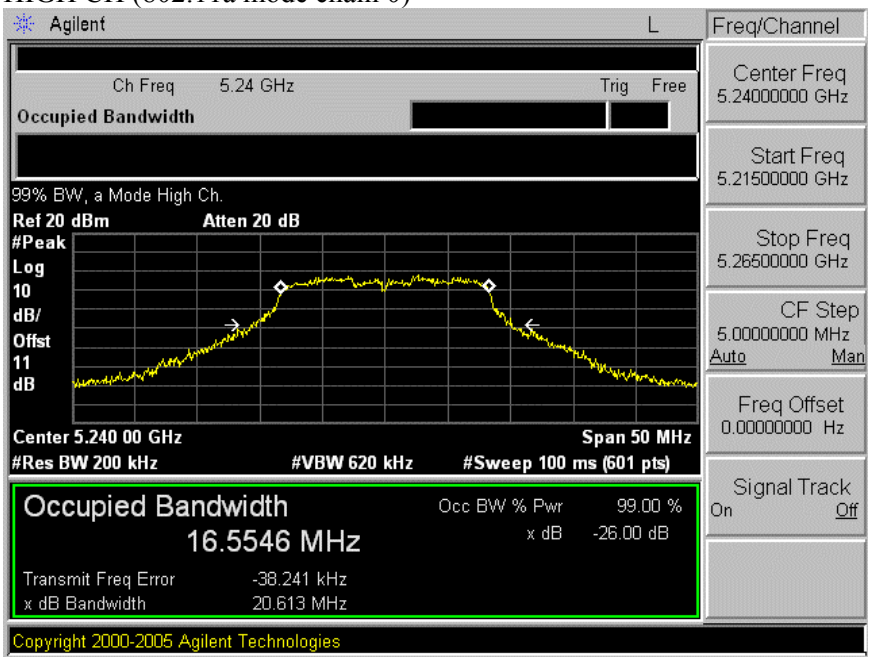
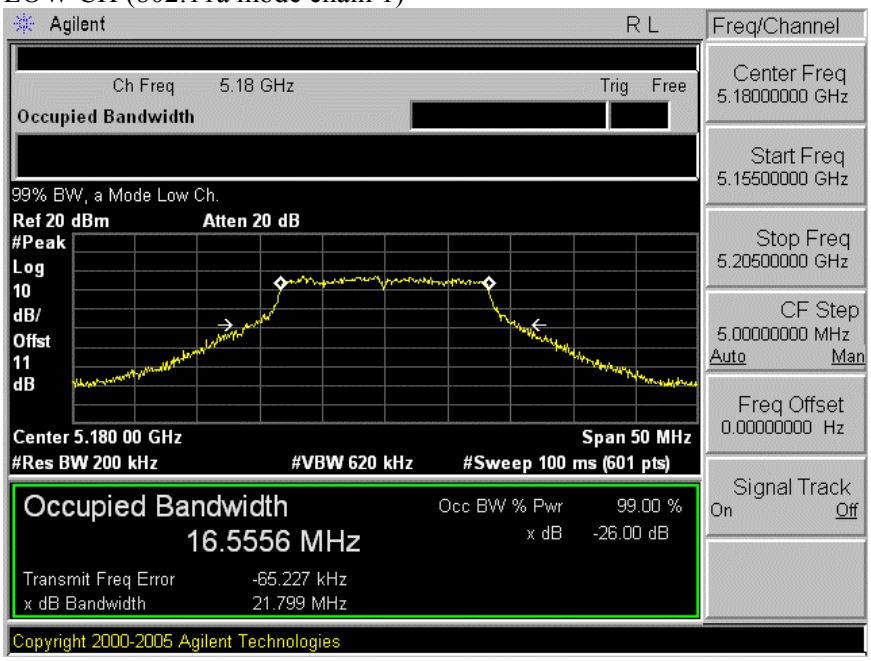


(802.11a MODE CHAIN 1)

LOW CH (802.11a mode chain 1)



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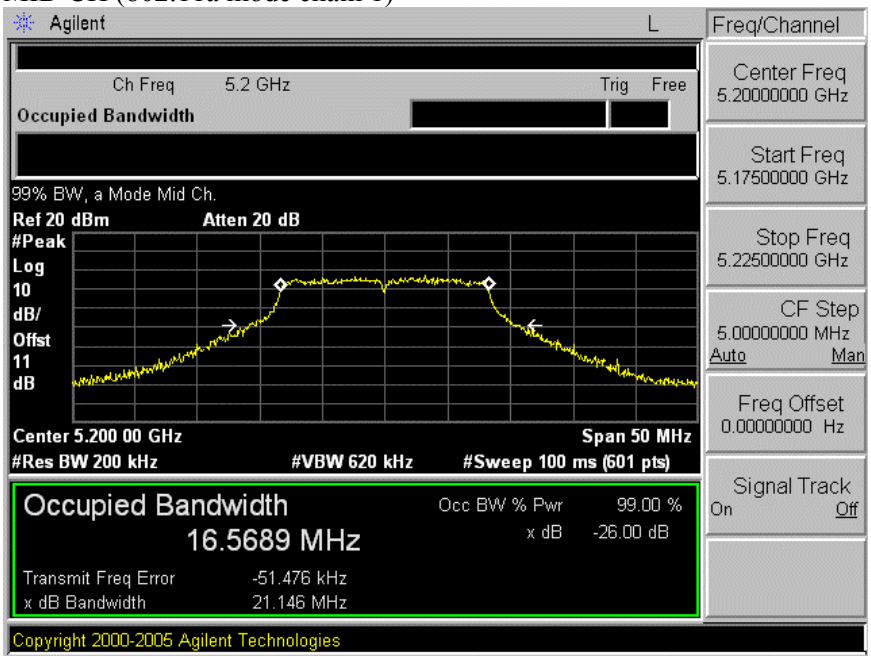
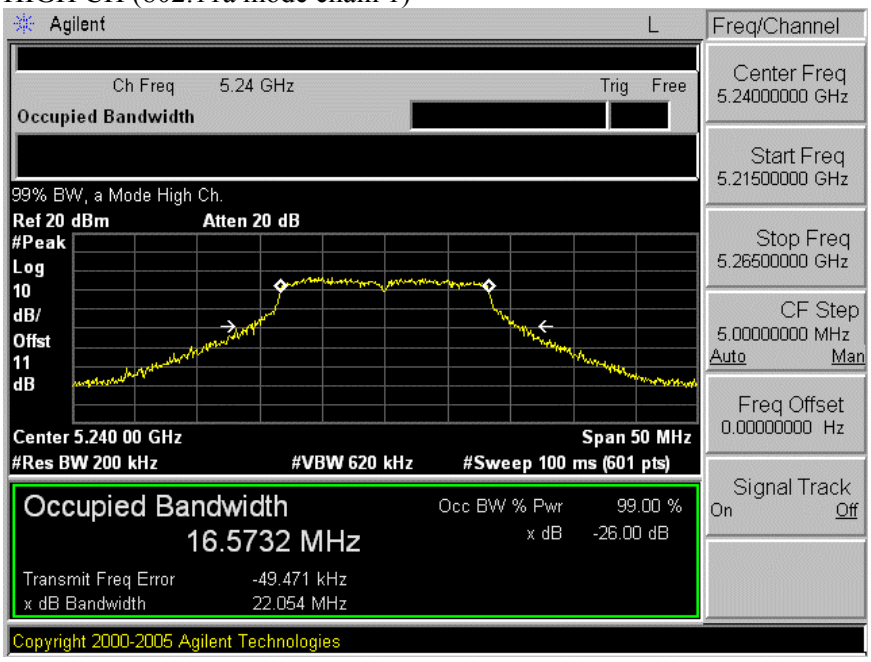
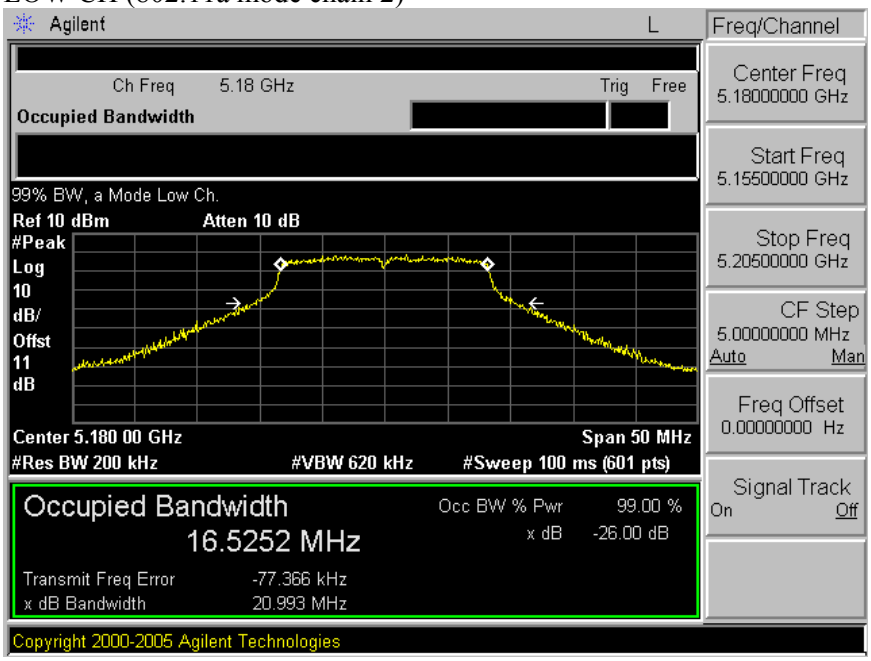


HIGH CH (802.11a mode chain 1)



(802.11a MODE CHAIN 2)

LOW CH (802.11a mode chain 2)



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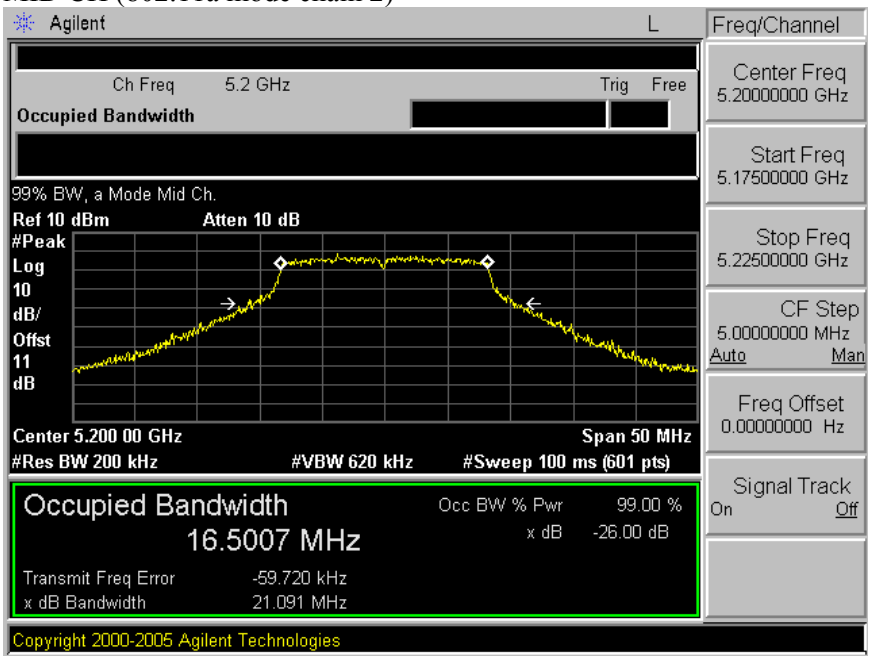

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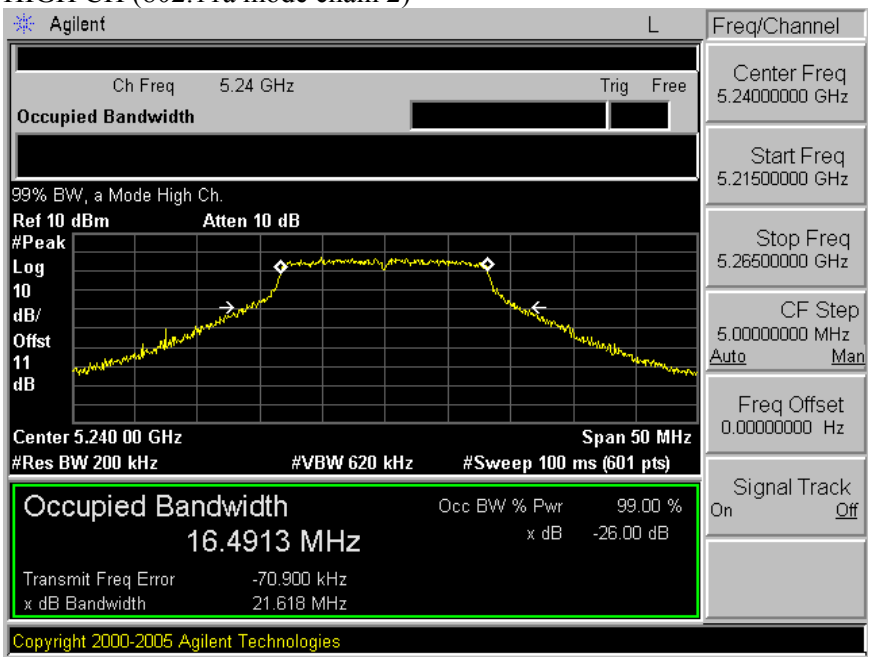
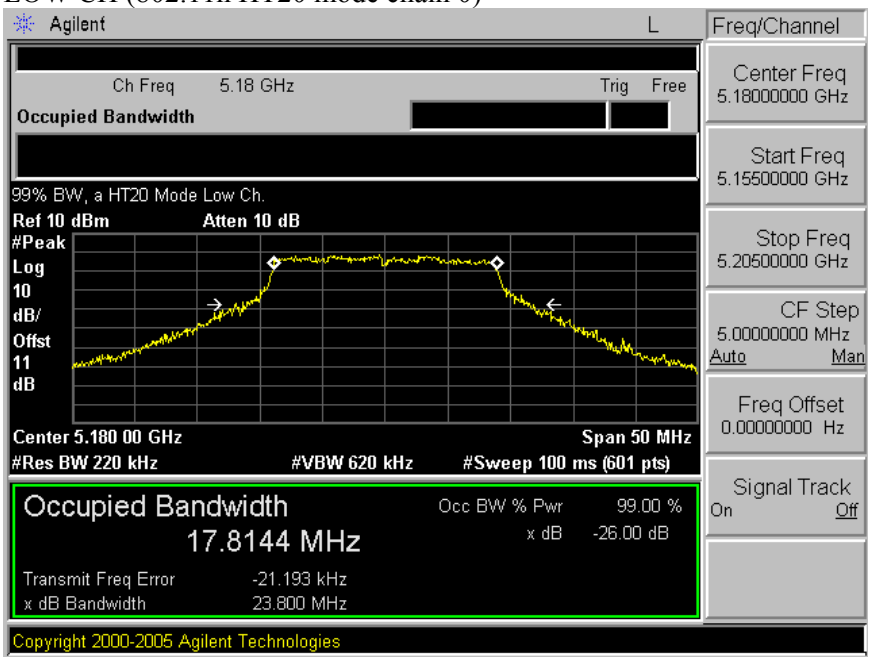


(802.11n HT20 MODE CHAIN 0)

LOW CH (802.11n HT20 mode chain 0)



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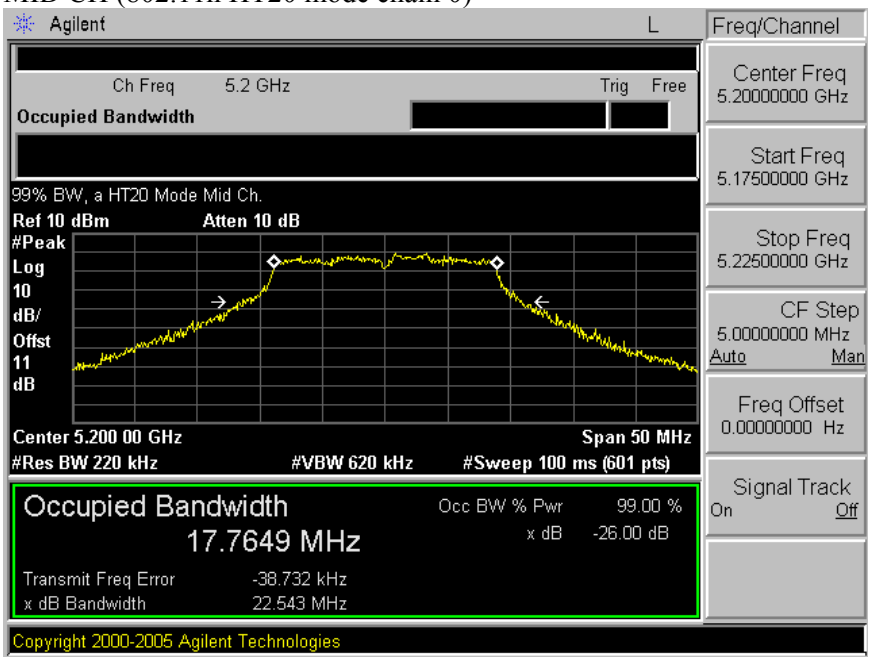

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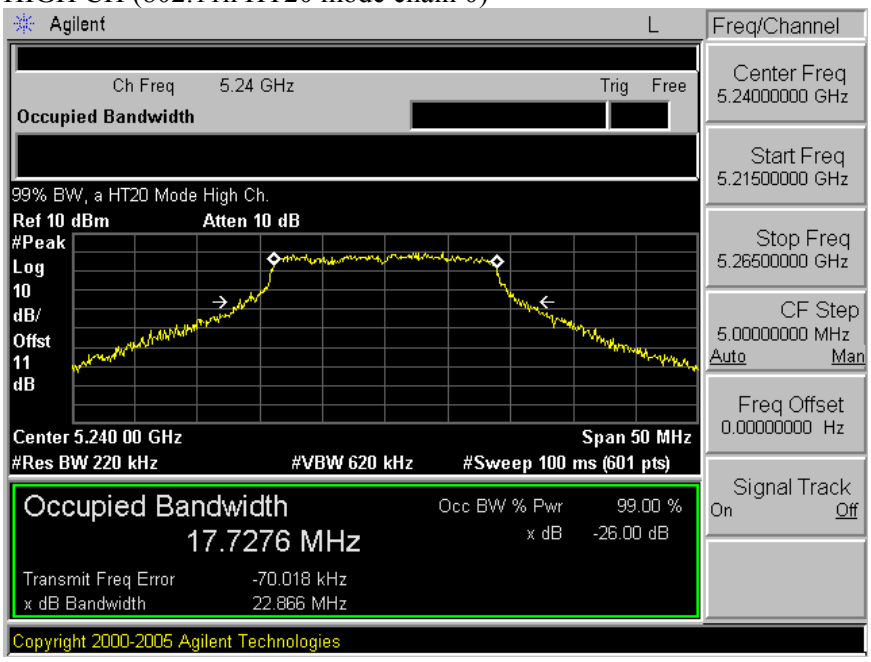
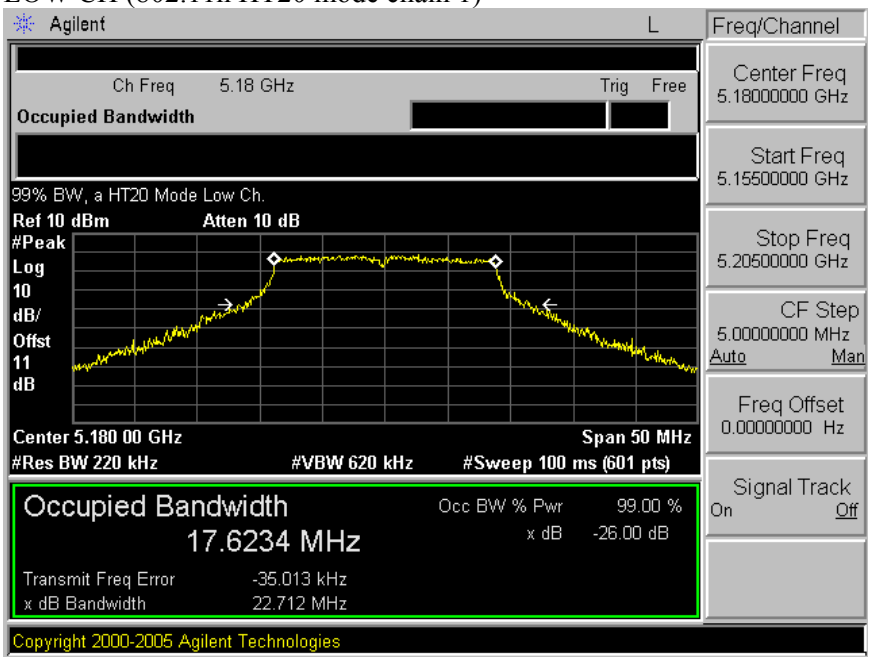


(802.11n HT20 MODE CHAIN 1)

LOW CH (802.11n HT20 mode chain 1)



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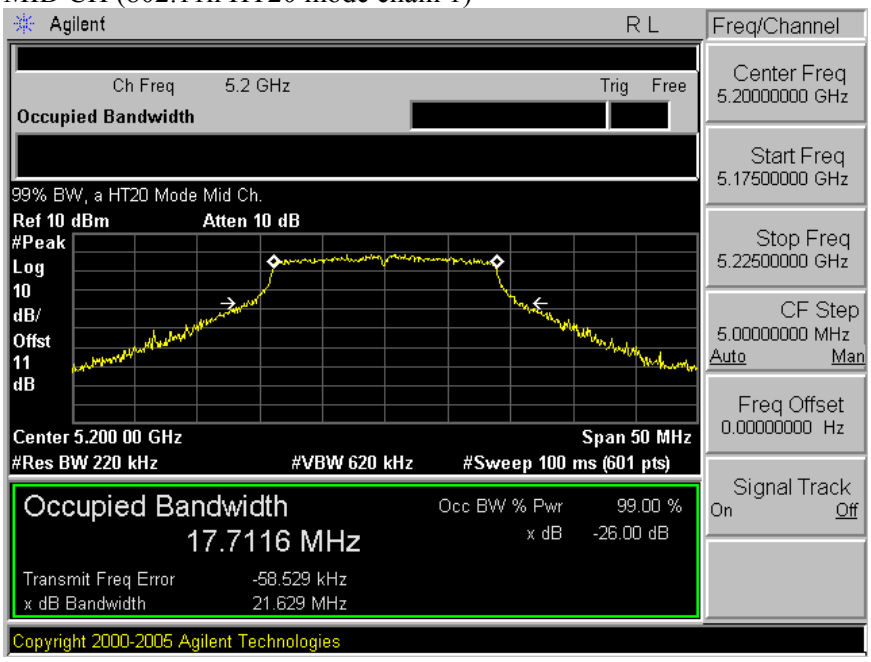

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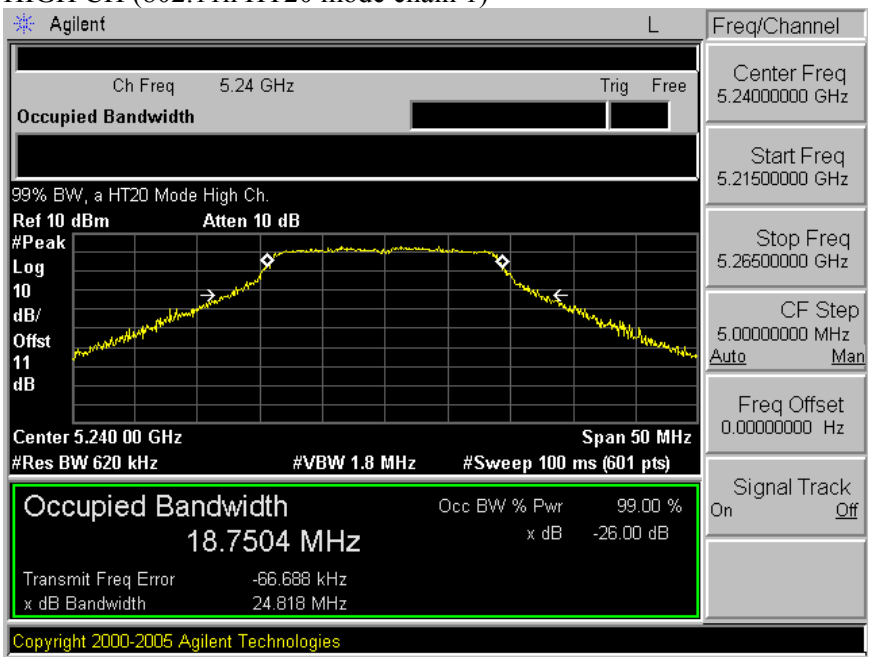

(802.11n HT20 MODE CHAIN 2)

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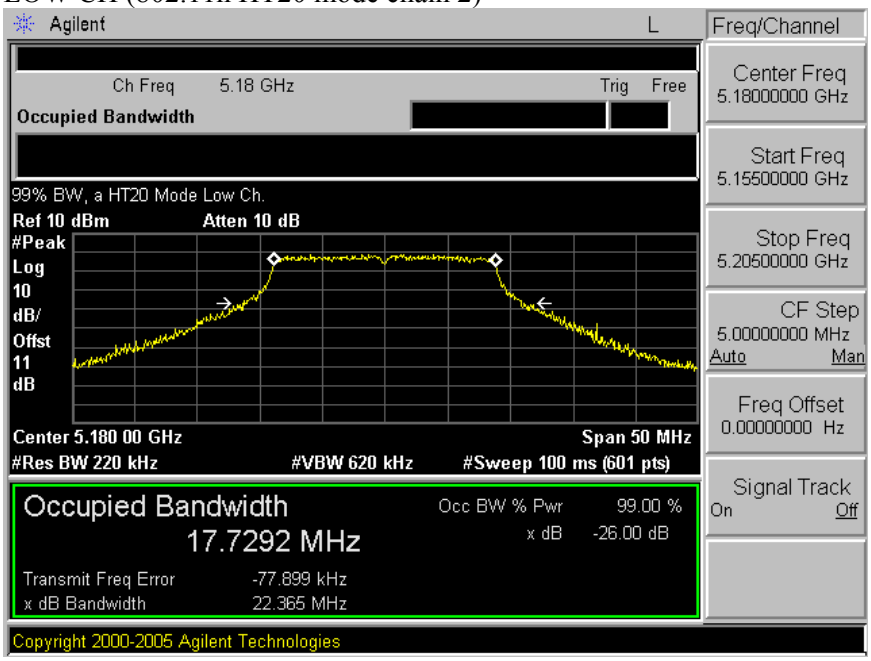
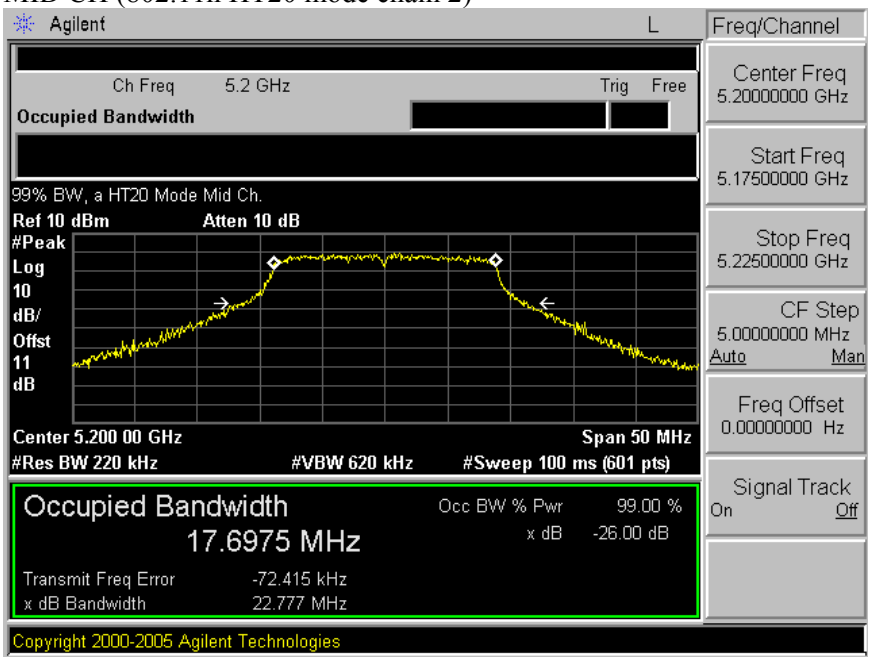


MID CH (802.11n HT20 mode chain 2)



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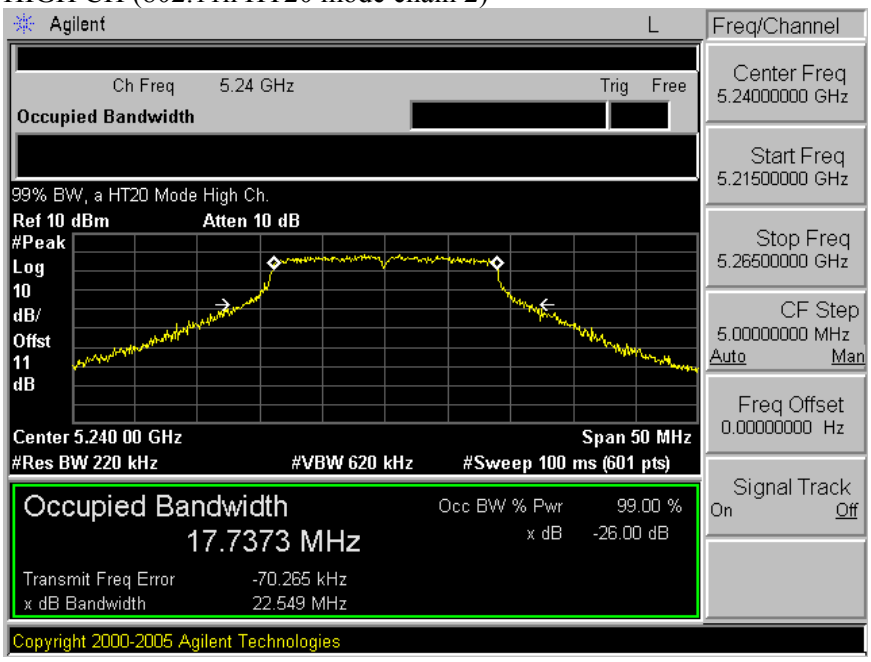
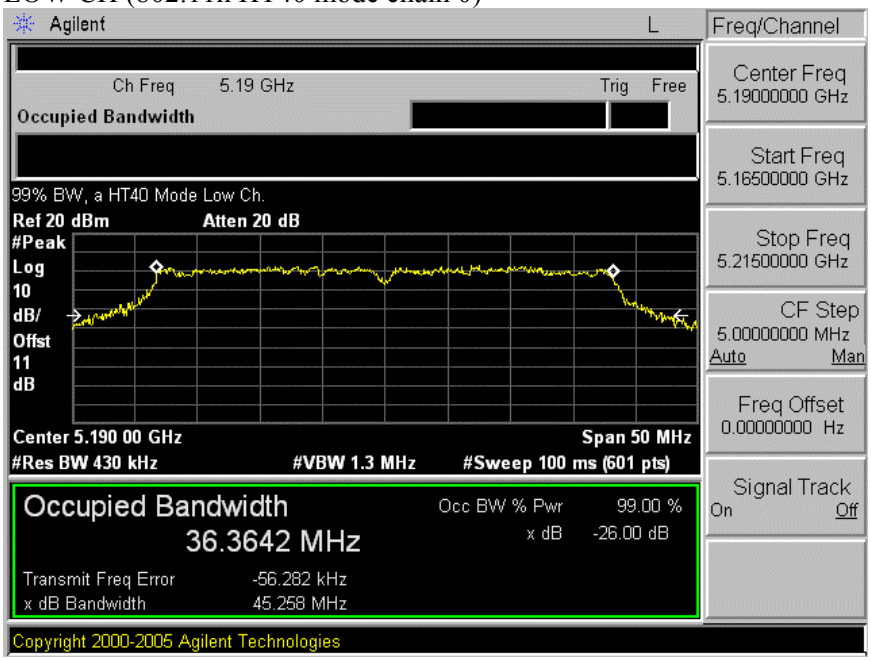


(802.11n HT40 MODE CHAIN 0)

LOW CH (802.11n HT40 mode chain 0)



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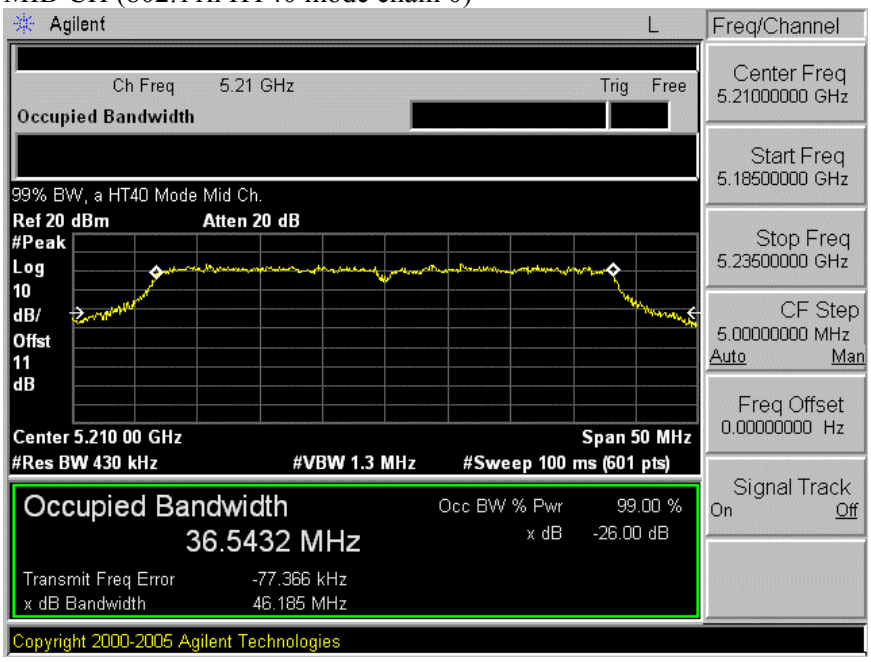

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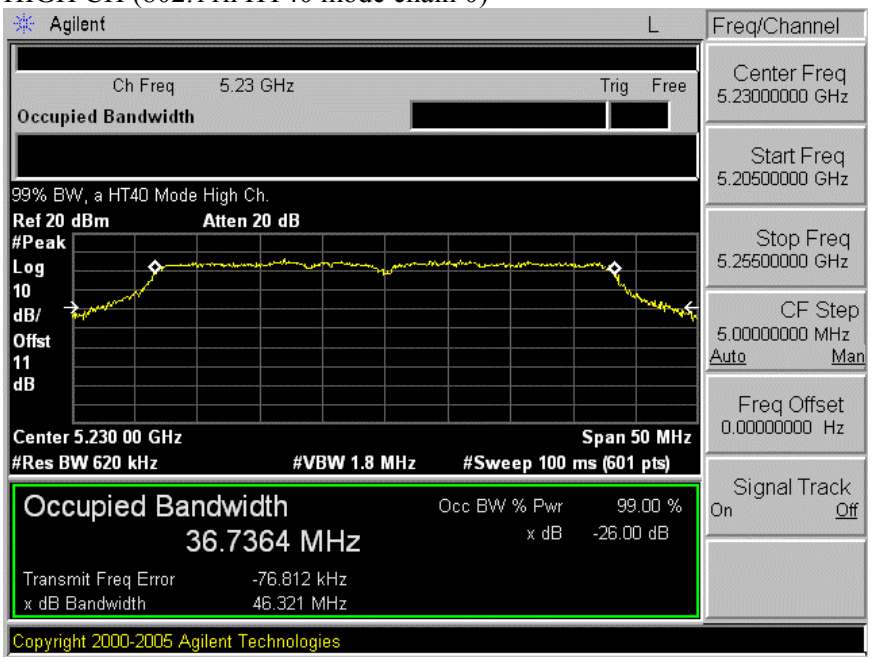
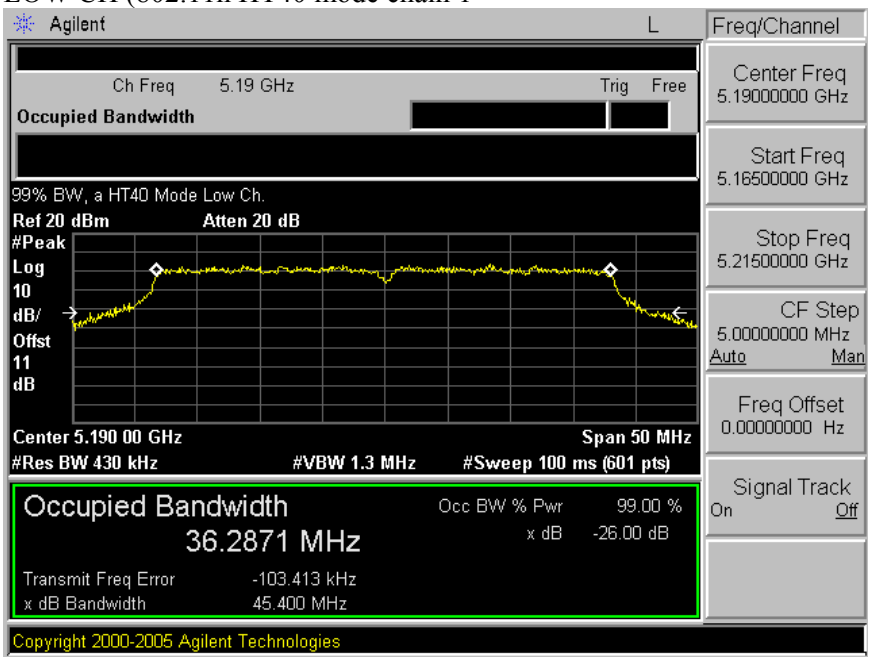
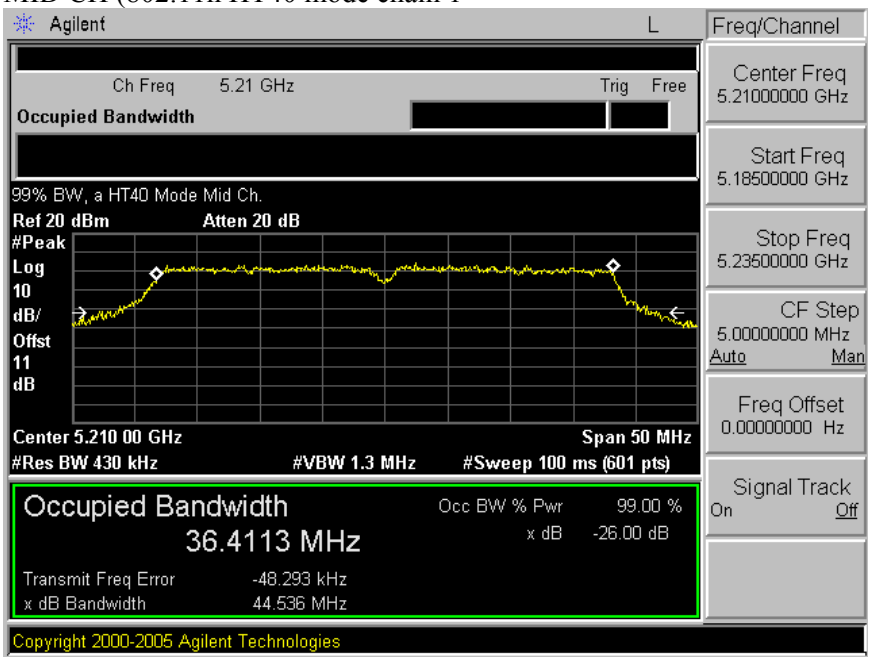


(802.11n HT40 MODE CHAIN 1

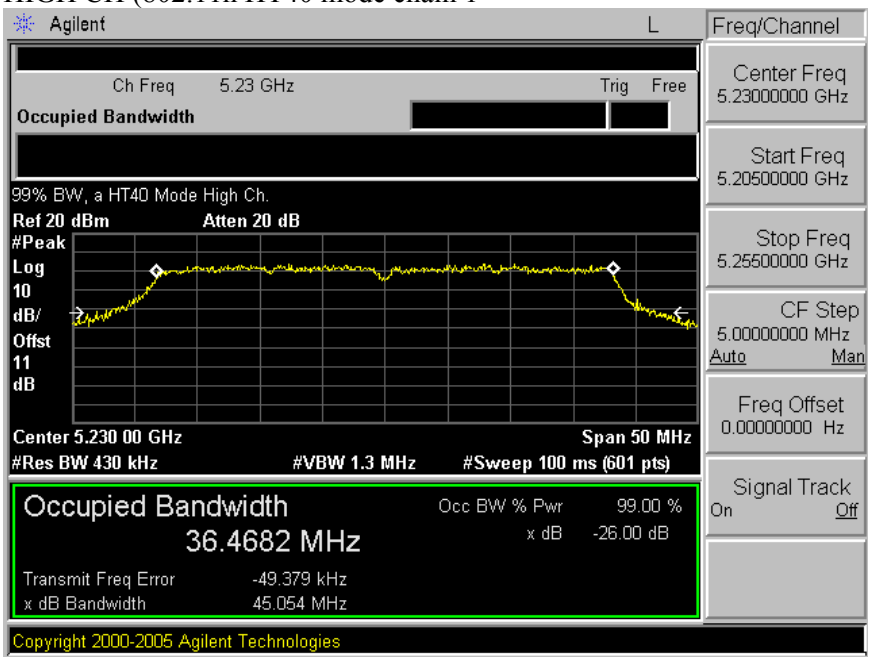
LOW CH (802.11n HT40 mode chain 1



MID CH (802.11n HT40 mode chain 1



HIGH CH (802.11n HT40 mode chain 1



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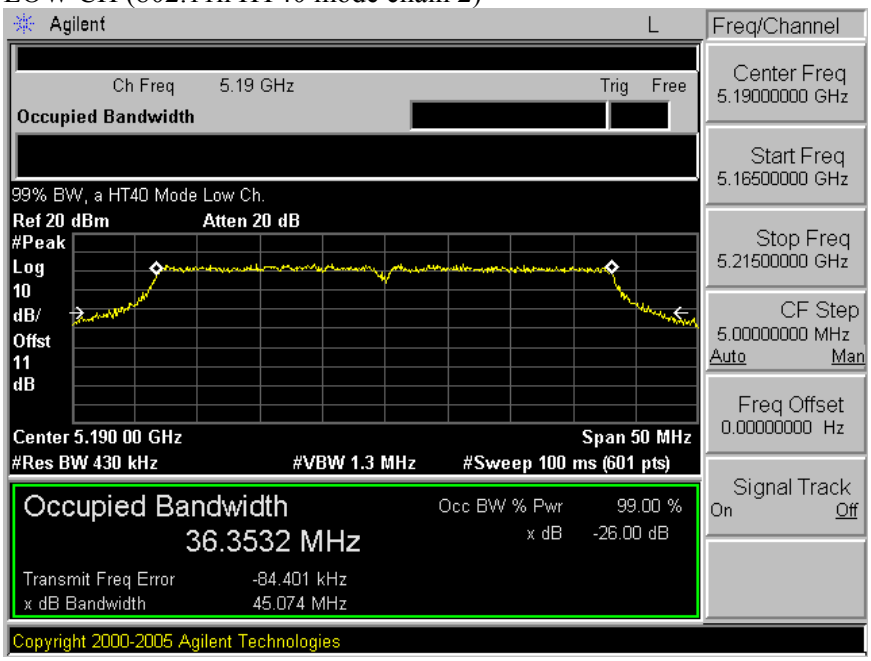

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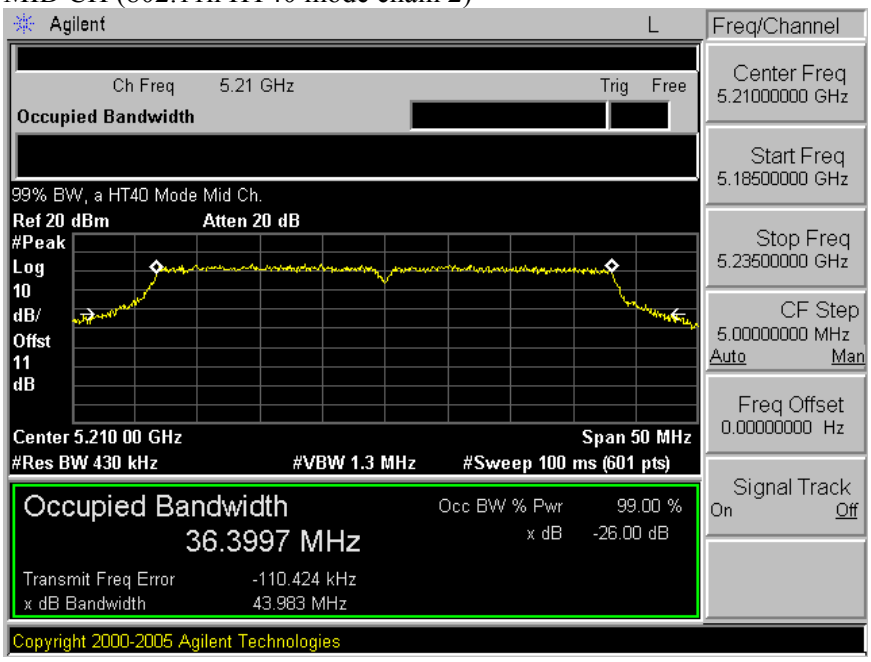
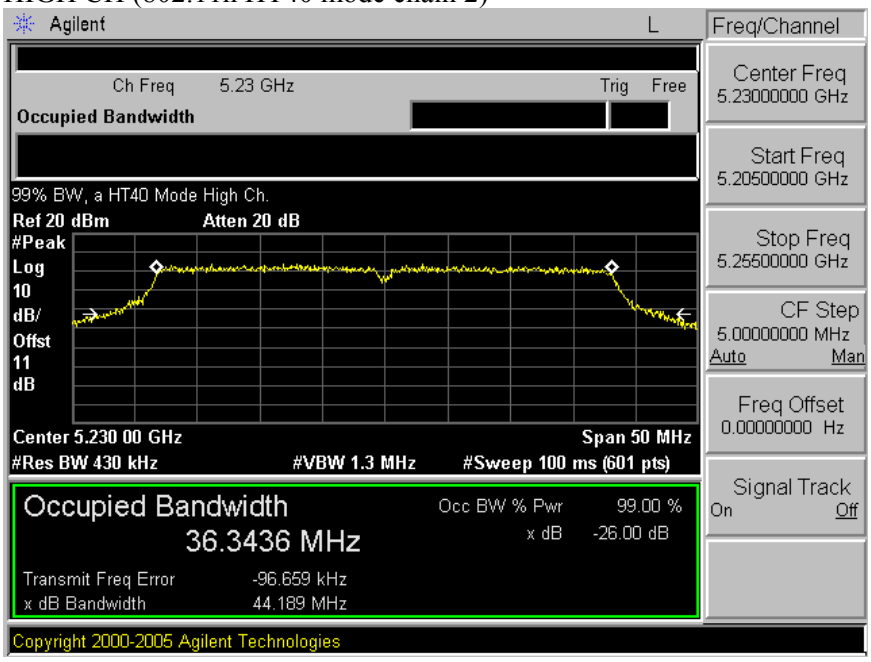


HIGH CH (802.11n HT40 mode chain 2)



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 1 Power / 10) + 10^ (Chain 2 Power / 10))

LIMITS AND RESULTS

No non-compliance noted:

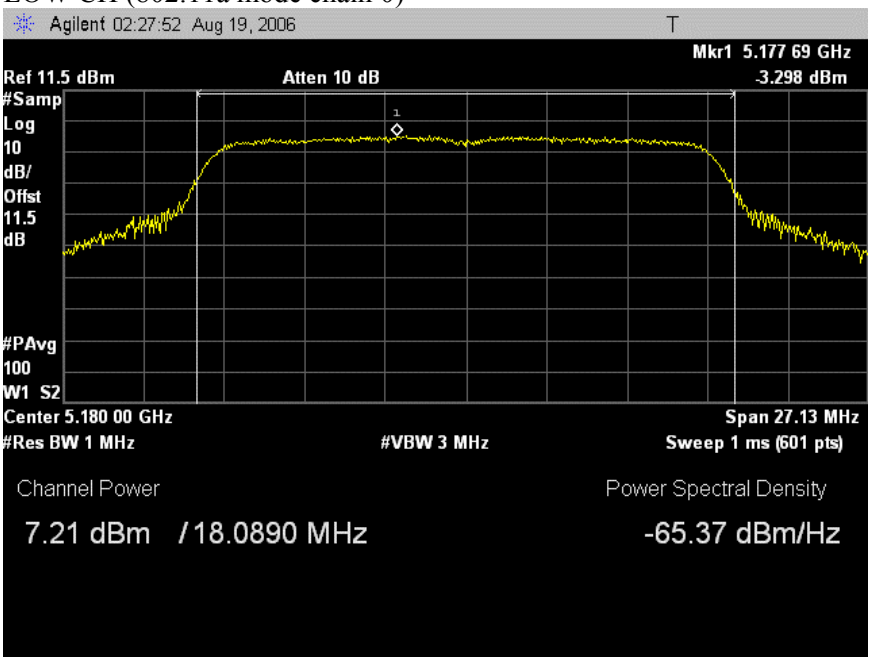
5150 to 5250 Band

Fixed Limit (dBm)	17
Antenna Gain (dBi)	3
10 Log (# Tx Chains)	4.77
Effective Legacy Gain	7.77

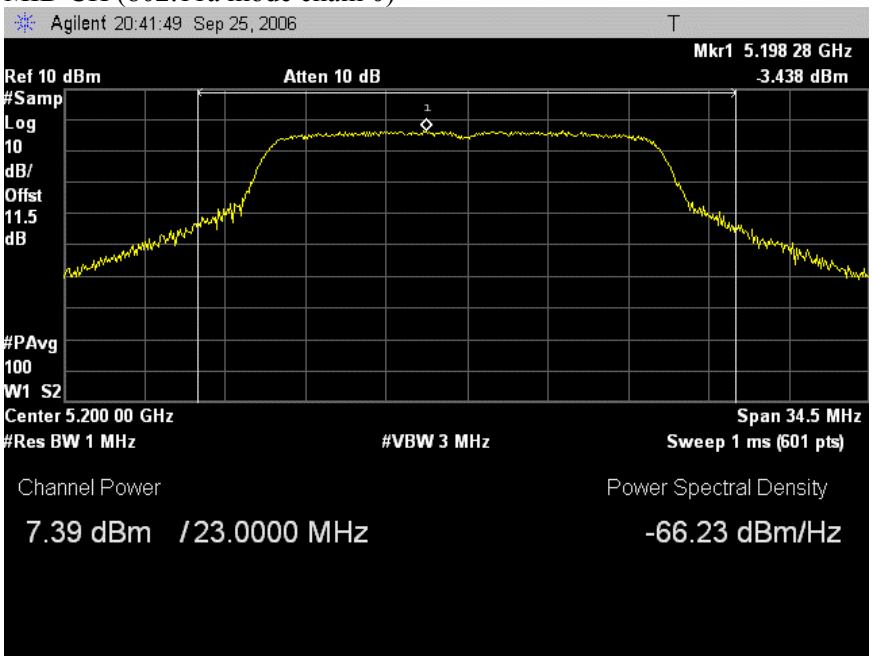
Mode Chan	Freq (MHz)	10LogB (dBm)	4+10LogB / 11+10LogB Limit (dBm)	Limit (dBm)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Margin (dB)
802.11a Mode									
Low	5180	13.43	17.43	15.23	7.21	8.80	7.27	12.60	-2.63
Mid	5200	13.29	17.29	15.23	7.39	7.58	8.20	12.51	-2.72
High	5240	13.43	17.43	15.23	8.10	8.09	8.30	12.94	-2.29
802.11n HT20 Mode									
Low	5180	13.77	17.77	17.00	8.60	9.25	10.11	14.14	-2.86
Mid	5200	13.57	17.57	17.00	9.46	8.34	9.86	14.04	-2.96
High	5240	13.95	17.95	17.00	9.18	7.09	9.49	13.48	-3.52
802.11n HT40 Mode									
Low	5190	16.57	20.57	17.00	11.96	11.72	12.33	16.78	-0.22
Mid	5210	16.65	20.65	17.00	12.26	12.12	12.13	16.94	-0.06
High	5230	16.66	20.66	17.00	11.38	11.62	11.52	16.28	-0.72

(802.11a MODE CHAIN 0)

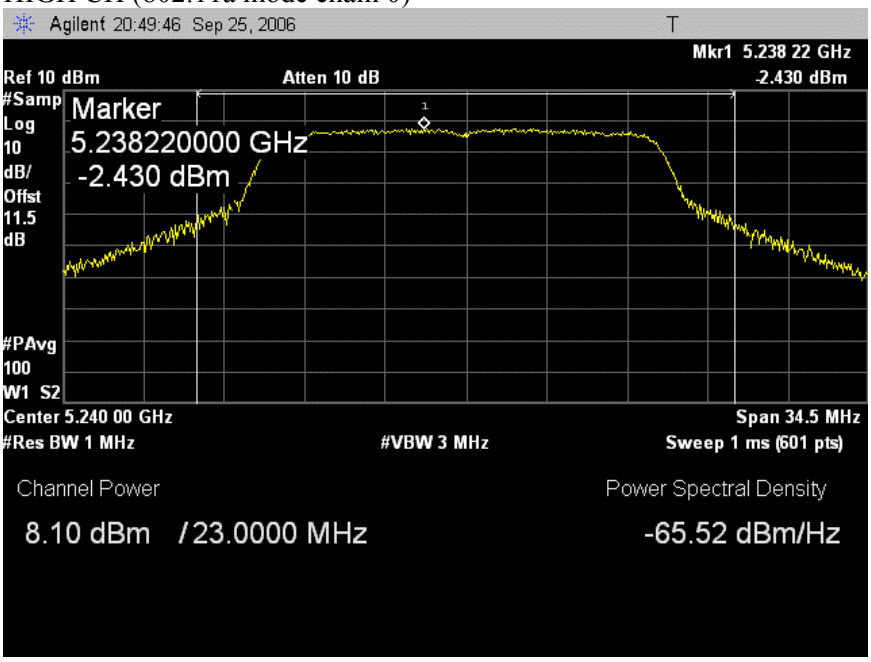
LOW CH (802.11a mode chain 0)



MID CH (802.11a mode chain 0)

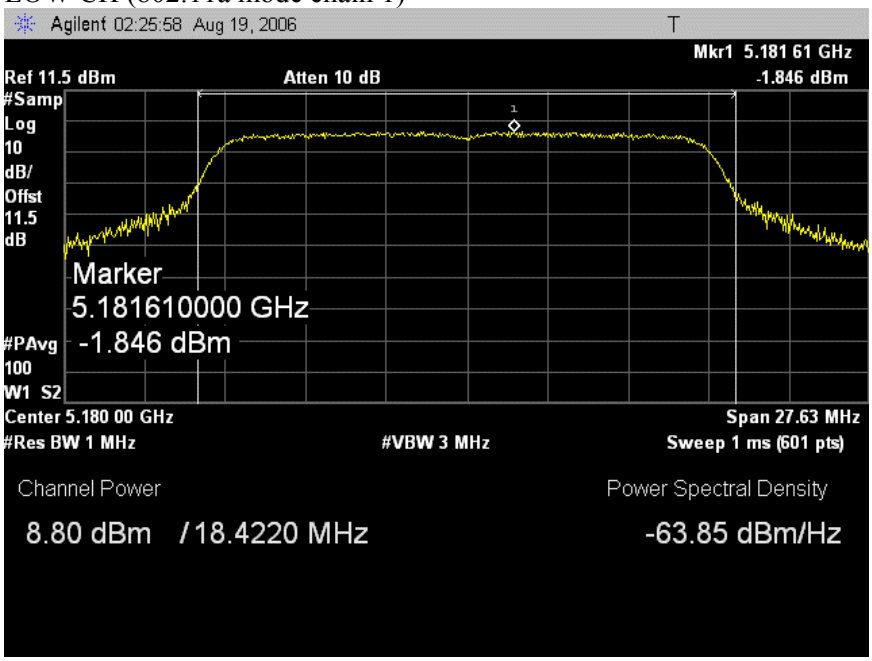


HIGH CH (802.11a mode chain 0)

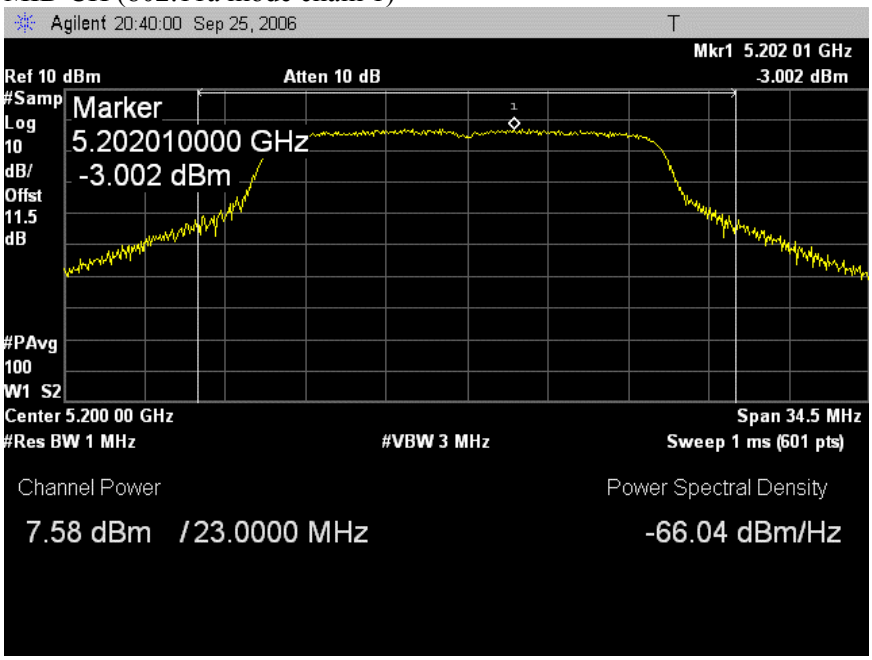


(802.11a MODE CHAIN 1)

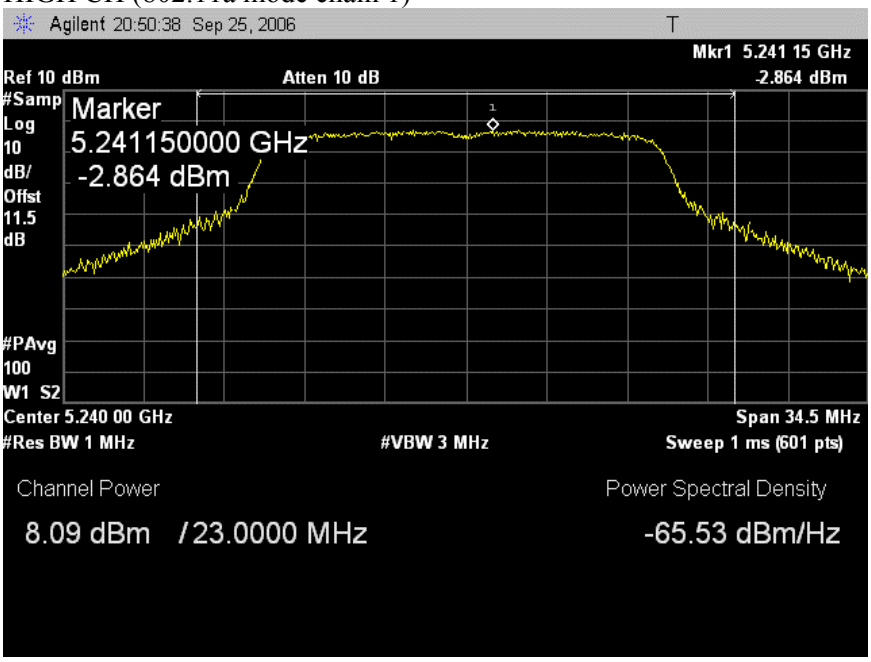
LOW CH (802.11a mode chain 1)



MID CH (802.11a mode chain 1)

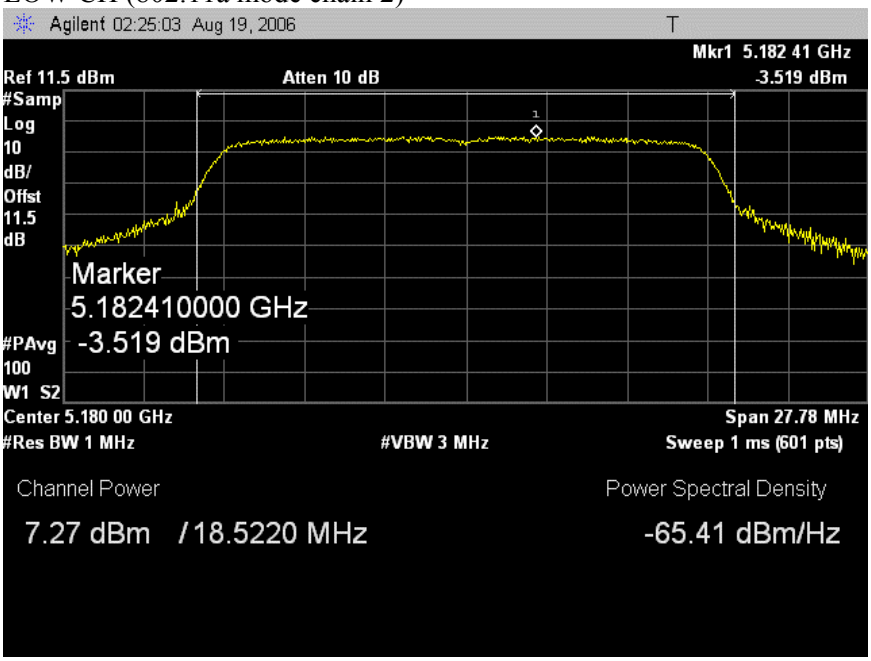


HIGH CH (802.11a mode chain 1)



(802.11a MODE CHAIN 2)

LOW CH (802.11a mode chain 2)



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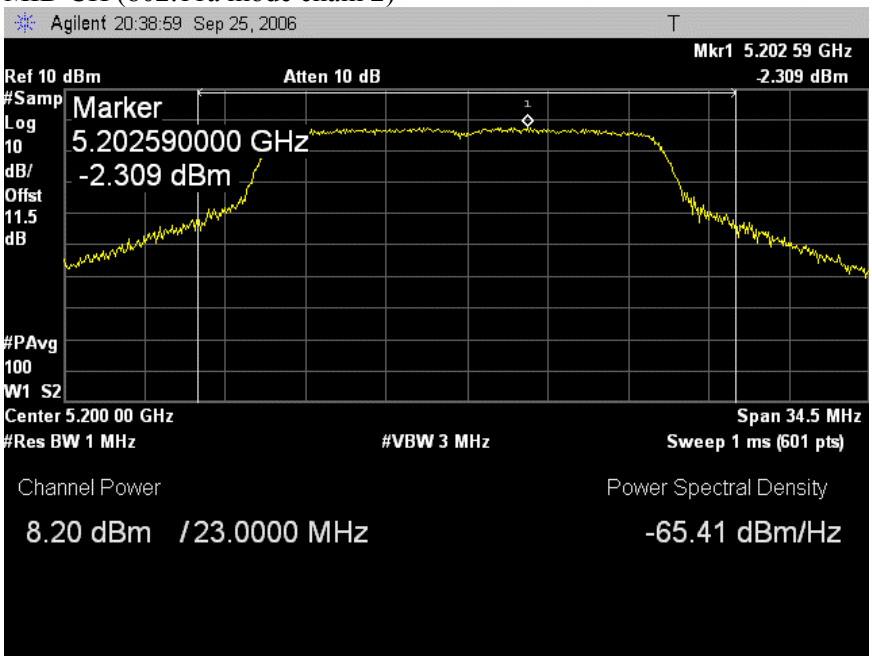
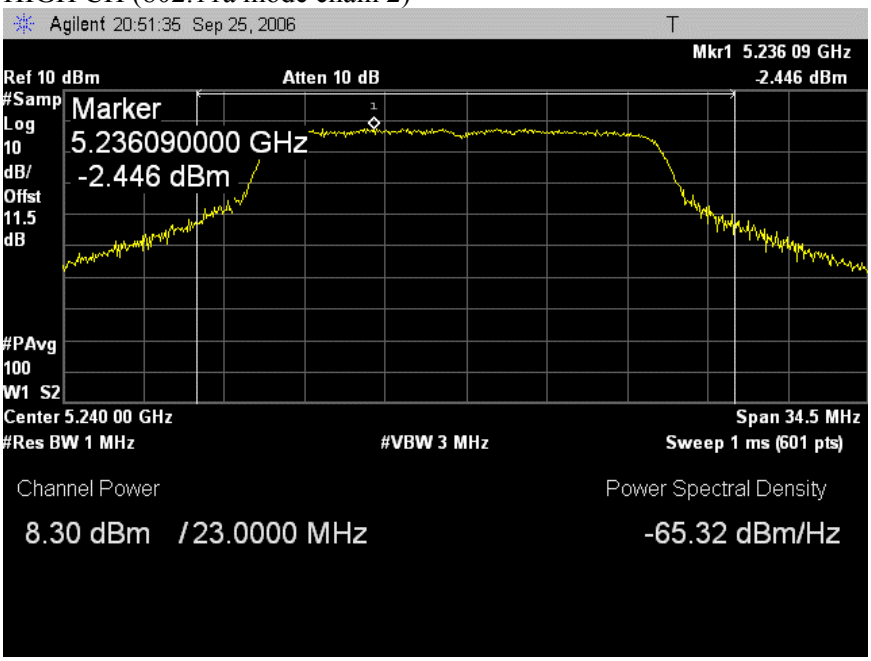
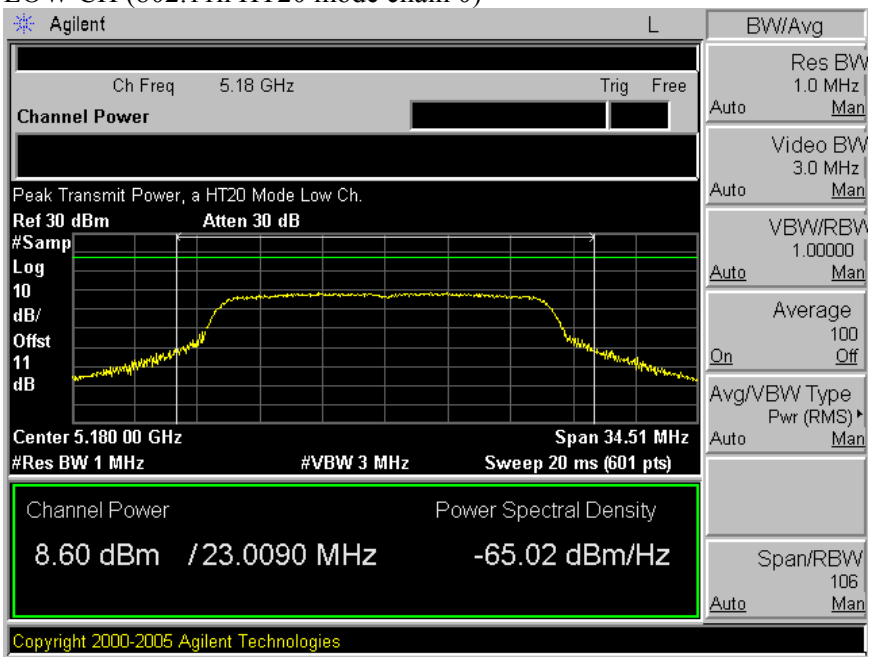


HIGH CH (802.11a mode chain 2)



(802.11n HT20 MODE CHAIN 0)

LOW CH (802.11n HT20 mode chain 0)



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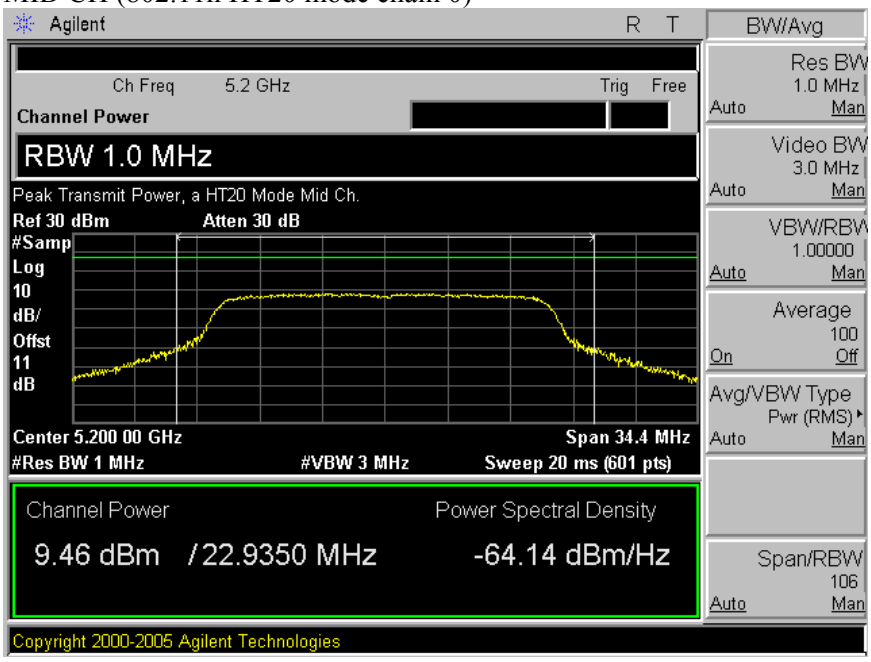

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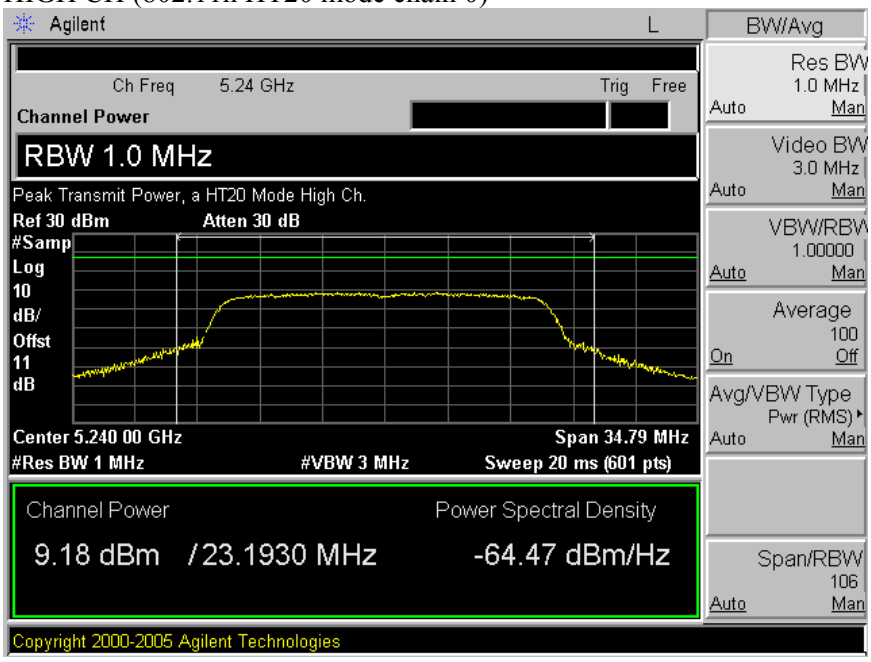
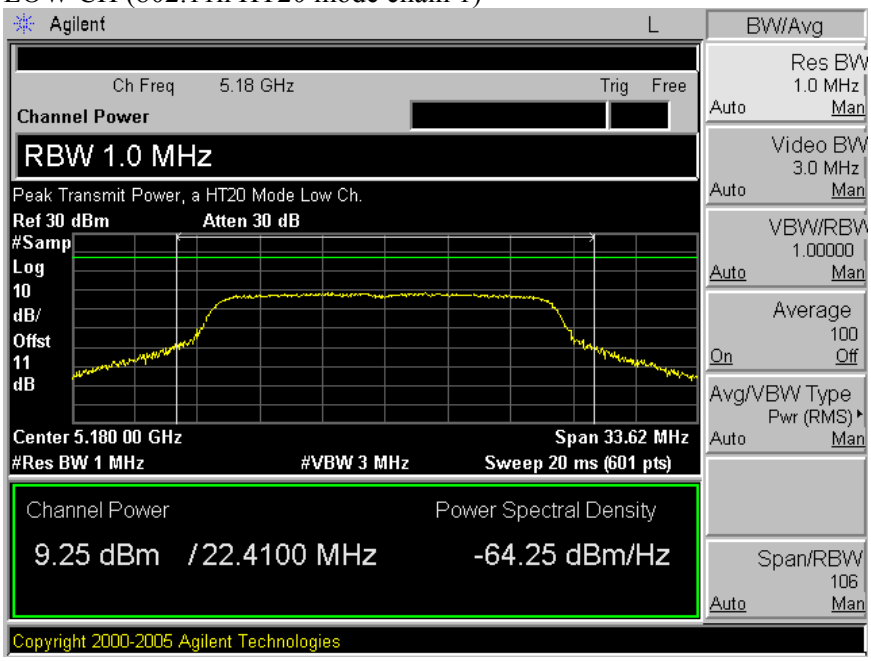


(802.11n HT20 MODE CHAIN 1)

LOW CH (802.11n HT20 mode chain 1)



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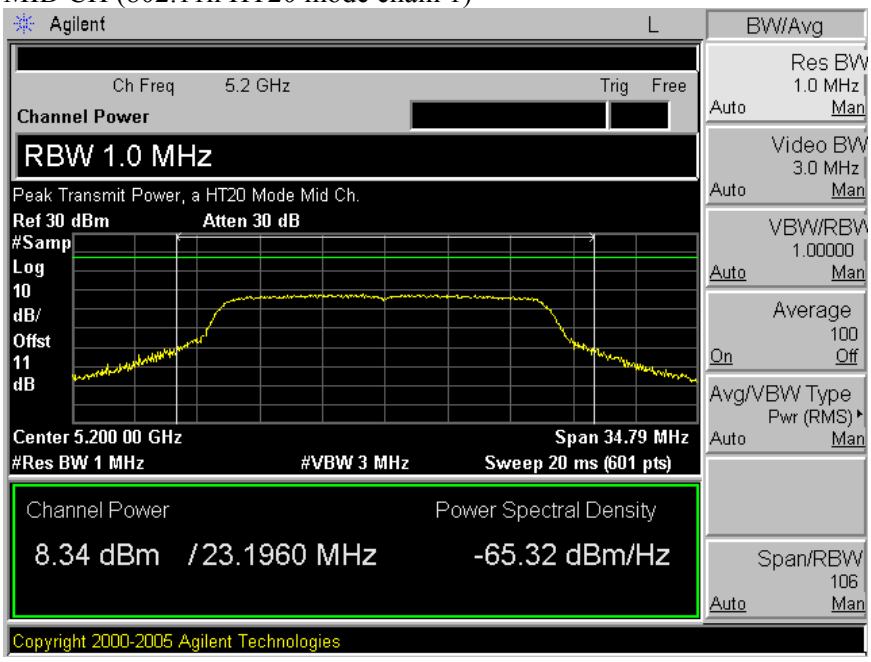

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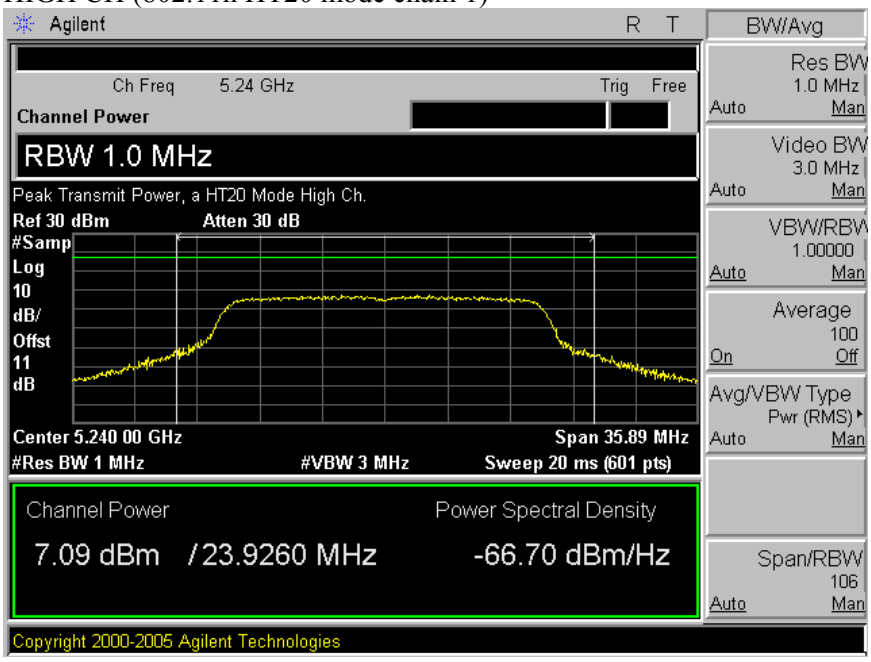
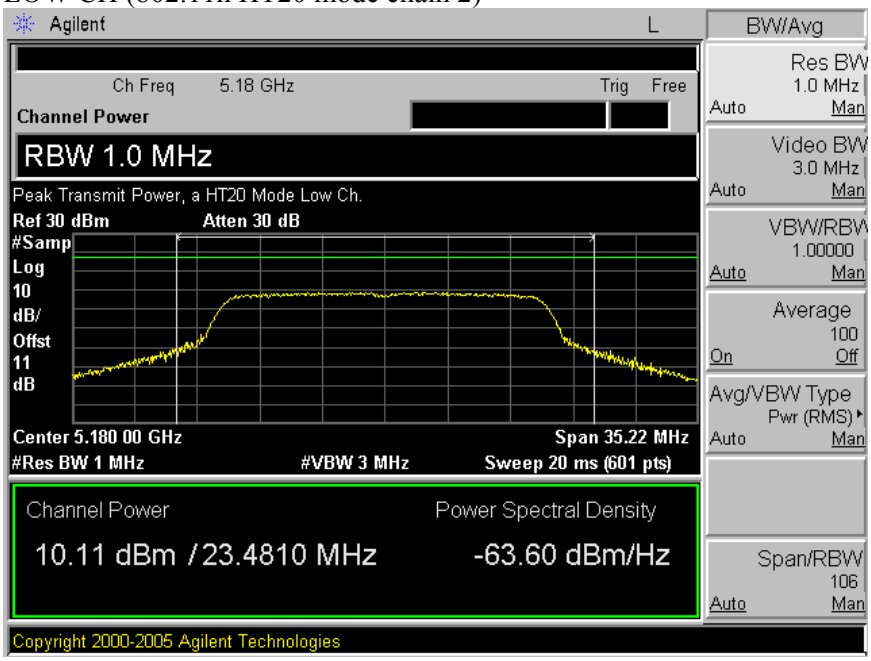


(802.11 HT20 MODE CHAIN 2)

LOW CH (802.11n HT20 mode chain 2)



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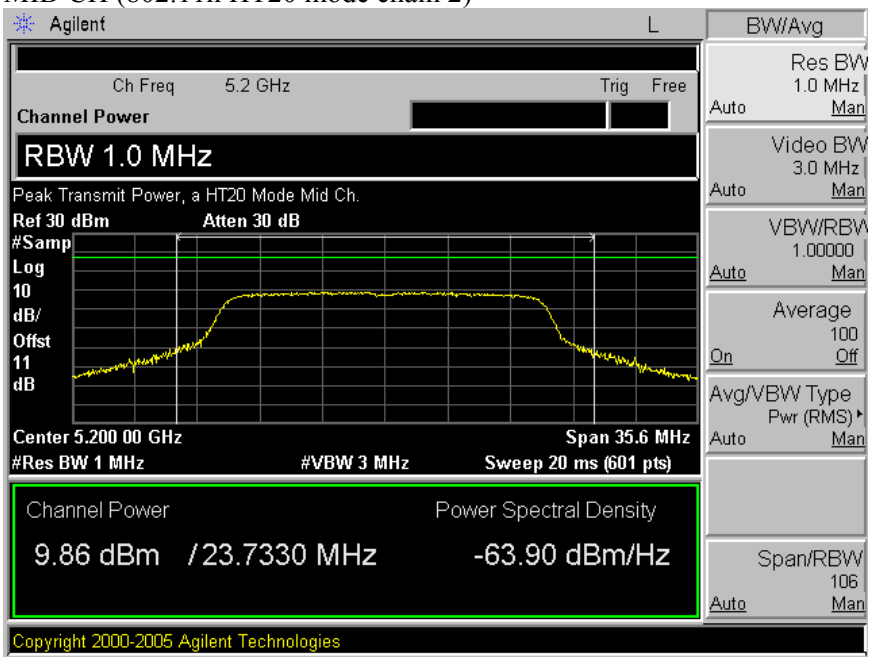
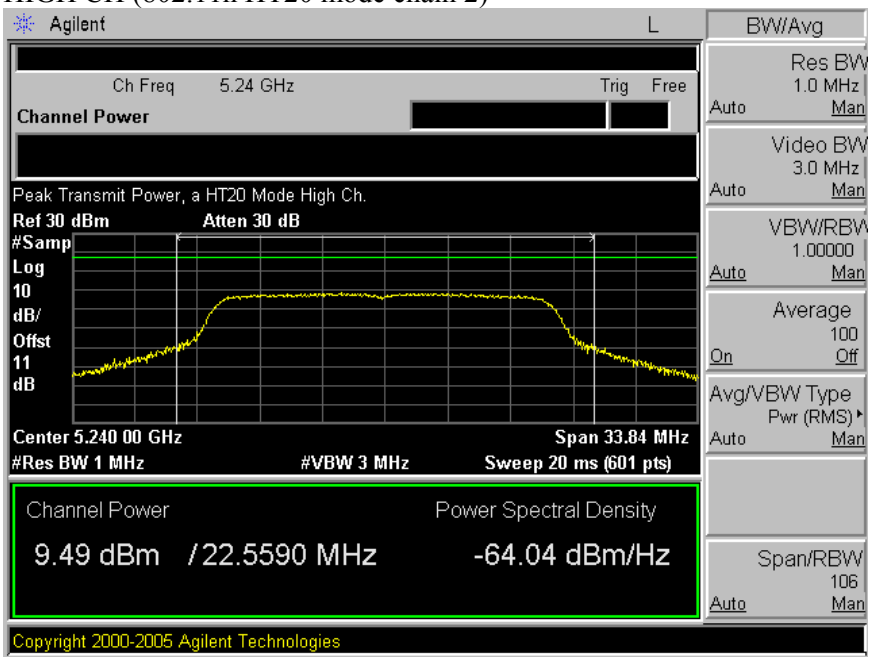
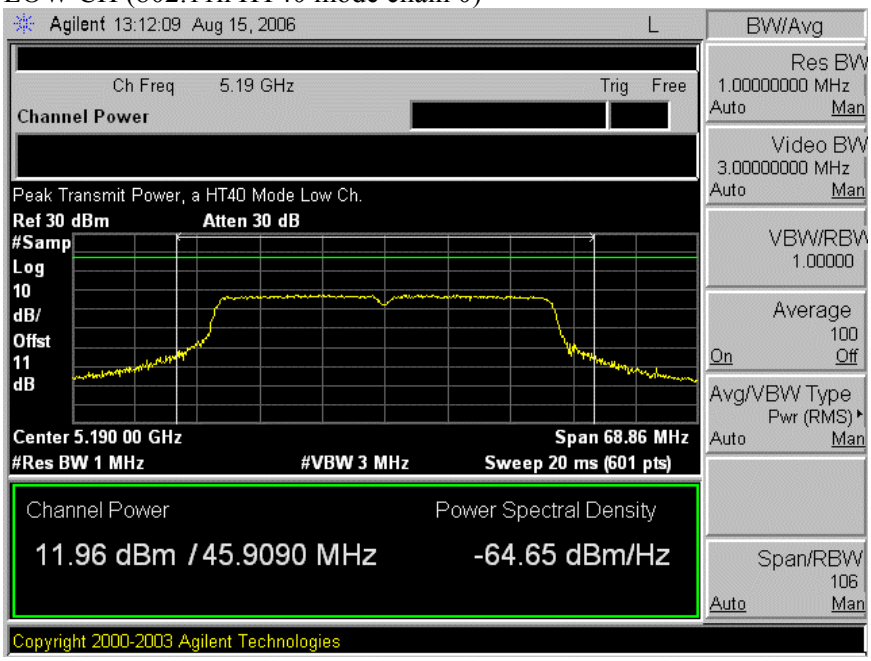


HIGH CH (802.11n HT20 mode chain 2)



(802.11 HT40 MODE CHAIN 0)

LOW CH (802.11n HT40 mode chain 0)



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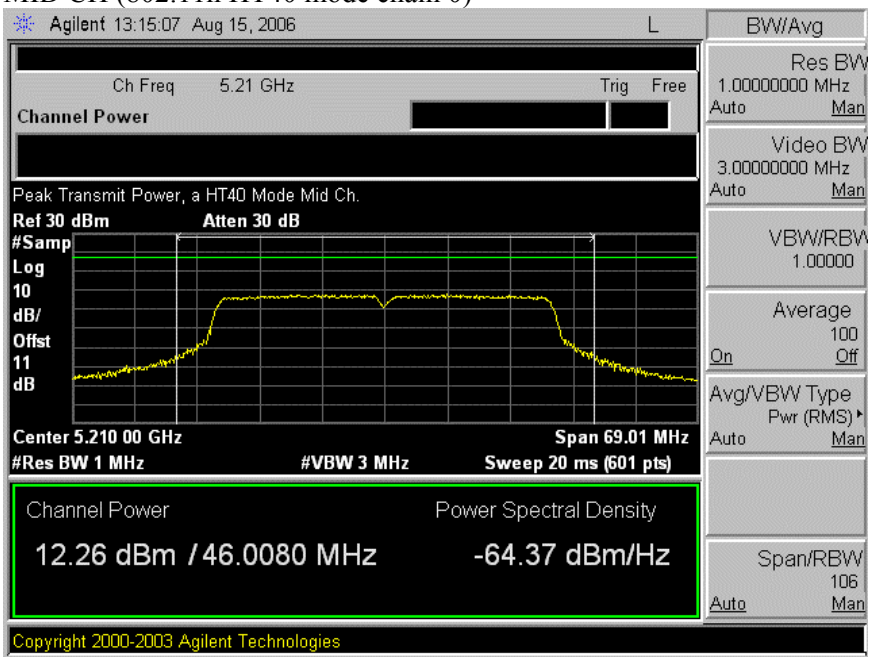

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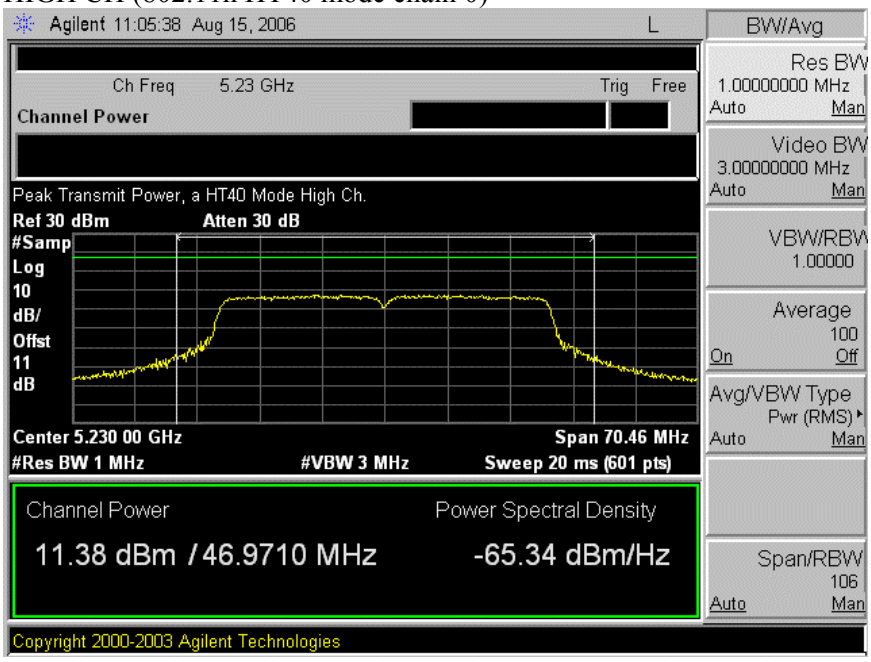
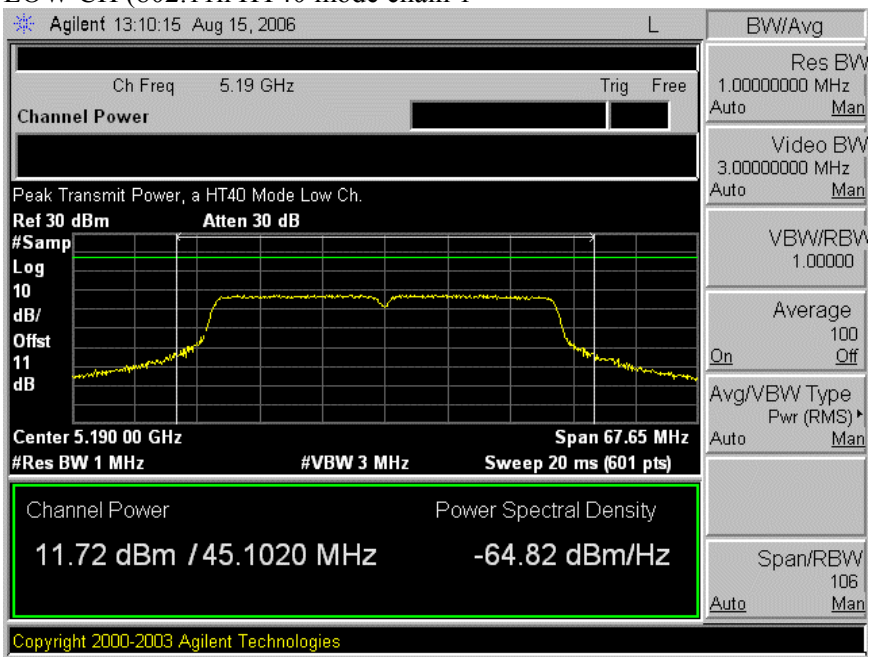
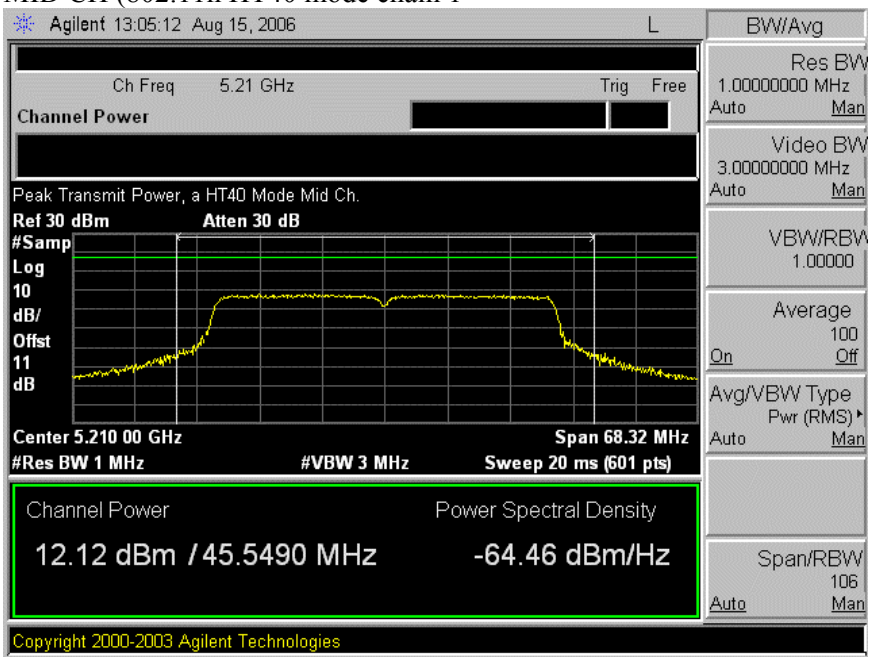


(802.11 HT40 MODE CHAIN 1

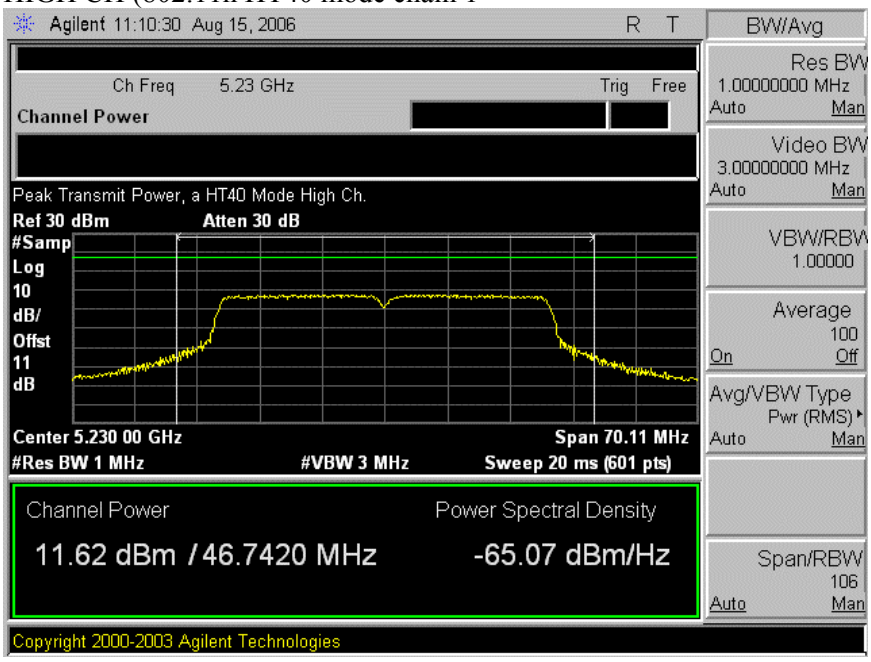
LOW CH (802.11n HT40 mode chain 1



MID CH (802.11n HT40 mode chain 1

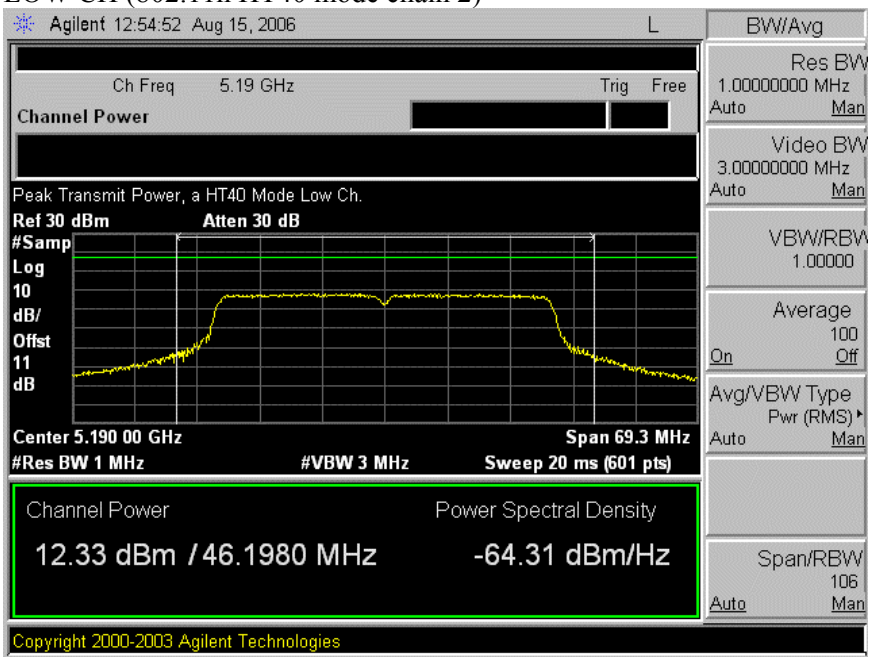


HIGH CH (802.11n HT40 mode chain 1

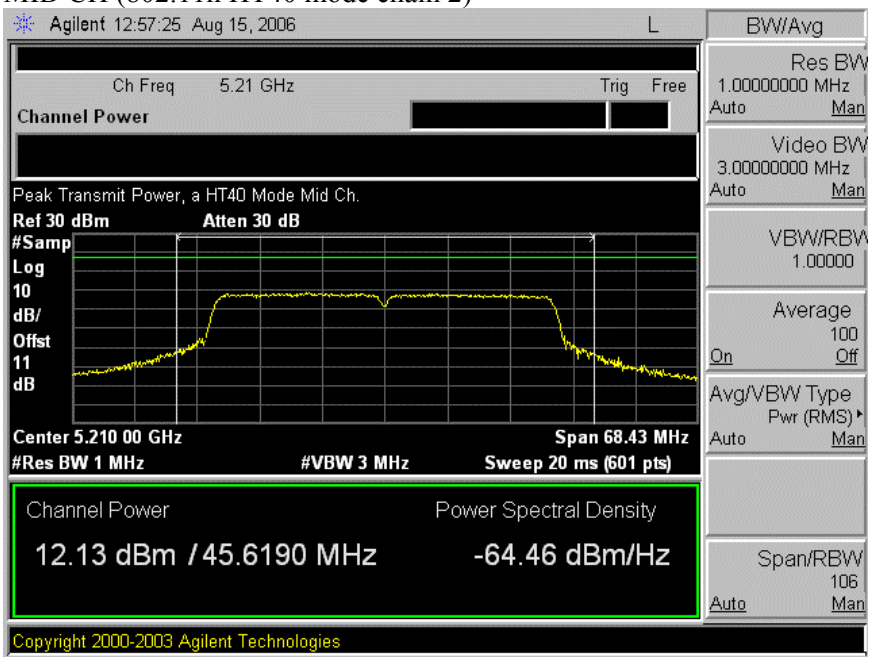


(802.11 HT40 MODE CHAIN 2)

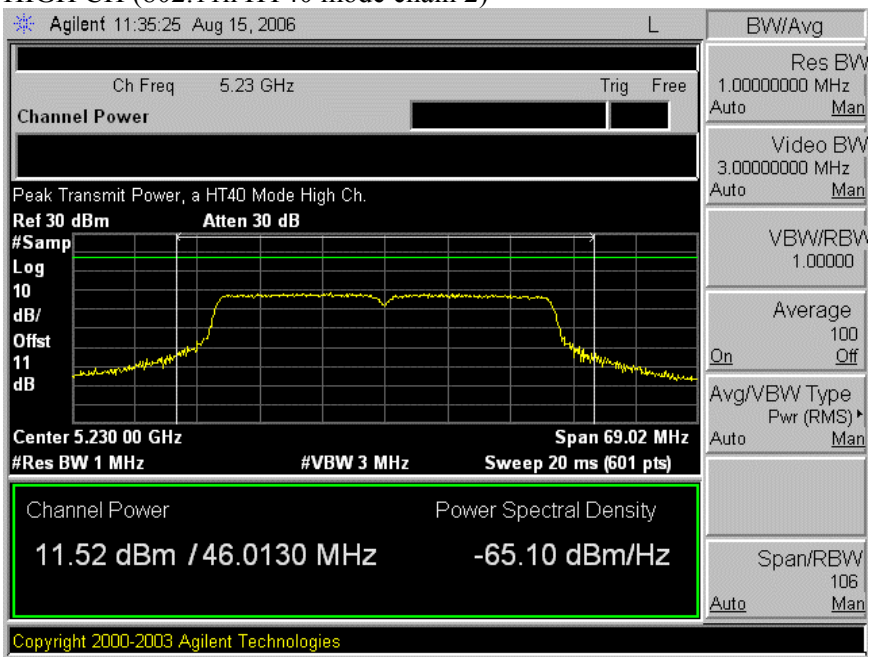
LOW CH (802.11n HT40 mode chain 2)



MID CH (802.11n HT40 mode chain 2)



HIGH CH (802.11n HT40 mode chain 2)



7.1.3. 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 1 PPSD / 10) + 10^ (Chain 2 PPSD / 10))

RESULTS

No non-compliance noted:

5150 to 5250 Band

Antenna Gain (dBi)	3
10 Log (# Tx Chains)	4.77
Effective Legacy Gain	7.77

Mode Channel	Frequency (MHz)	PPSD Chain 0 (dBm)	PPSD Chain 1 (dBm)	PPSD Chain 2 (dBm)	PPSD Total (dBm)	Limit (dBm)	Margin (dB)
802.11a Mode							
Low	5180	-3.300	-1.850	-3.520	1.947	2.229	-0.282
Middle	5200	-3.438	-3.002	-2.309	1.880	2.229	-0.349
High	5240	-2.430	-2.864	-2.446	2.196	2.229	-0.033
802.11n HT20 Mode							
Low	5180	-1.770	-1.650	-1.340	3.188	4.000	-0.812
Middle	5200	-1.770	-2.100	-0.760	3.266	4.000	-0.734
High	5240	-1.620	-3.050	-1.640	2.717	4.000	-1.283
802.11n HT40 Mode							
Low	5190	-2.350	-2.380	-1.820	2.596	4.000	-1.404
Middle	5210	-2.450	-2.370	-1.760	2.589	4.000	-1.411
High	5230	-2.330	-2.300	-2.360	2.441	4.000	-1.559

RESULTS WITH COMBINER

No non-compliance noted:

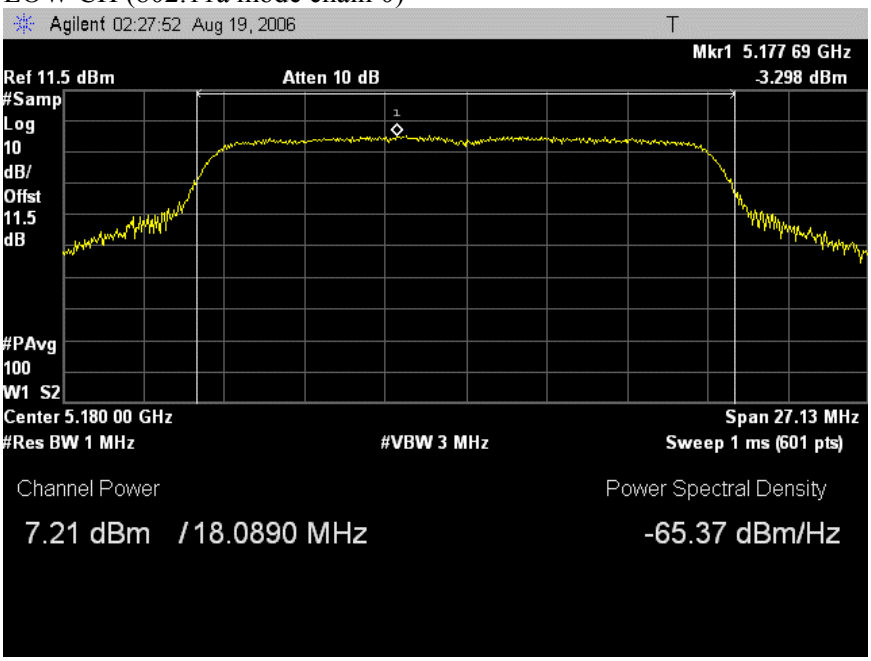
5150 to 5250 Band

Antenna Gain (dBi)	3
10 Log (# Tx Chains)	4.77
Effective Legacy Gain	7.77

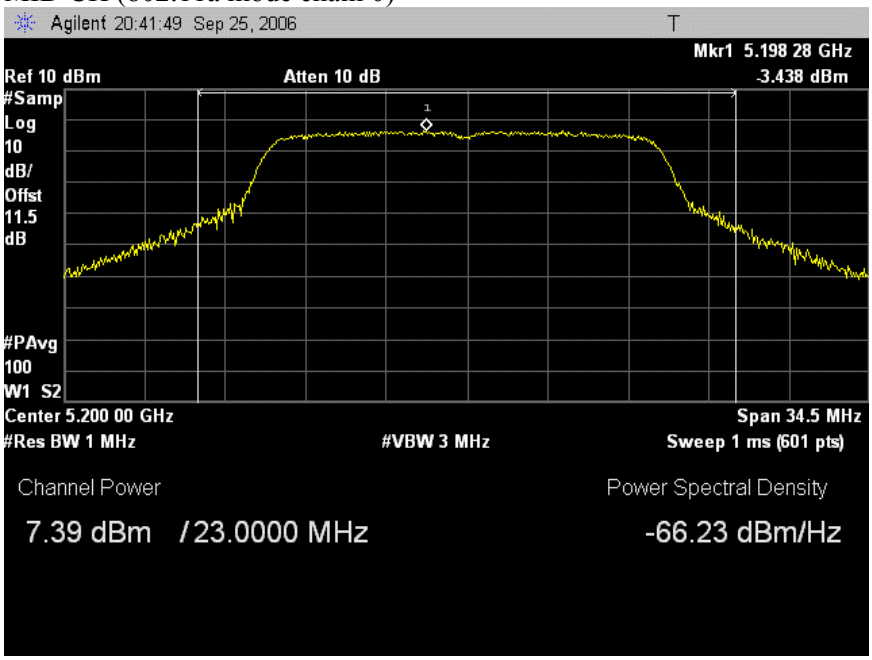
Mode Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
802.11a Mode				
Low	5180	0.610	2.23	-1.62
Middle	5200	-2.898	2.23	-5.13
High	5240	-2.217	2.23	-4.45
802.11n HT20 Mode				
Low	5180	3.500	4.00	-0.50
Middle	5200	3.060	4.00	-0.94
High	5240	3.010	4.00	-0.99
802.11n HT40 Mode				
Low	5190	3.800	4.00	-0.20
Middle	5210	3.480	4.00	-0.52
High	5230	3.580	4.00	-0.42

(802.11a MODE CHAIN 0)

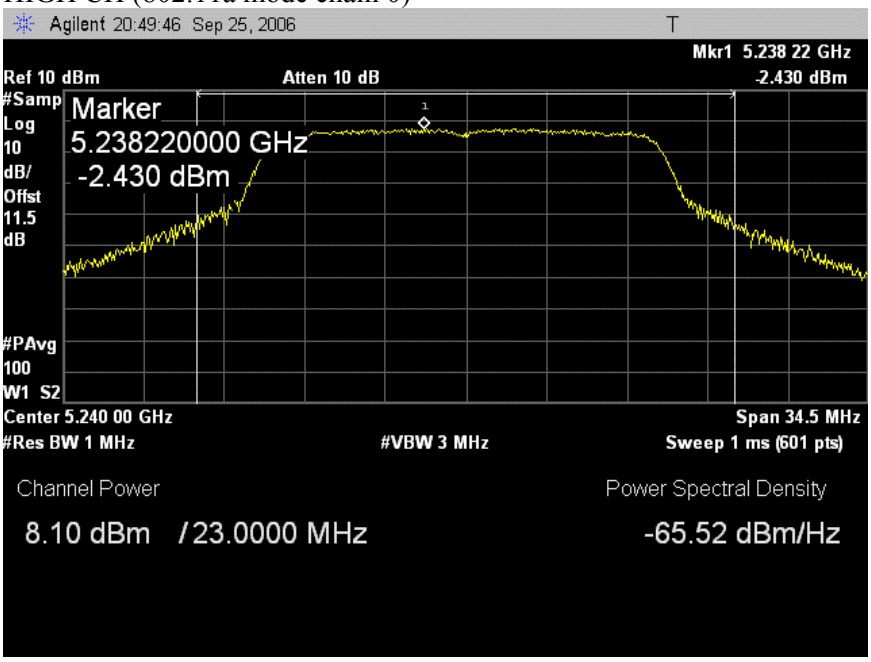
LOW CH (802.11a mode chain 0)



MID CH (802.11a mode chain 0)

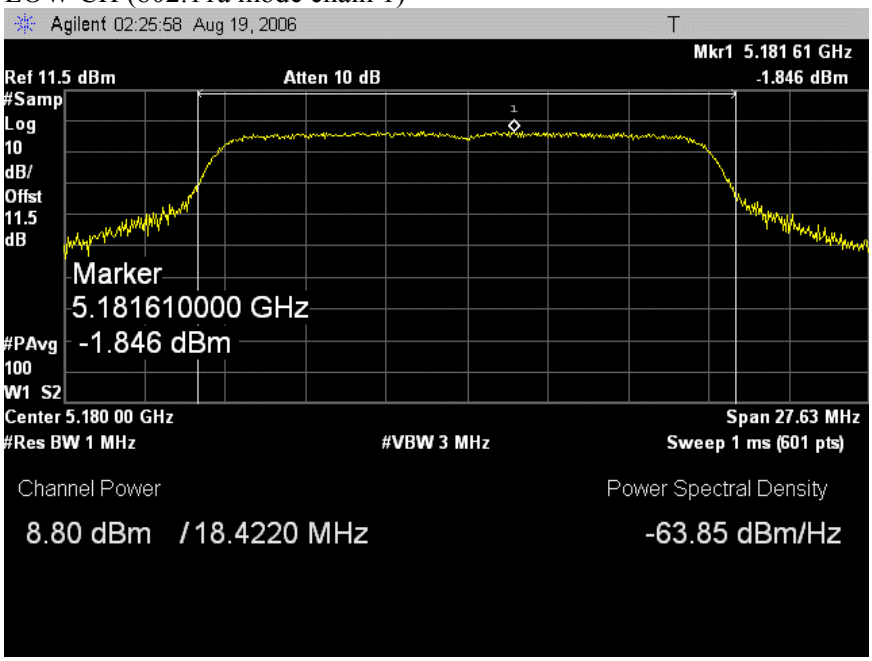


HIGH CH (802.11a mode chain 0)

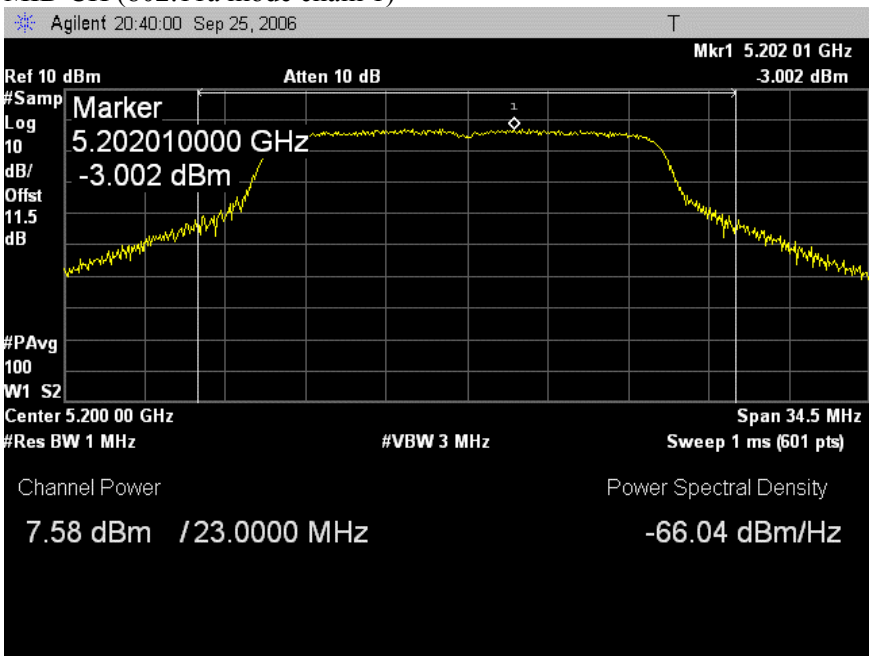


(802.11a MODE CHAIN 1)

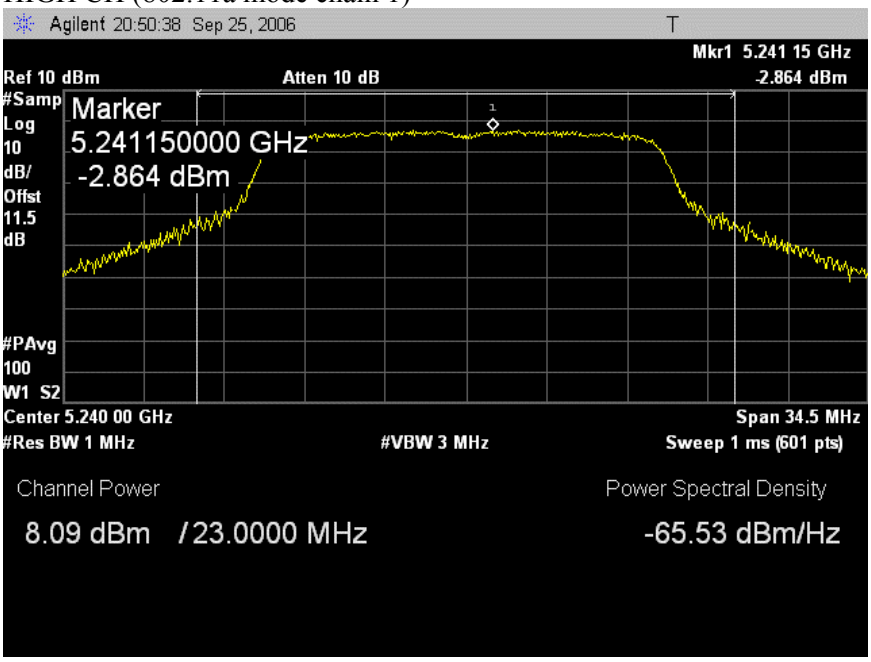
LOW CH (802.11a mode chain 1)



MID CH (802.11a mode chain 1)

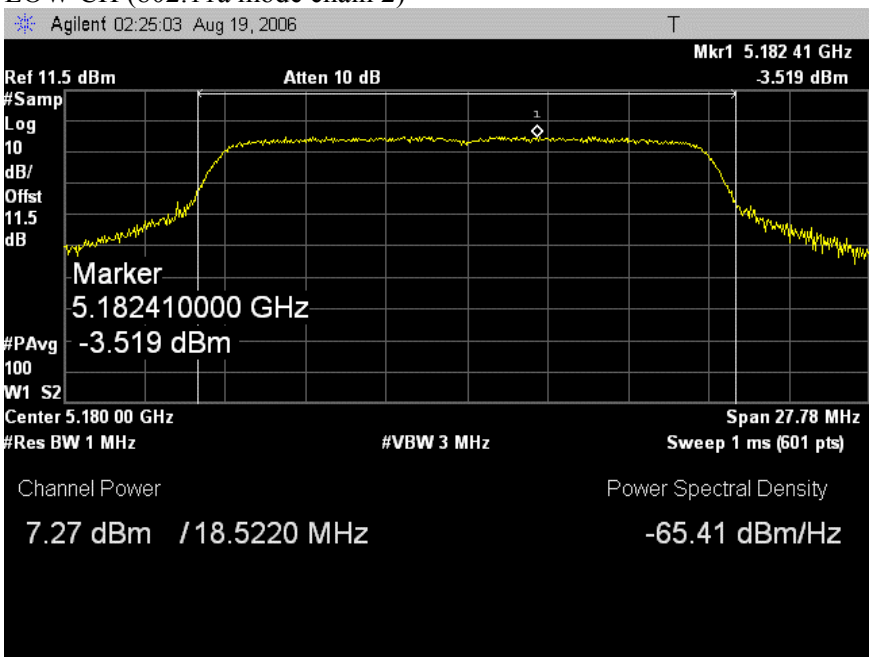


HIGH CH (802.11a mode chain 1)

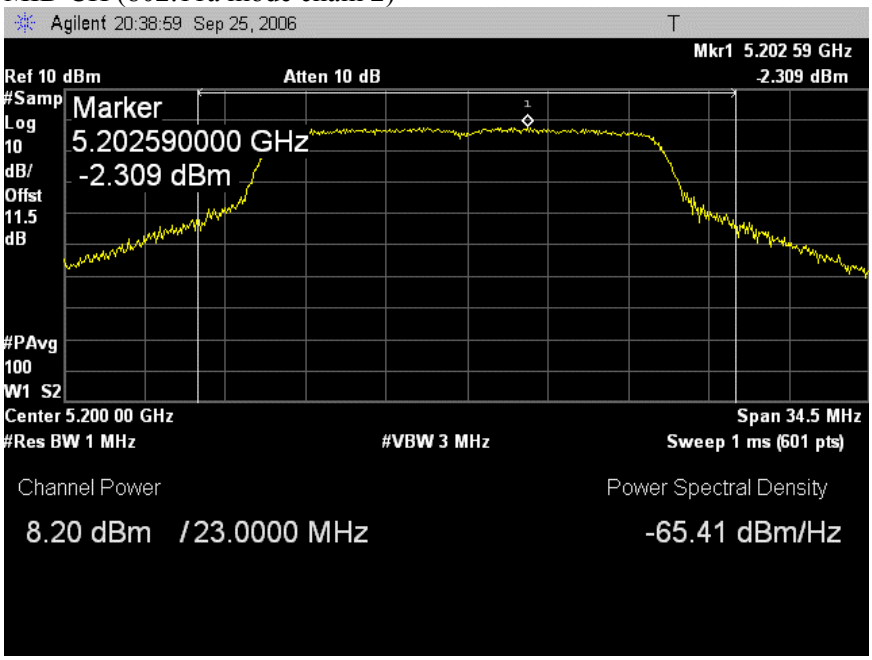


(802.11a MODE CHAIN 2)

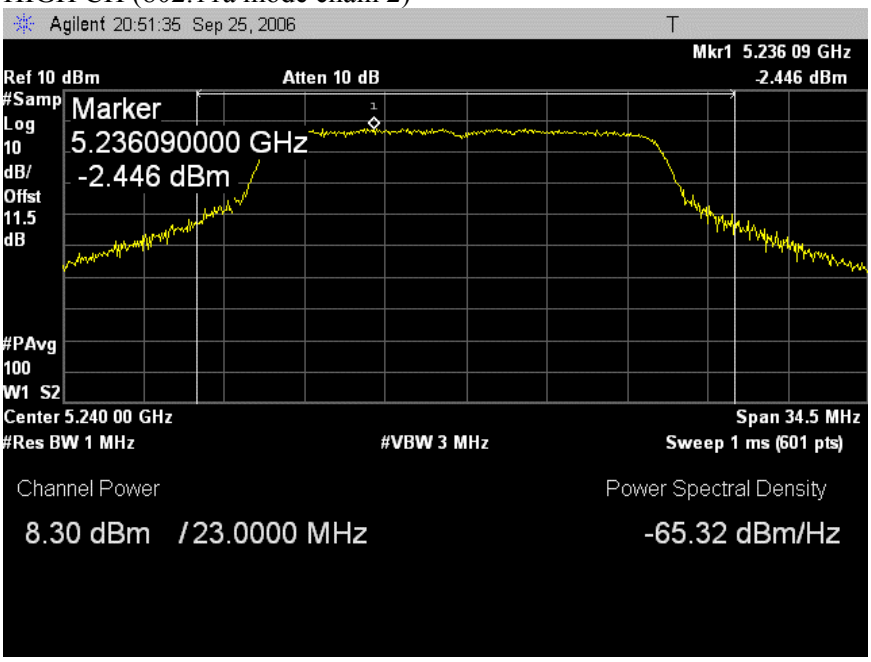
LOW CH (802.11a mode chain 2)



MID CH (802.11a mode chain 2)

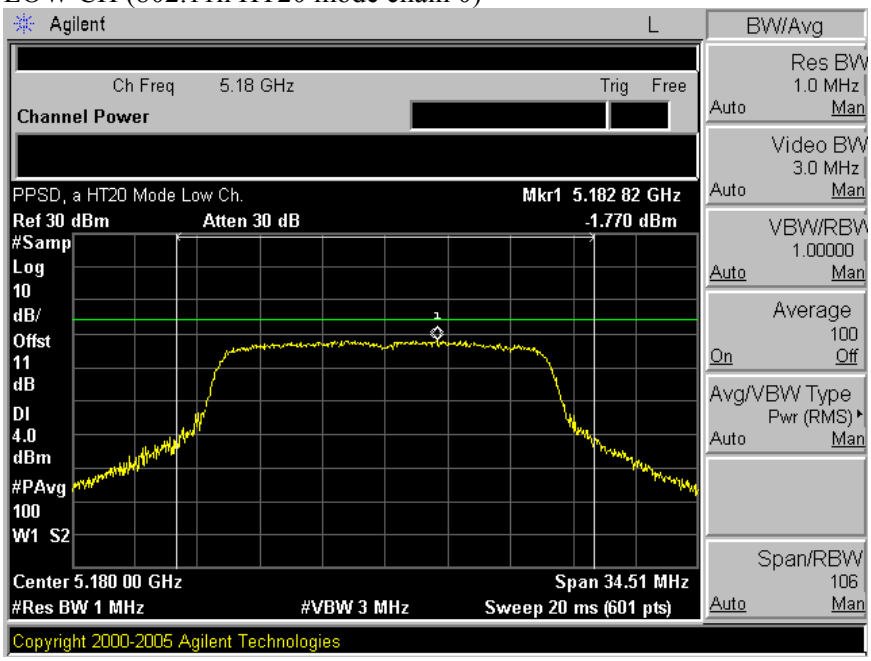


HIGH CH (802.11a mode chain 2)



(802.11n HT20 MODE CHAIN 0)

LOW CH (802.11n HT20 mode chain 0)



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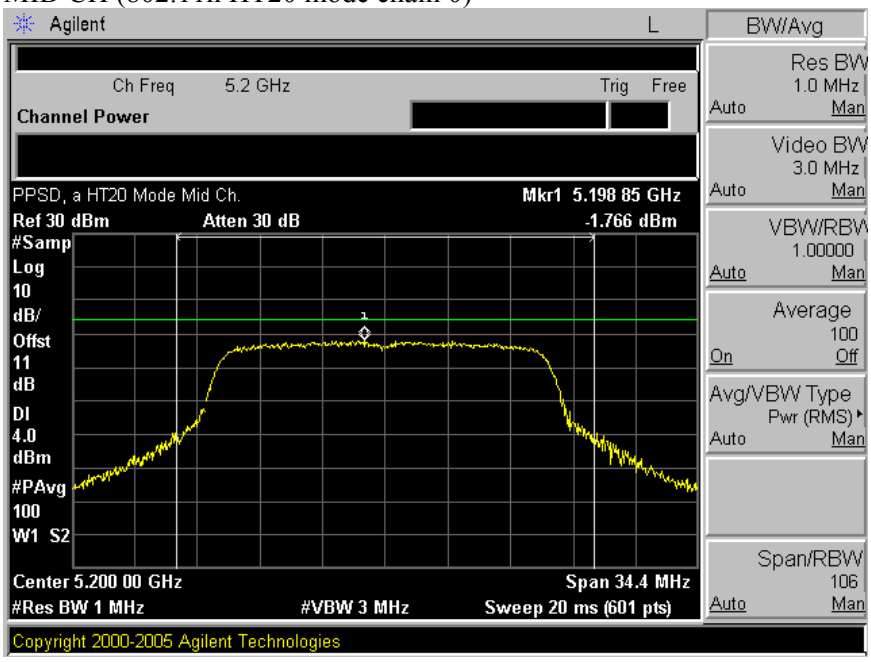

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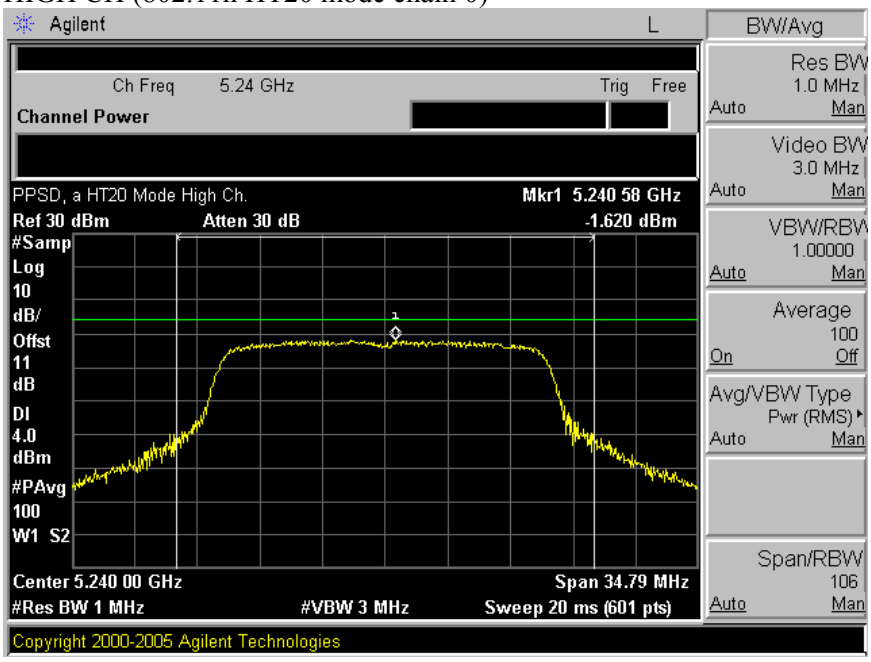
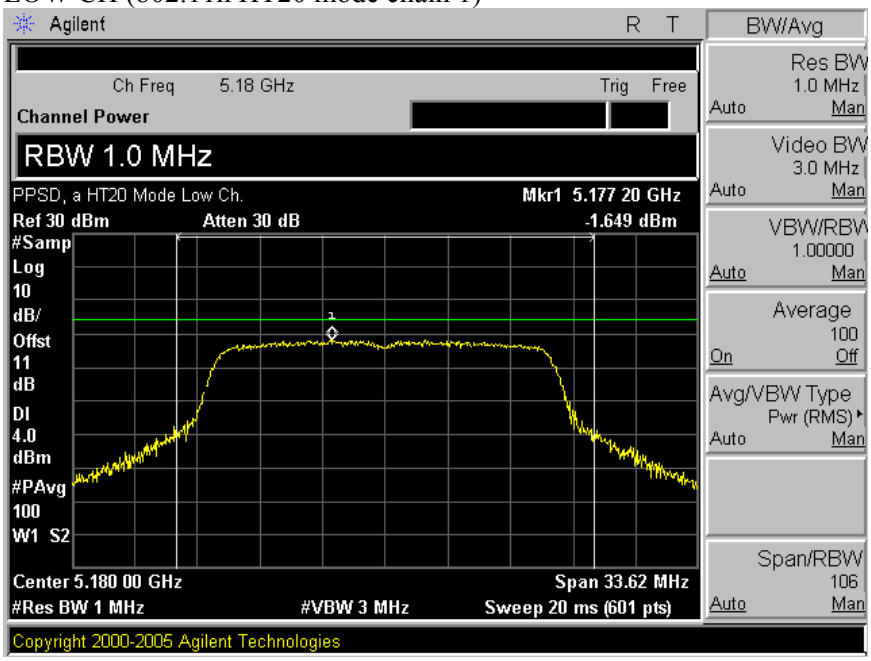
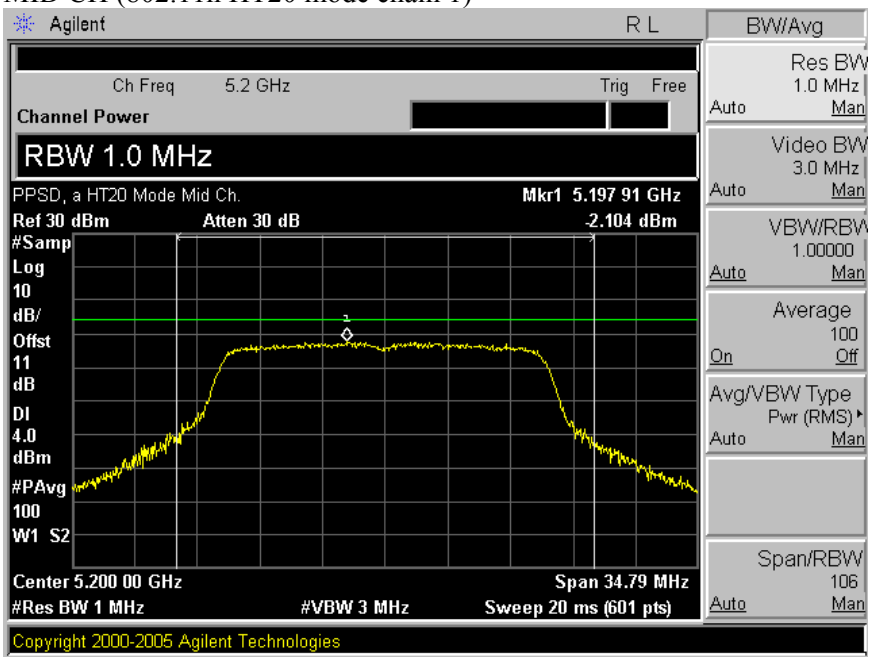


(802.11n HT20 MODE CHAIN 1)

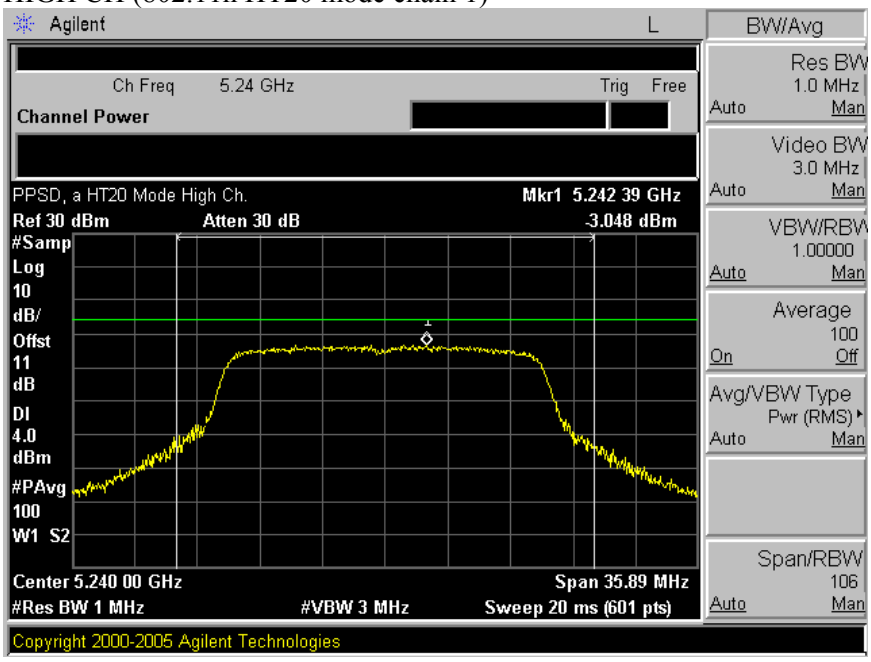
LOW CH (802.11n HT20 mode chain 1)



MID CH (802.11n HT20 mode chain 1)

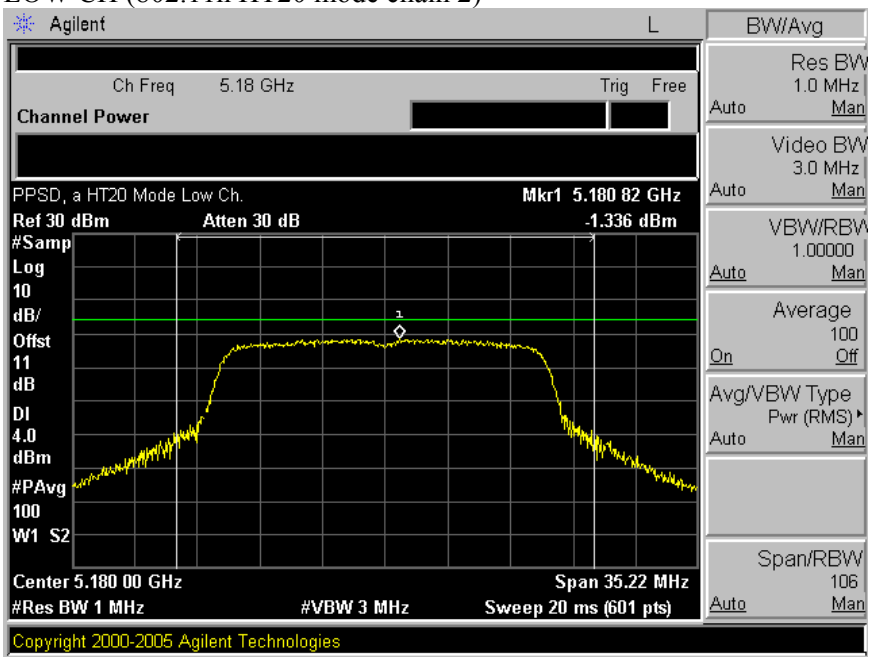


HIGH CH (802.11n HT20 mode chain 1)

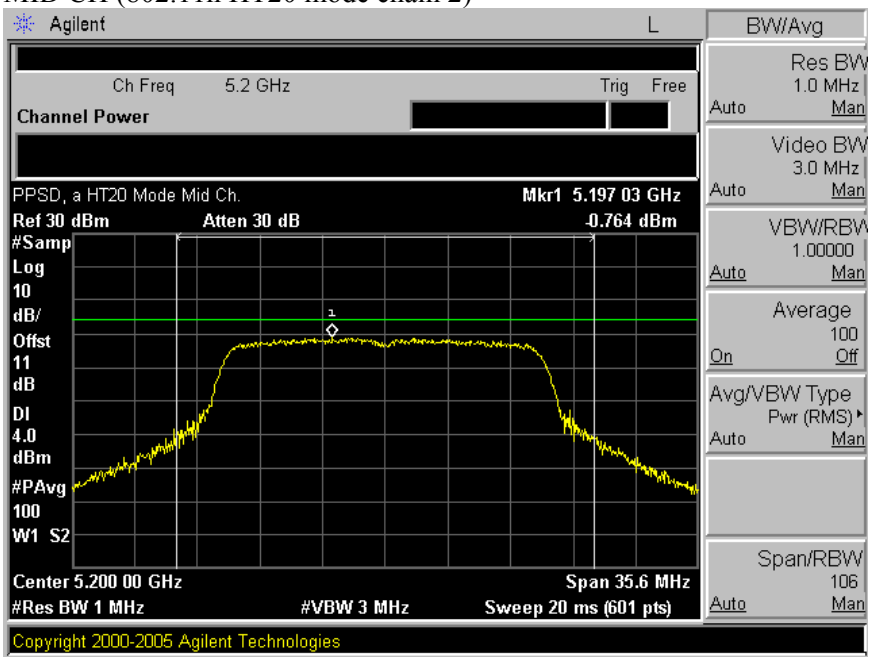


(802.11 HT20 MODE CHAIN 2)

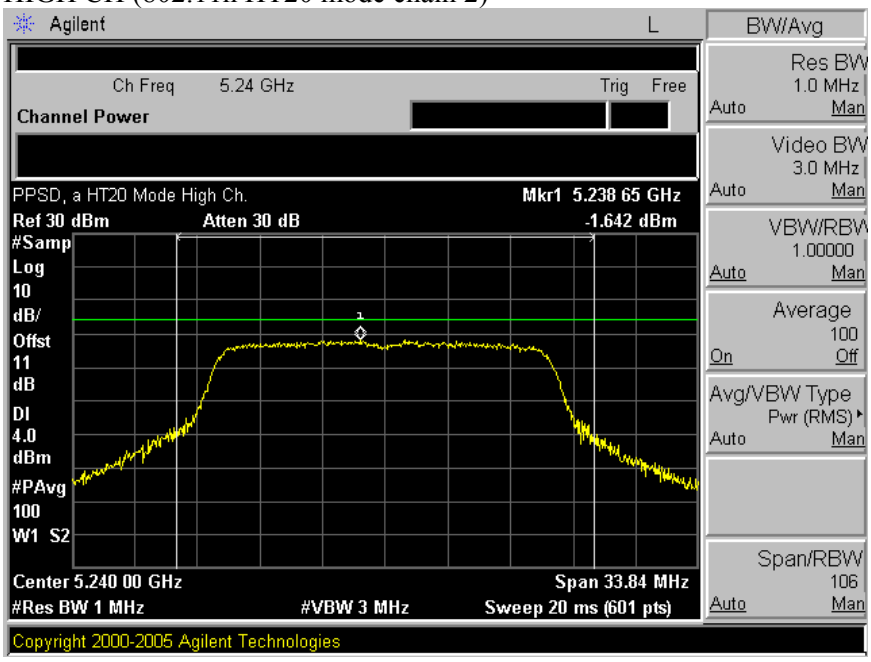
LOW CH (802.11n HT20 mode chain 2)



MID CH (802.11n HT20 mode chain 2)

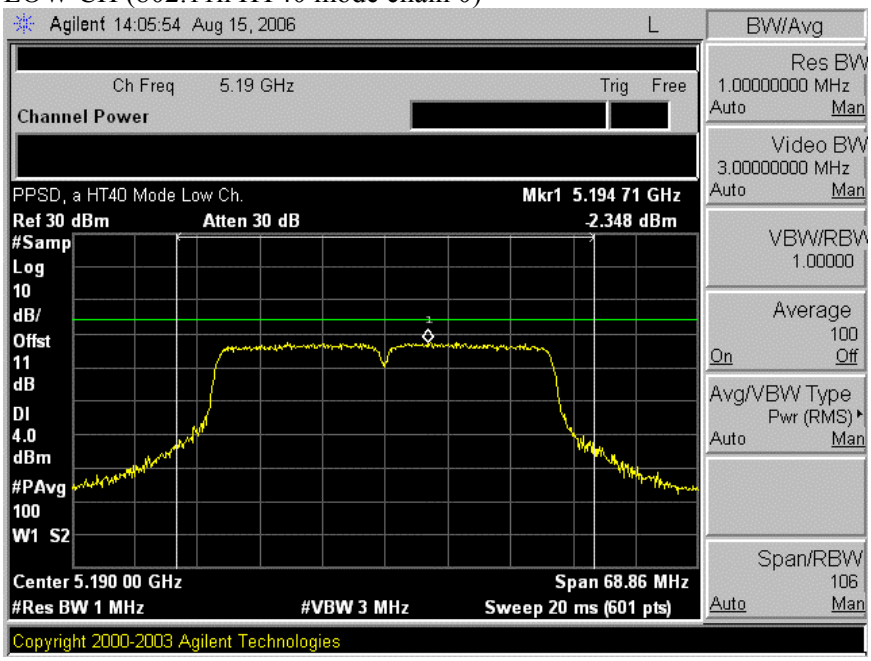


HIGH CH (802.11n HT20 mode chain 2)

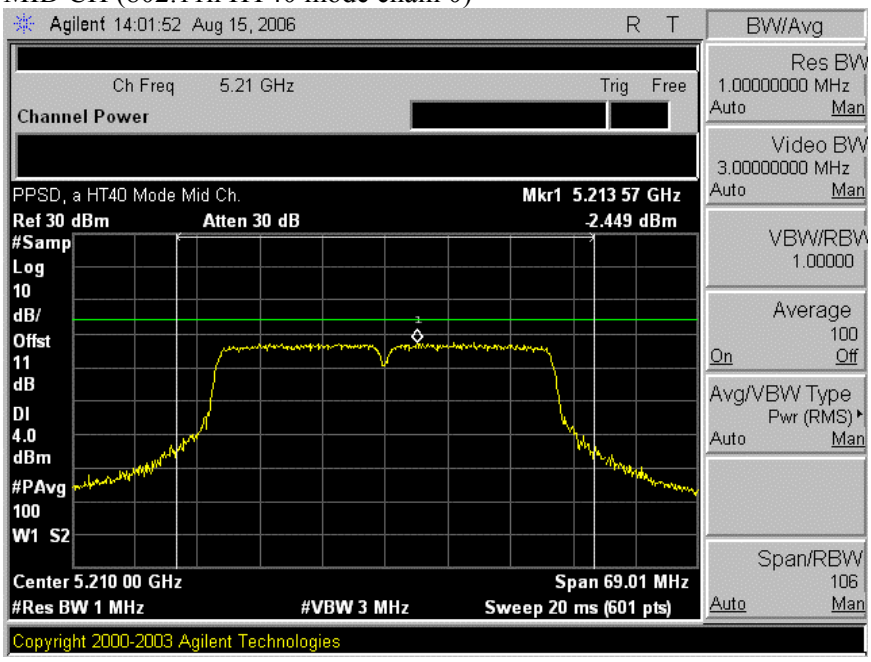


(802.11 HT40 MODE CHAIN 0)

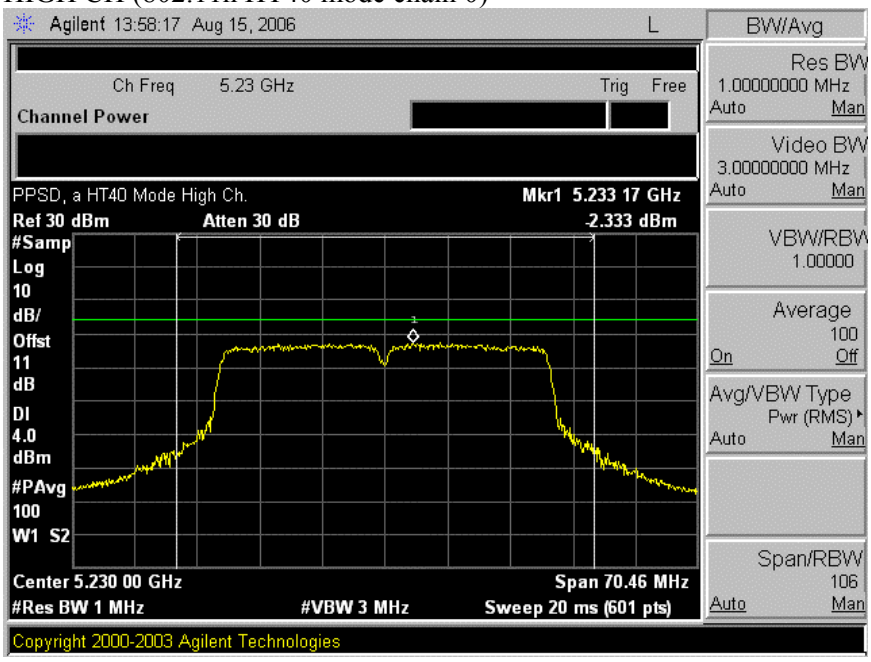
LOW CH (802.11n HT40 mode chain 0)



MID CH (802.11n HT40 mode chain 0)

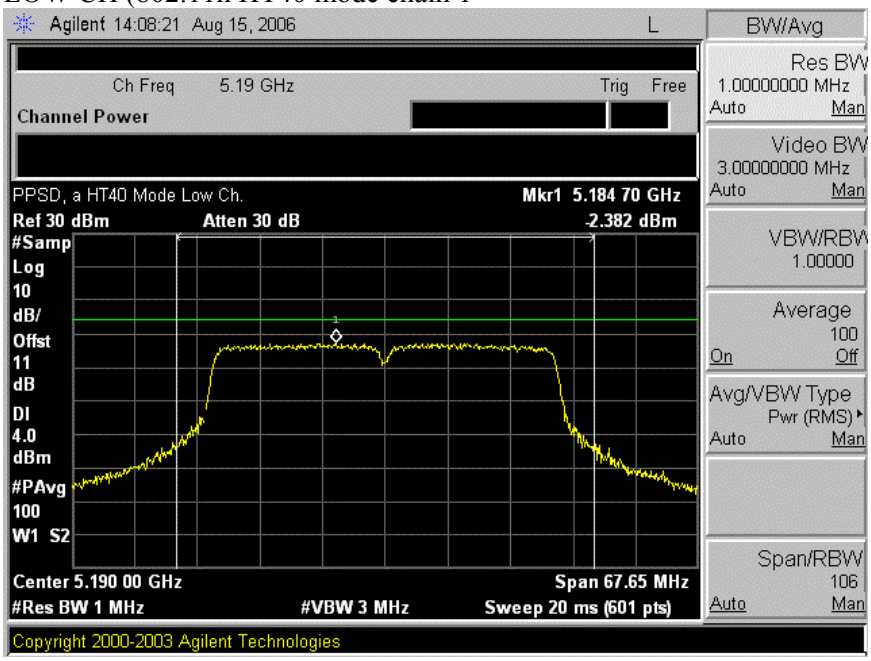


HIGH CH (802.11n HT40 mode chain 0)

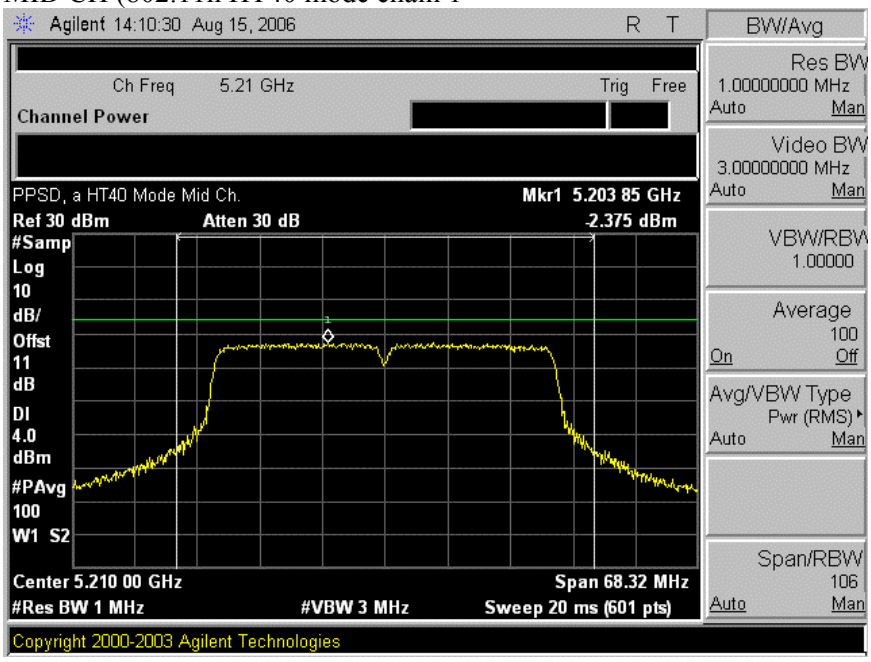


(802.11 HT40 MODE CHAIN 1

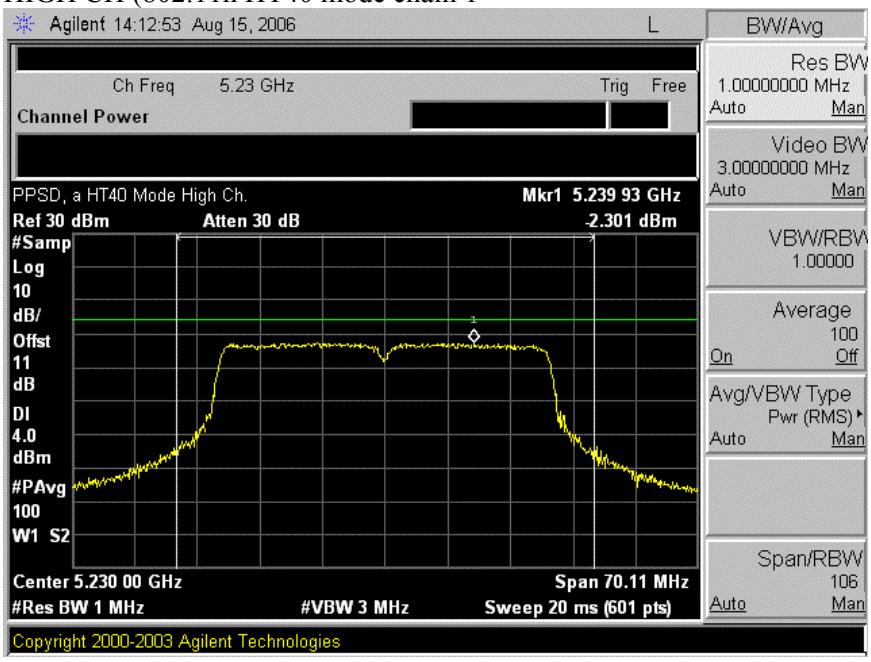
LOW CH (802.11n HT40 mode chain 1



MID CH (802.11n HT40 mode chain 1

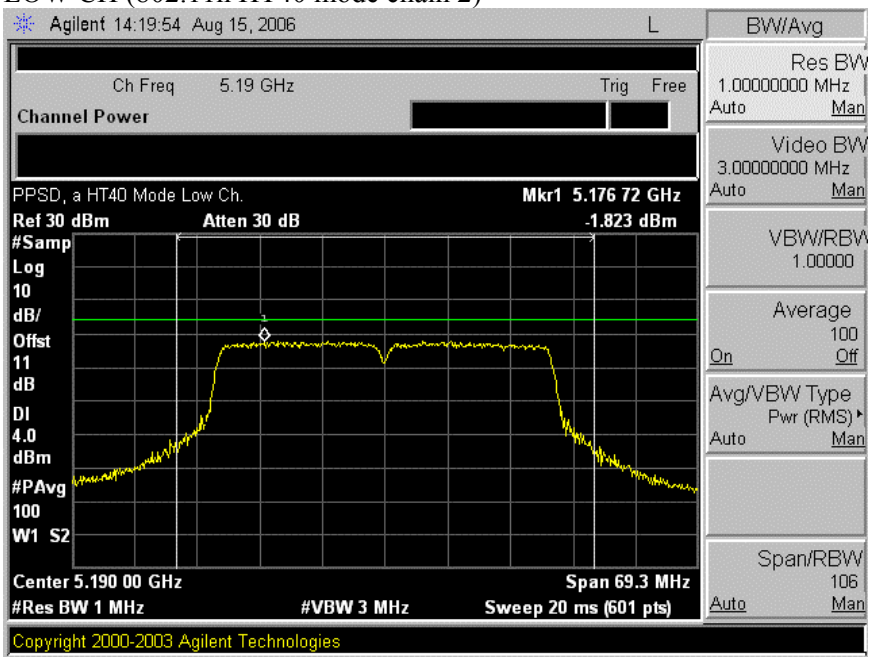


HIGH CH (802.11n HT40 mode chain 1

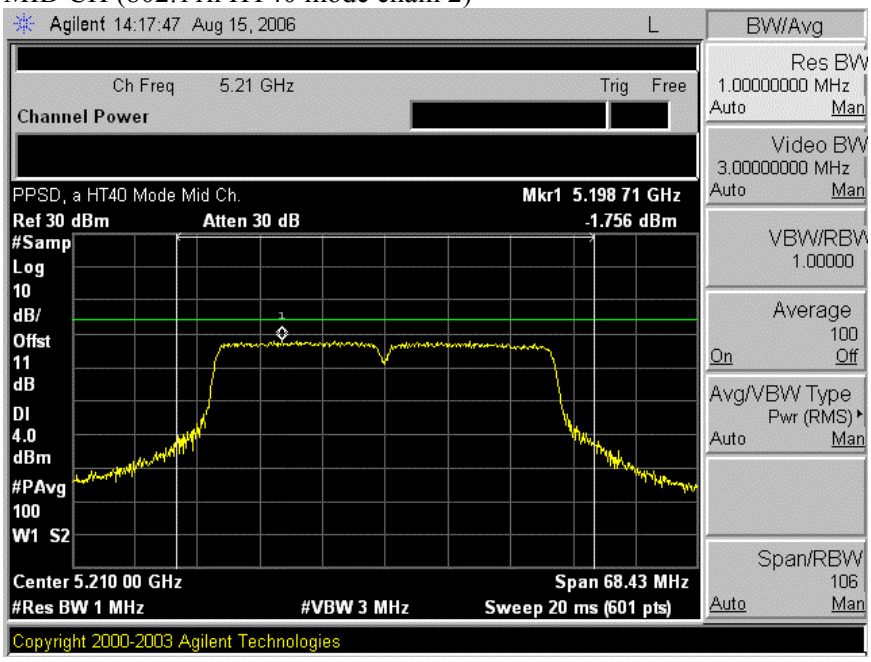


(802.11 HT40 MODE CHAIN 2)

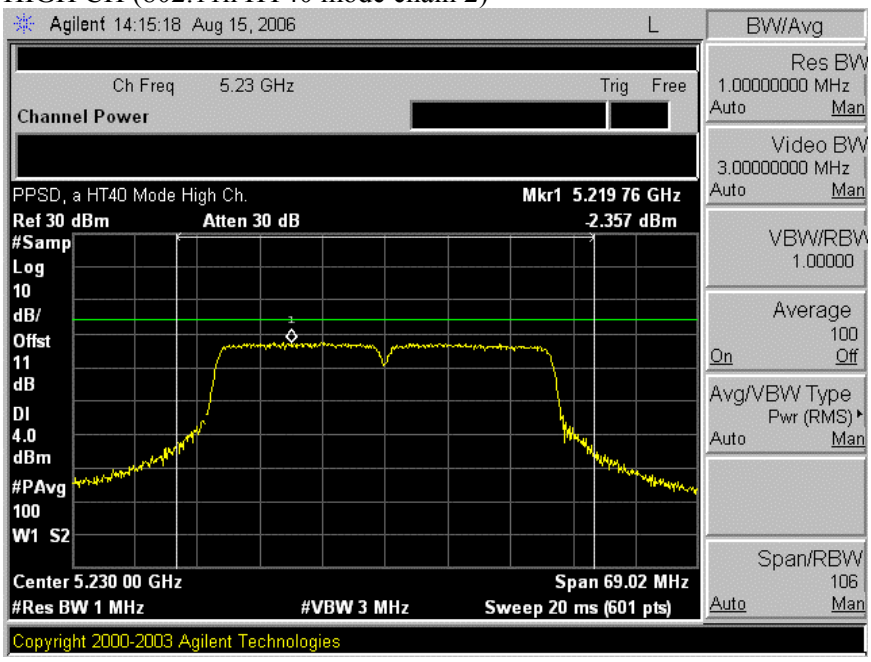
LOW CH (802.11n HT40 mode chain 2)



MID CH (802.11n HT40 mode chain 2)

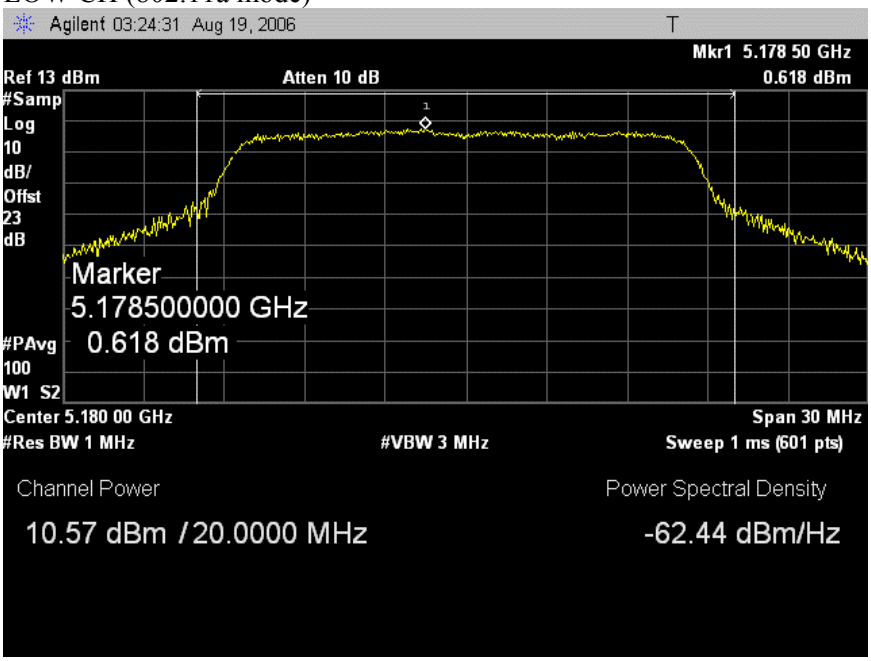


HIGH CH (802.11n HT40 mode chain 2)

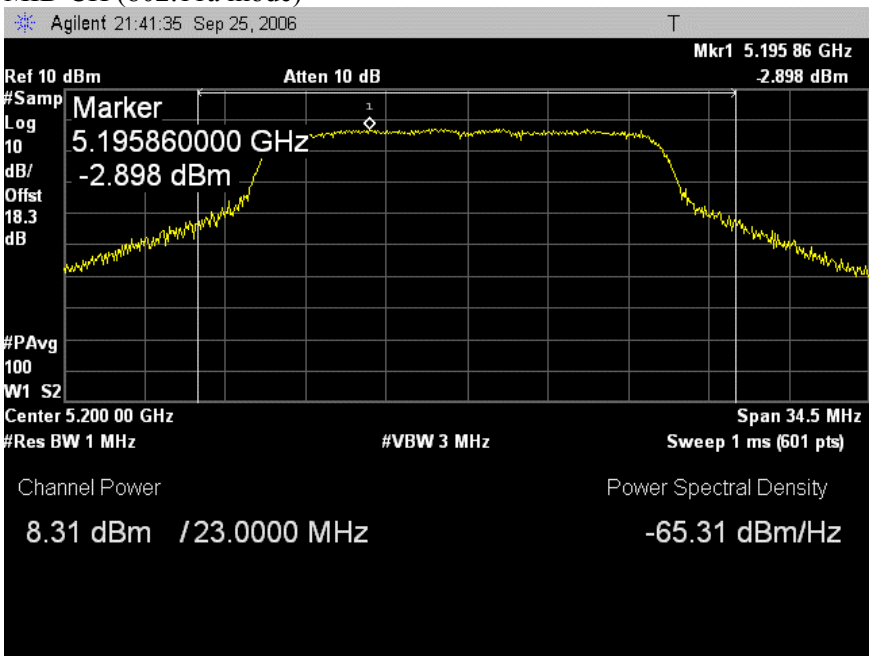


(802.11a MODE) WITH COMBINER

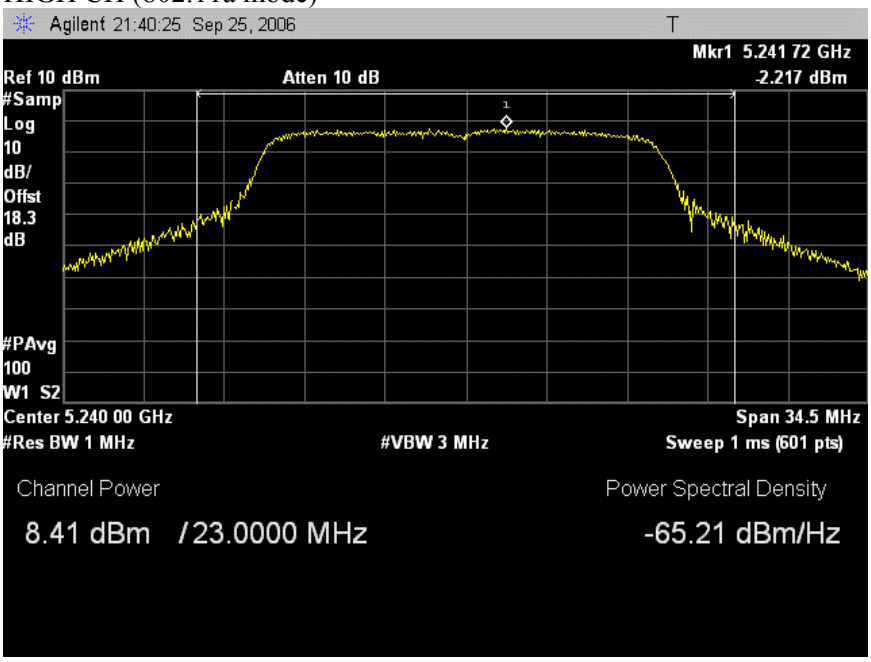
LOW CH (802.11a mode)



MID CH (802.11a mode)

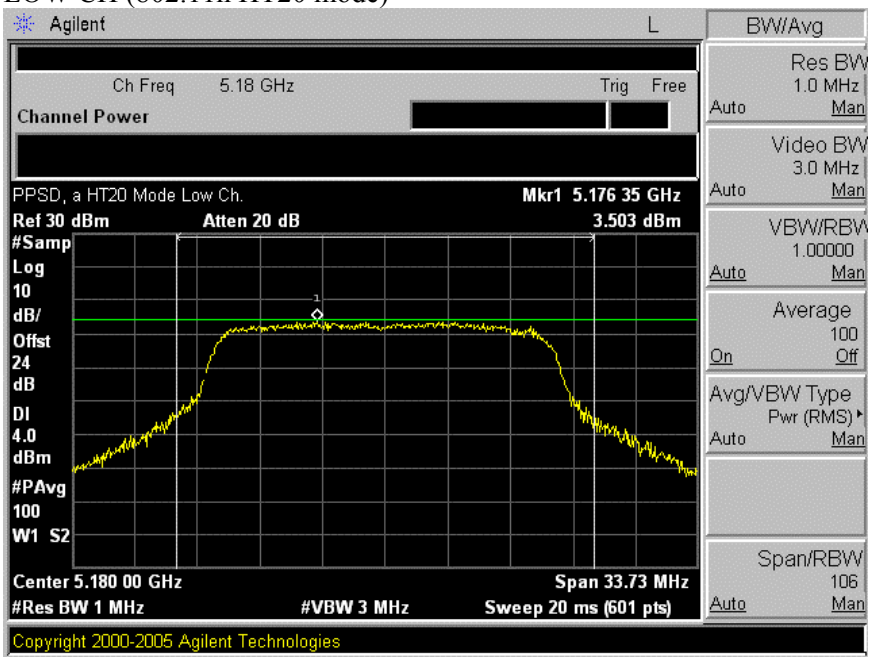


HIGH CH (802.11a mode)

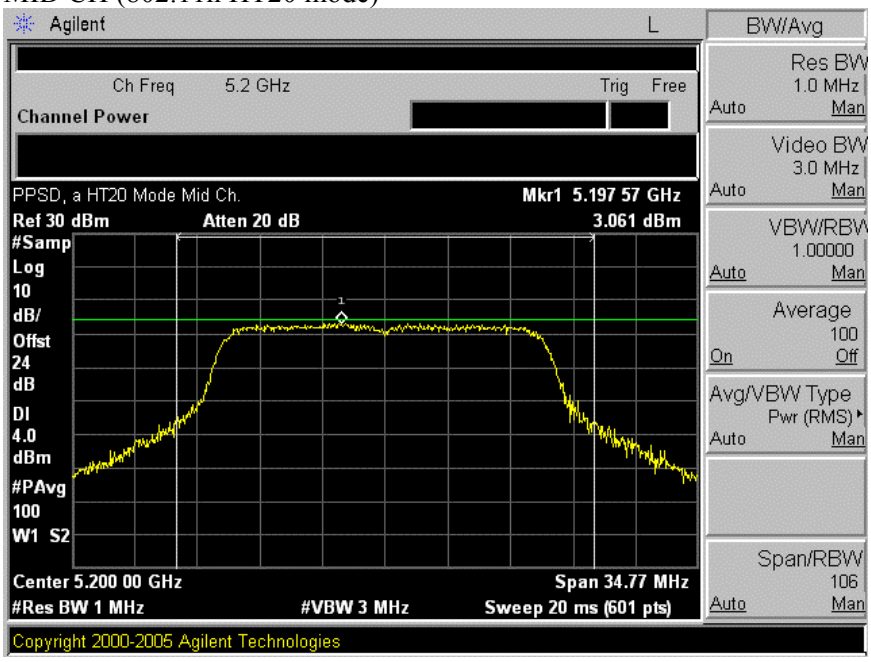


(802.11n HT20 MODE) WITH COMBINER

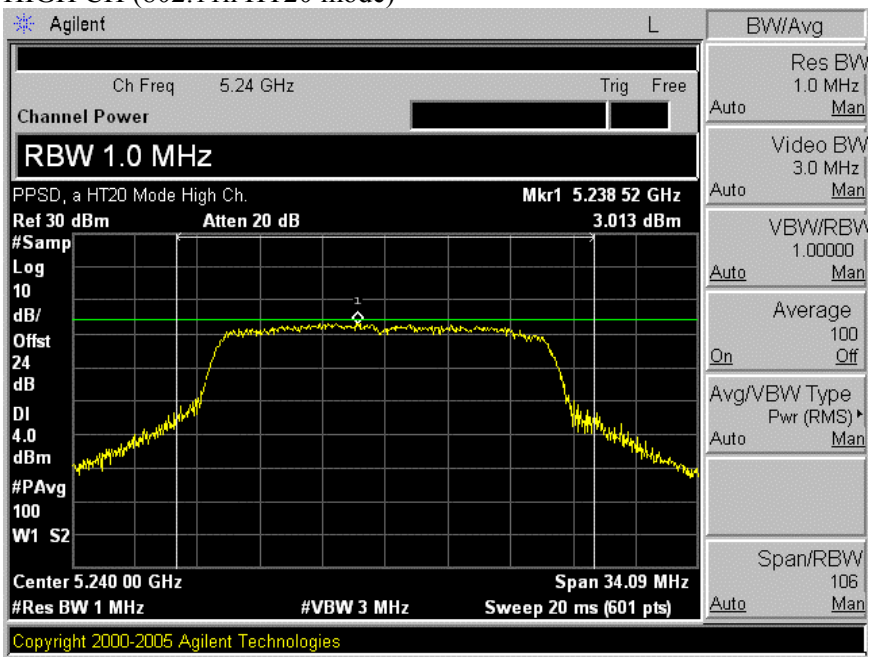
LOW CH (802.11n HT20 mode)



MID CH (802.11n HT20 mode)

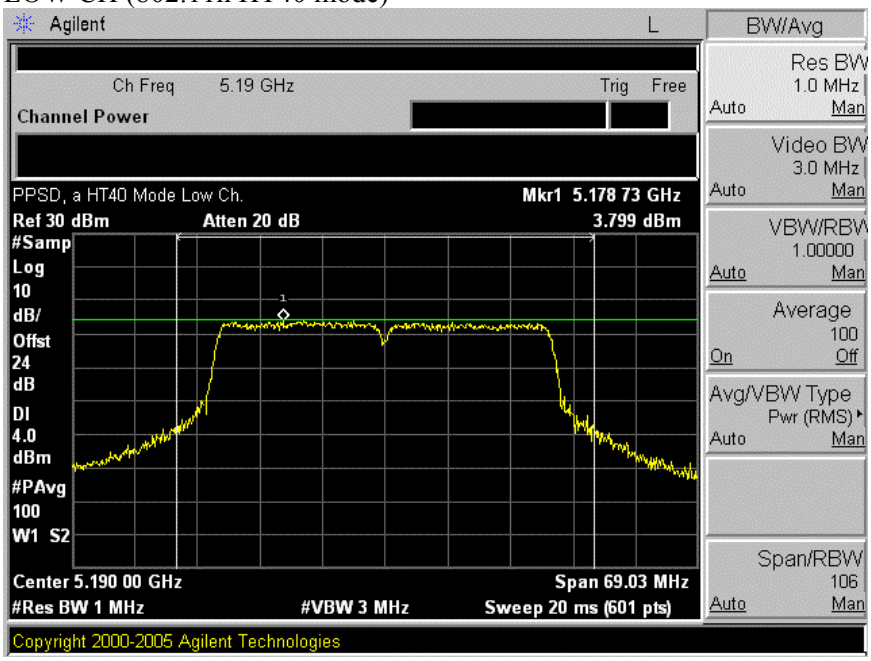


HIGH CH (802.11n HT20 mode)

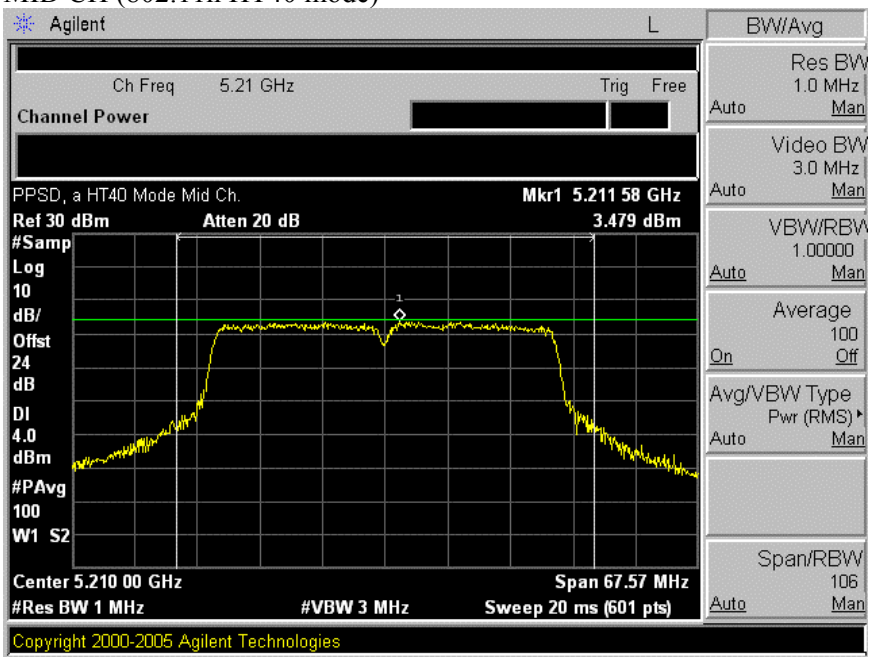


(802.11 HT40 MODE) WITH COMBINER

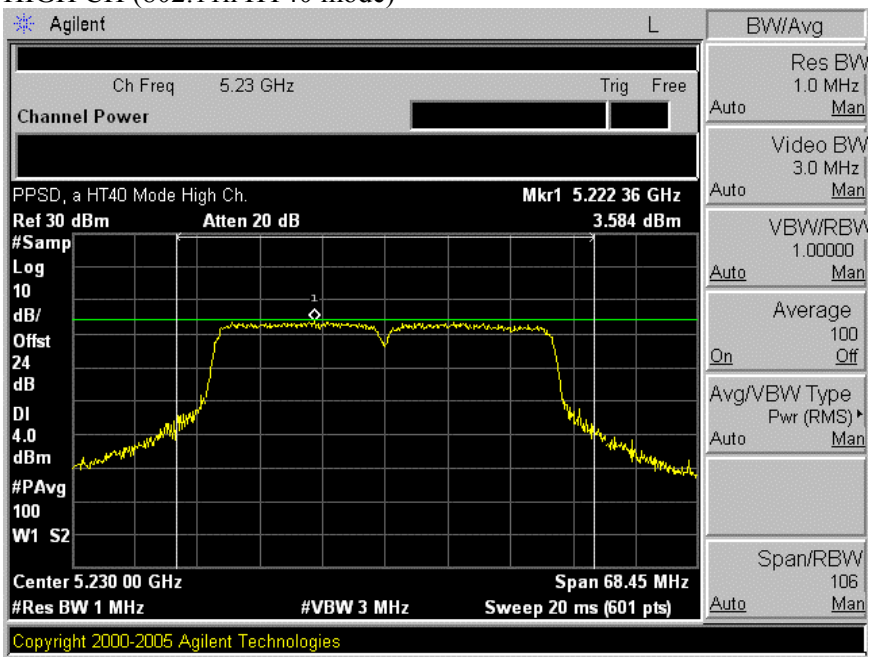
LOW CH (802.11n HT40 mode)



MID CH (802.11n HT40 mode)



HIGH CH (802.11n HT40 mode)



7.1.4. 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.

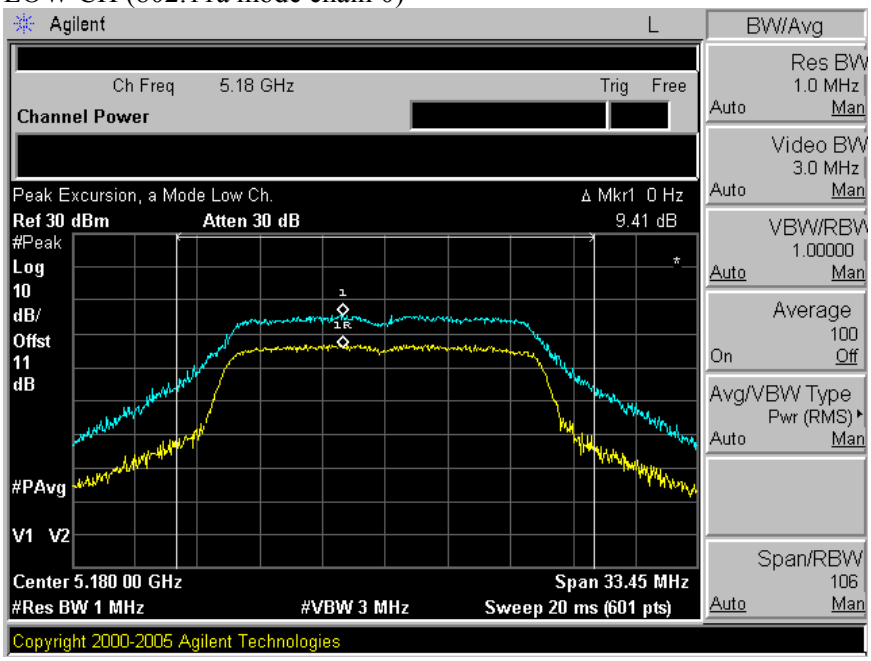
RESULTS

No non-compliance noted:

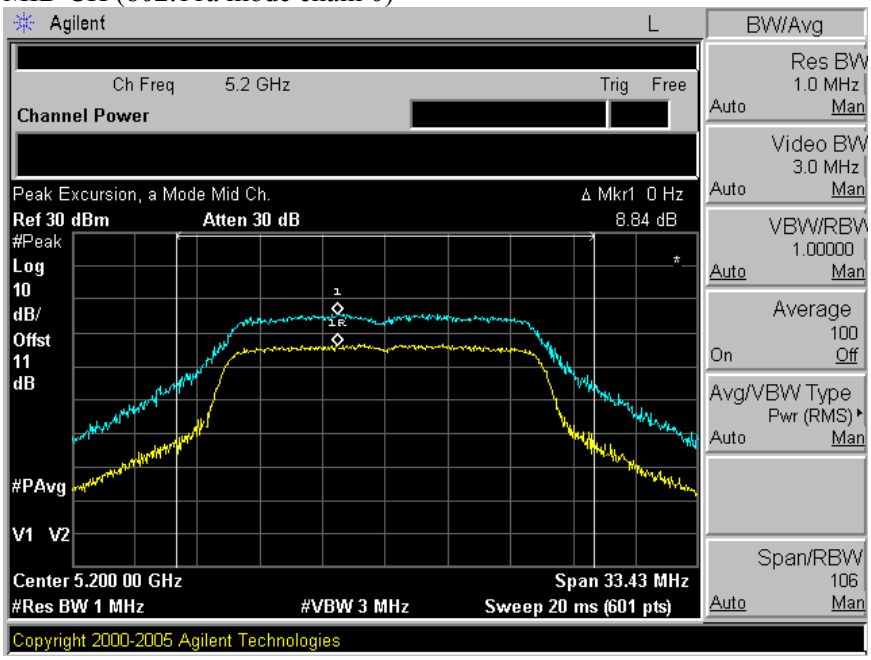
Mode Channel	Frequency (MHz)	Peak Excursion Chain 0 (dBm)	Peak Excursion Chain 1 (dBm)	Peak Excursion Chain 2 (dBm)	Limit (dBm)	Worst Case Margin (dB)
802.11a Mode						
Low	5180	9.41	9.78	10.35	13	-2.65
Middle	5200	8.84	10.70	11.44	13	-1.56
High	5240	9.17	10.86	10.28	13	-2.14
802.11n HT20 Mode						
Low	5180	10.53	9.91	10.04	13	-2.47
Middle	5200	11.81	8.60	10.37	13	-1.19
High	5240	11.28	10.50	10.16	13	-1.72
802.11n HT40 Mode						
Low	5190	9.43	10.14	11.00	13	-2.00
Middle	5210	9.96	9.25	9.78	13	-3.04
High	5230	10.35	10.22	9.90	13	-2.65

(802.11a MODE CHAIN 0)

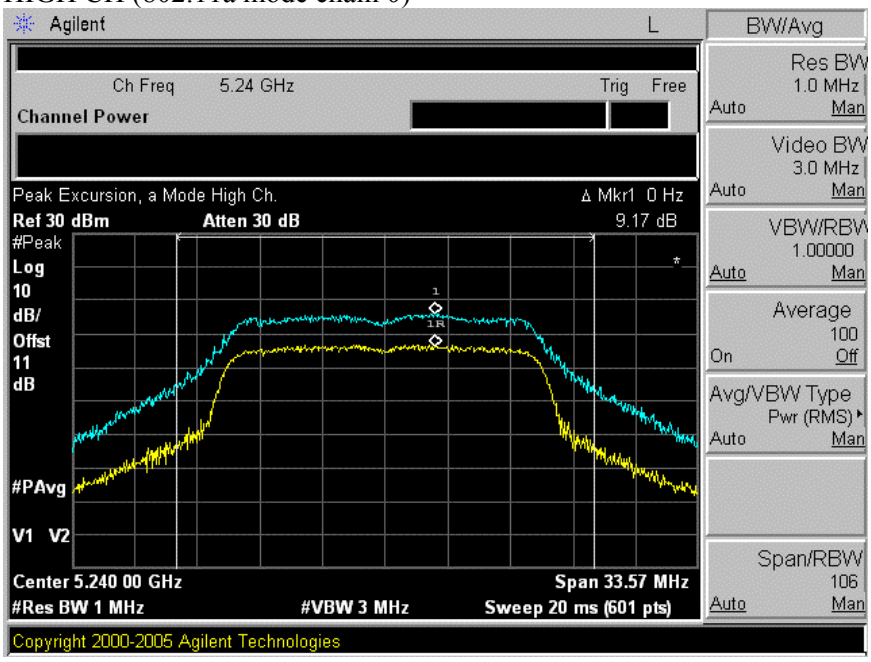
LOW CH (802.11a mode chain 0)



MID CH (802.11a mode chain 0)

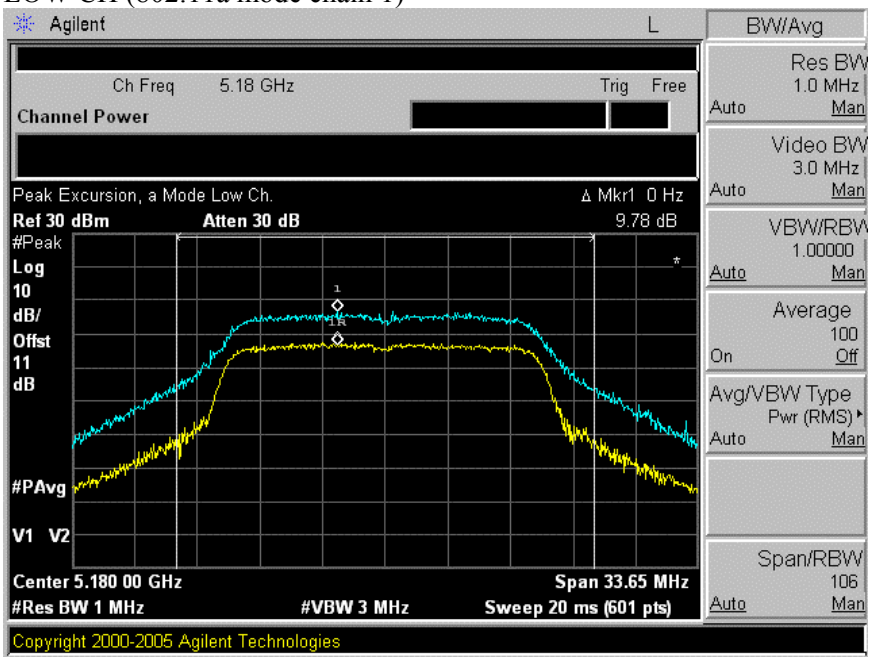


HIGH CH (802.11a mode chain 0)

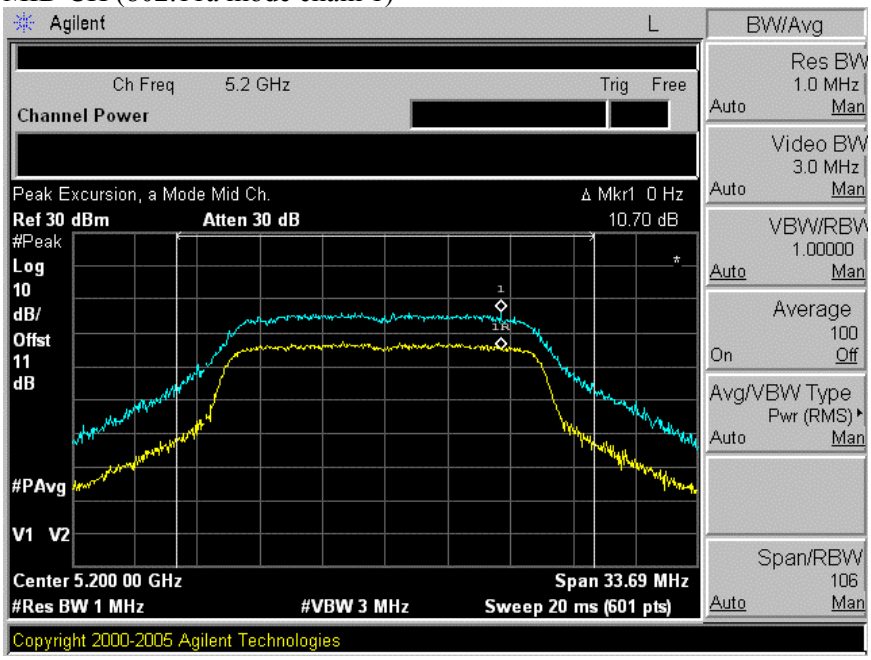


(802.11a MODE CHAIN 1)

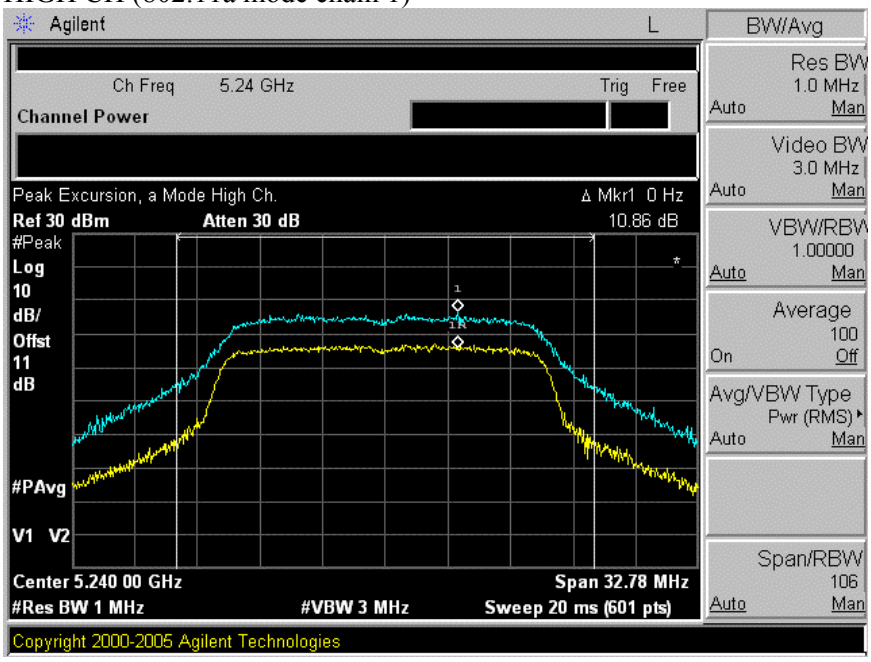
LOW CH (802.11a mode chain 1)



MID CH (802.11a mode chain 1)

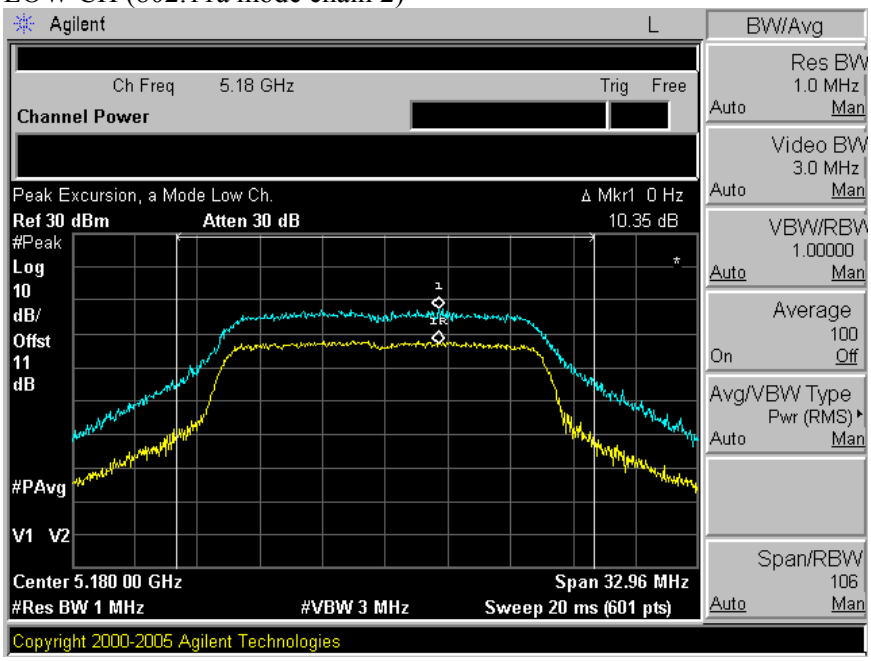


HIGH CH (802.11a mode chain 1)

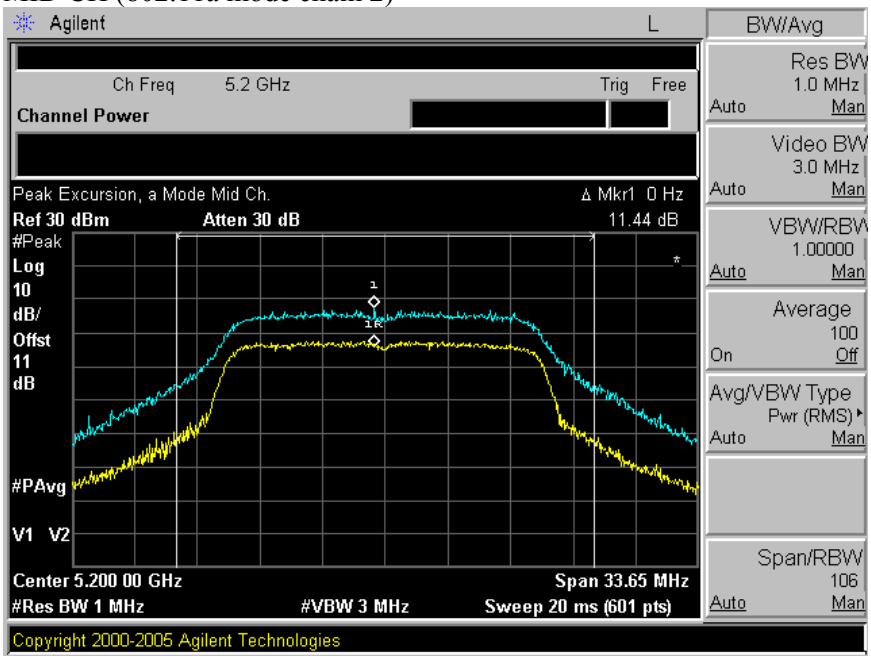


(802.11a MODE CHAIN 2)

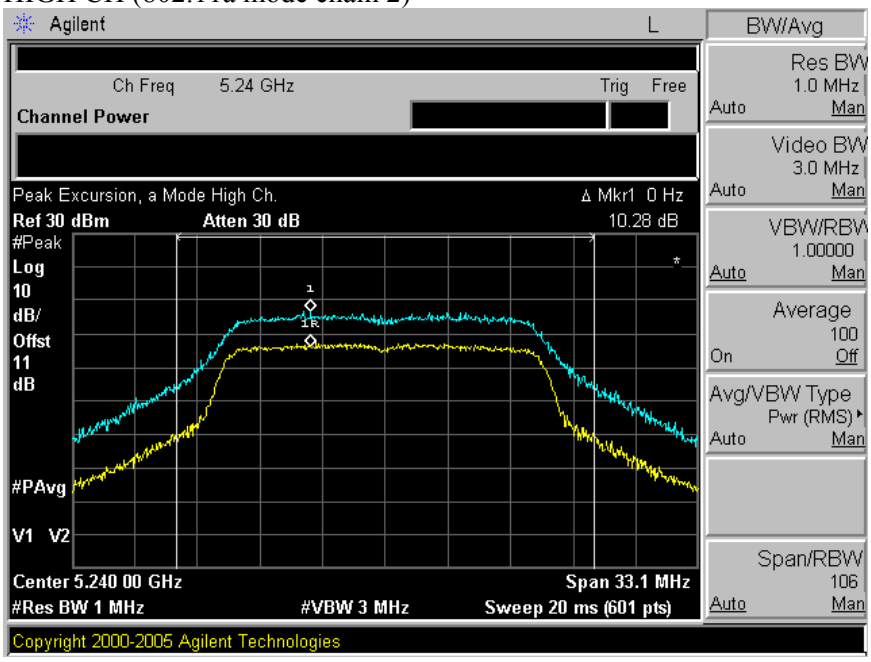
LOW CH (802.11a mode chain 2)



MID CH (802.11a mode chain 2)

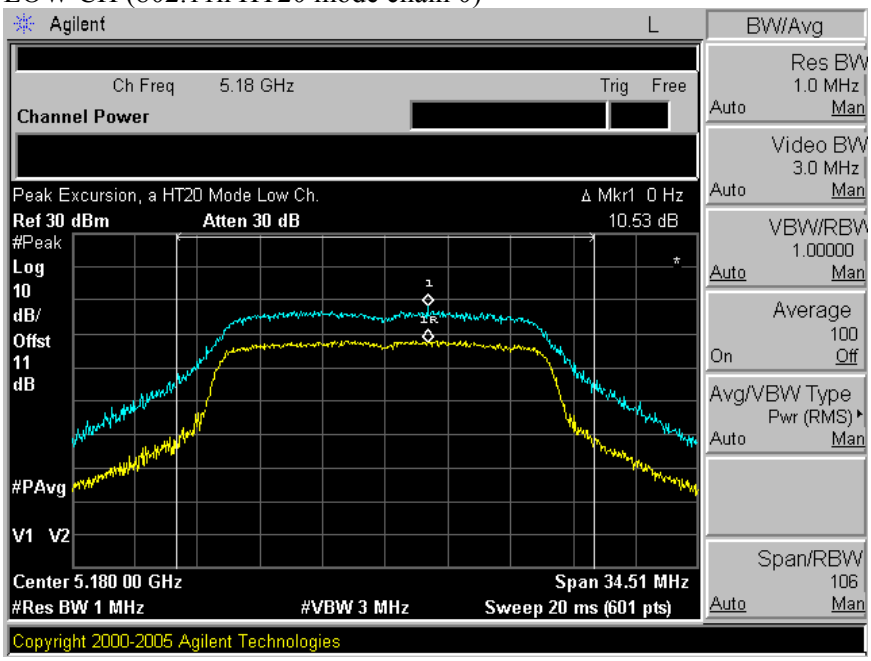


HIGH CH (802.11a mode chain 2)

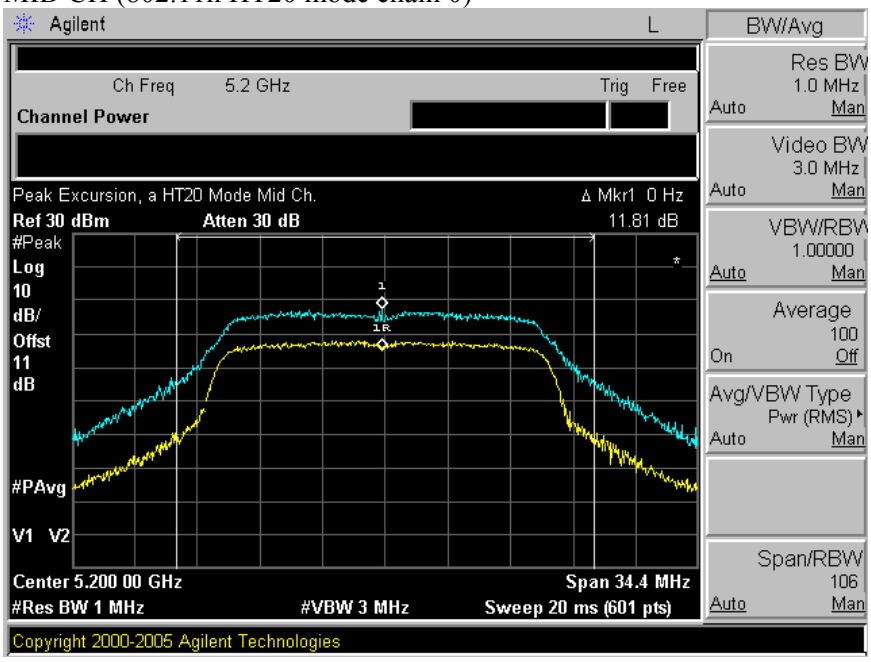


(802.11n HT20 MODE CHAIN 0)

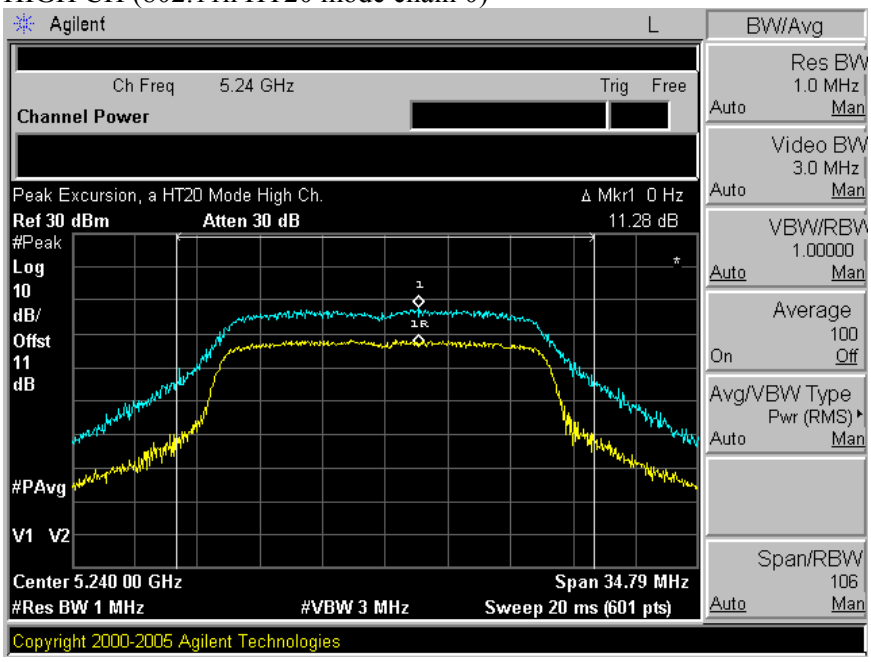
LOW CH (802.11n HT20 mode chain 0)



MID CH (802.11n HT20 mode chain 0)

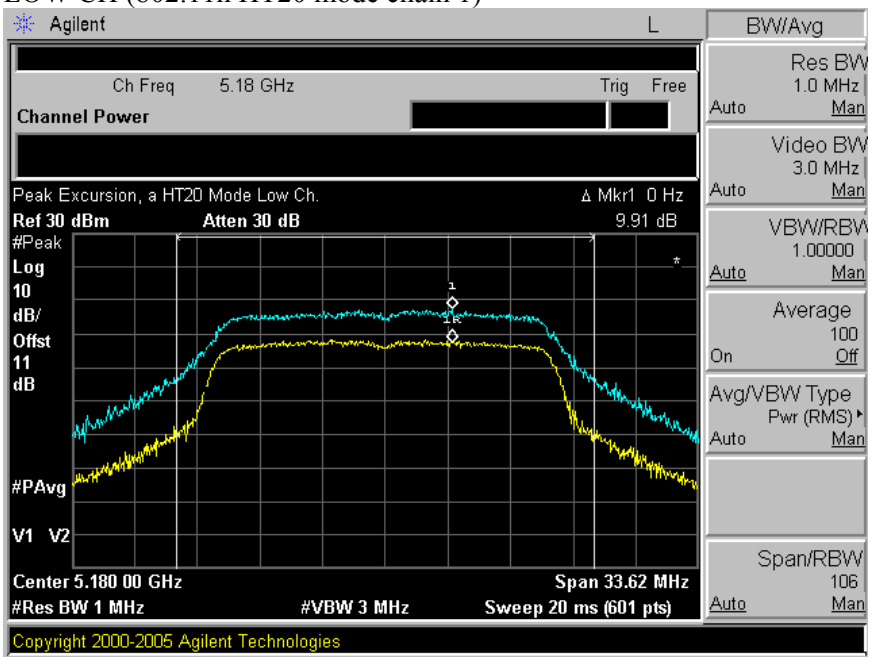


HIGH CH (802.11n HT20 mode chain 0)

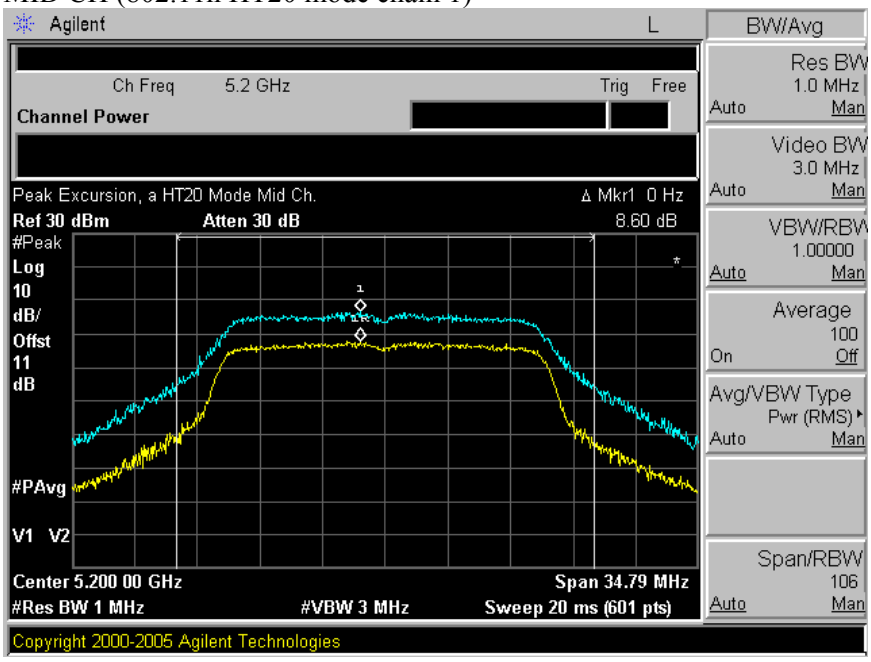


(802.11n HT20 MODE CHAIN 1)

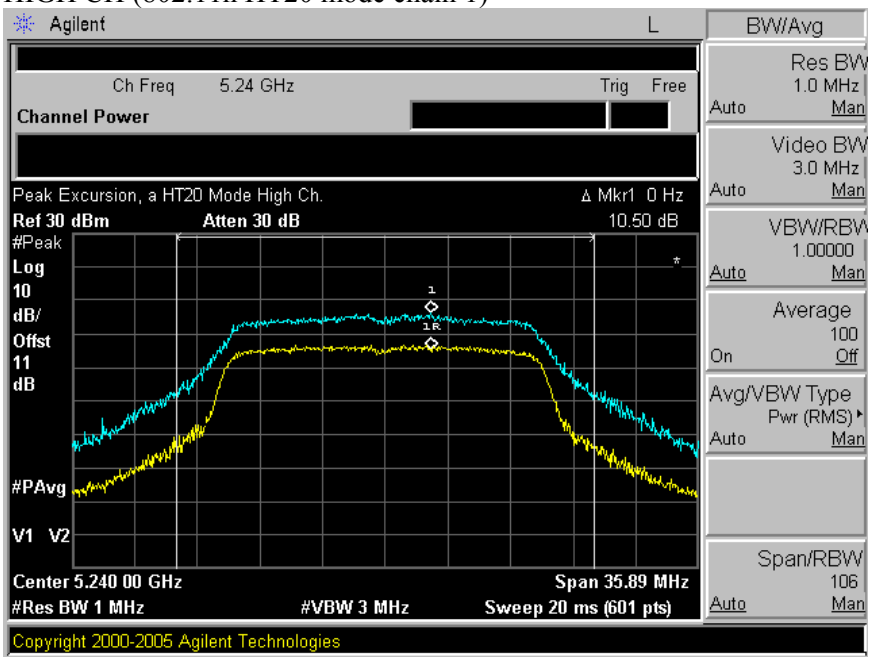
LOW CH (802.11n HT20 mode chain 1)



MID CH (802.11n HT20 mode chain 1)

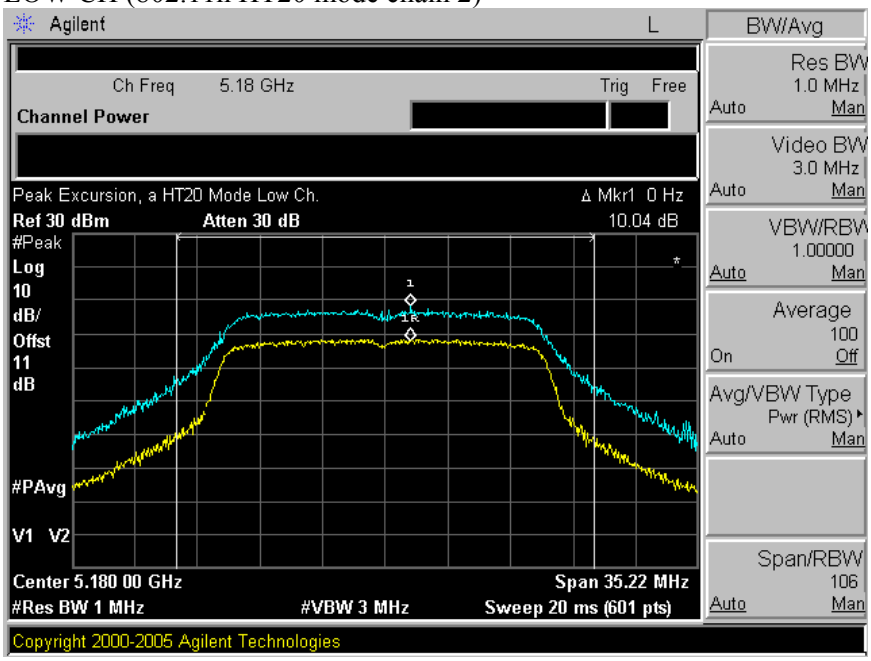


HIGH CH (802.11n HT20 mode chain 1)

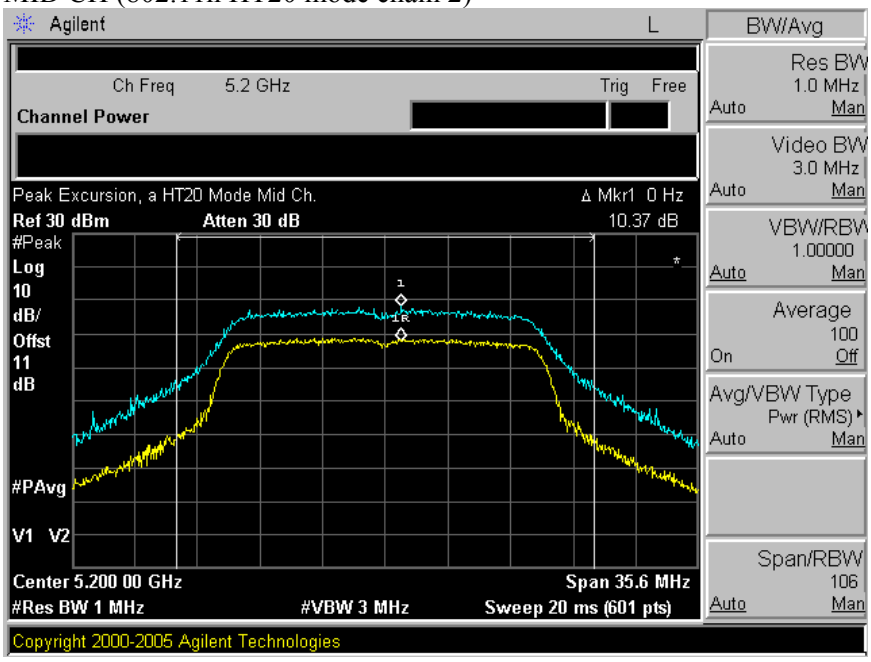


(802.11 HT20 MODE CHAIN 2)

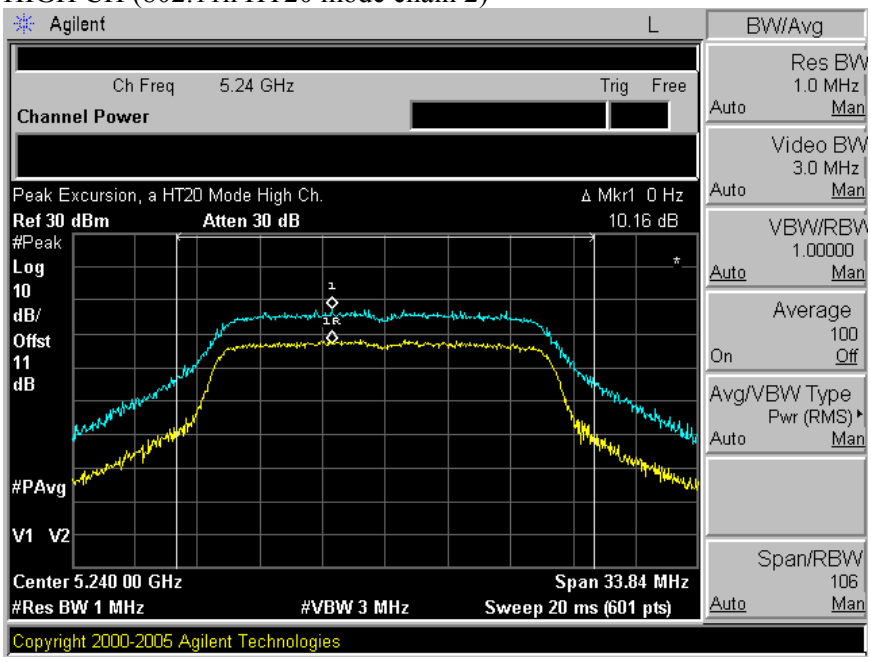
LOW CH (802.11n HT20 mode chain 2)



MID CH (802.11n HT20 mode chain 2)

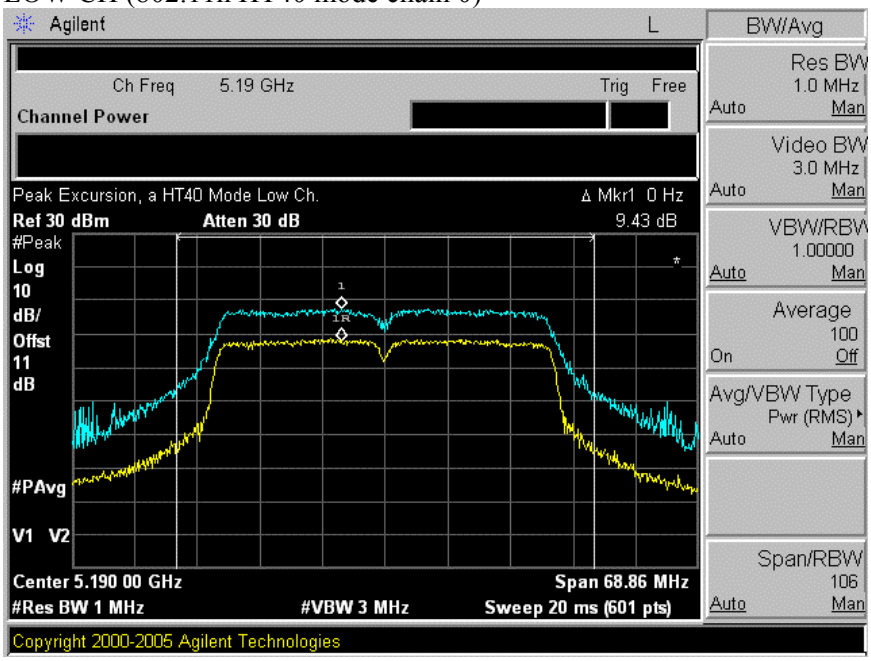


HIGH CH (802.11n HT20 mode chain 2)

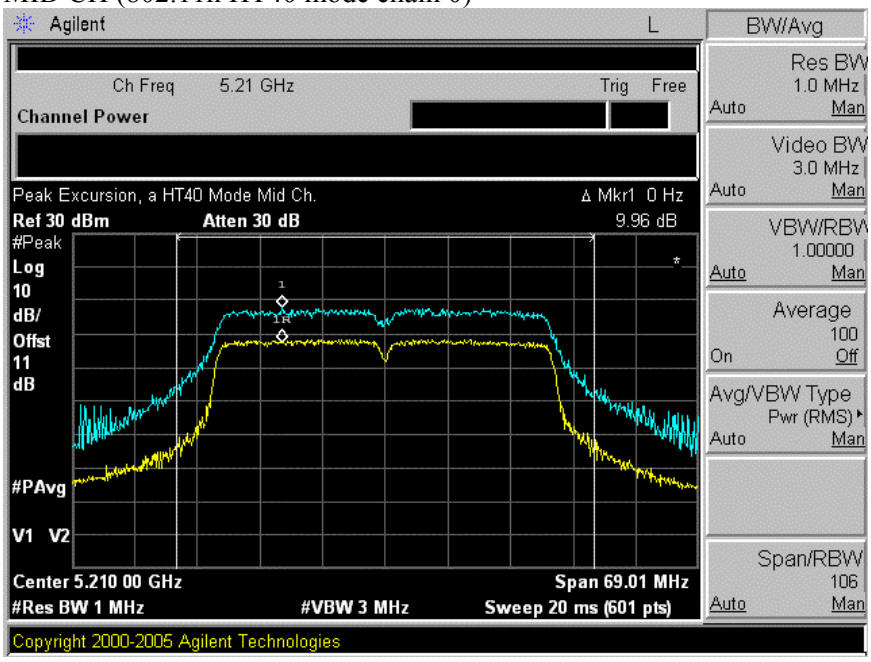


(802.11 HT40 MODE CHAIN 0)

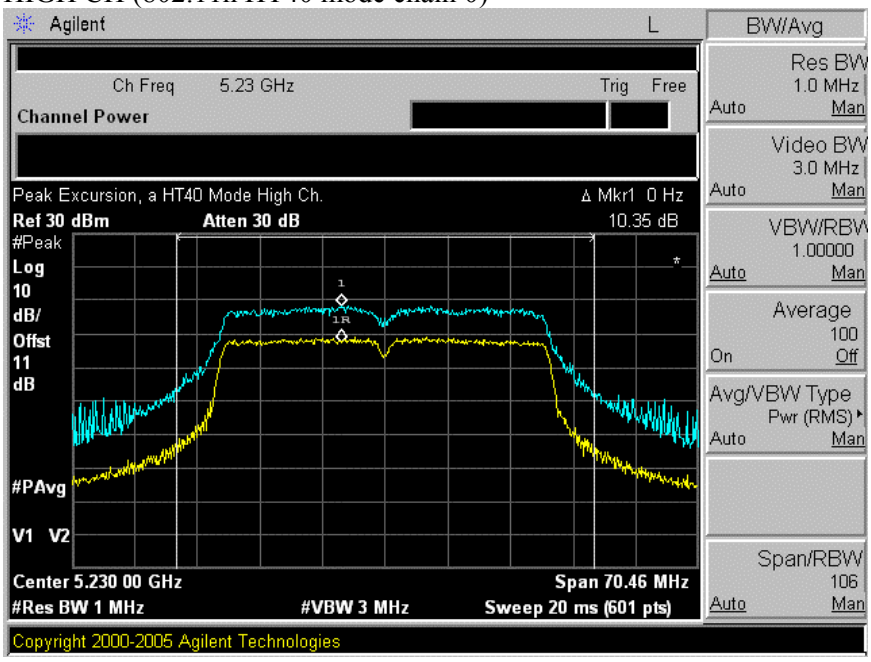
LOW CH (802.11n HT40 mode chain 0)



MID CH (802.11n HT40 mode chain 0)

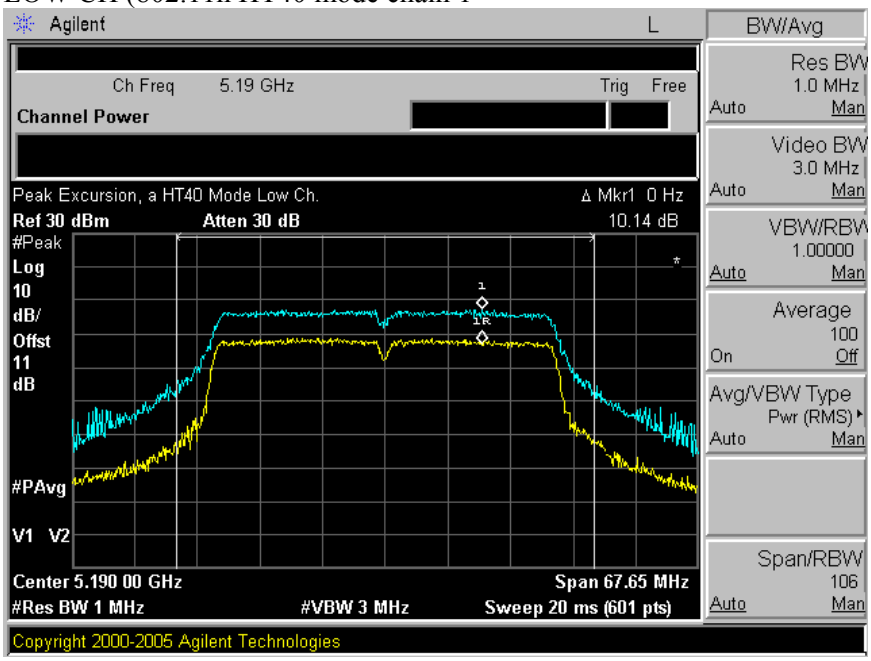


HIGH CH (802.11n HT40 mode chain 0)

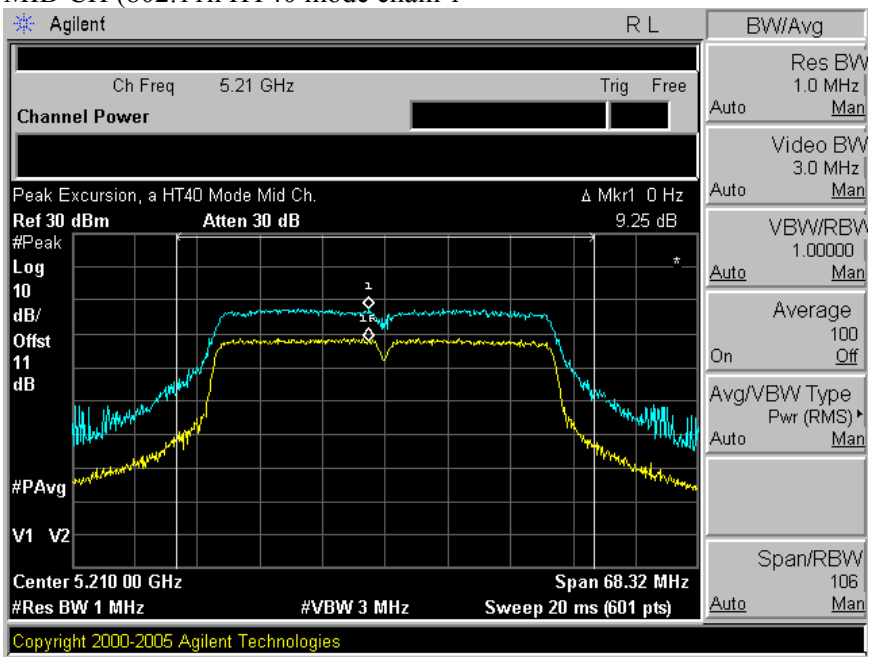


(802.11 HT40 MODE CHAIN 1

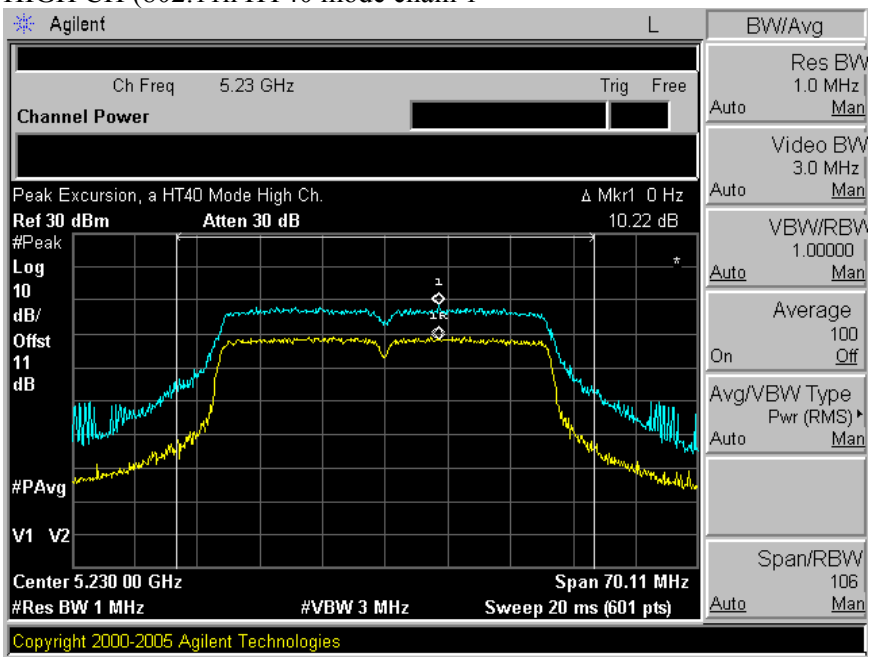
LOW CH (802.11n HT40 mode chain 1



MID CH (802.11n HT40 mode chain 1

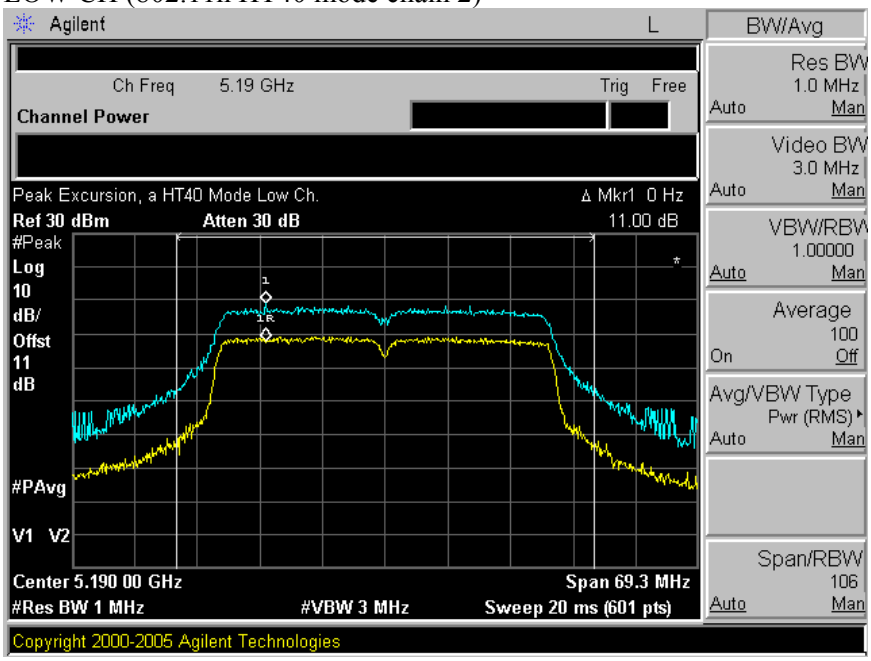


HIGH CH (802.11n HT40 mode chain 1

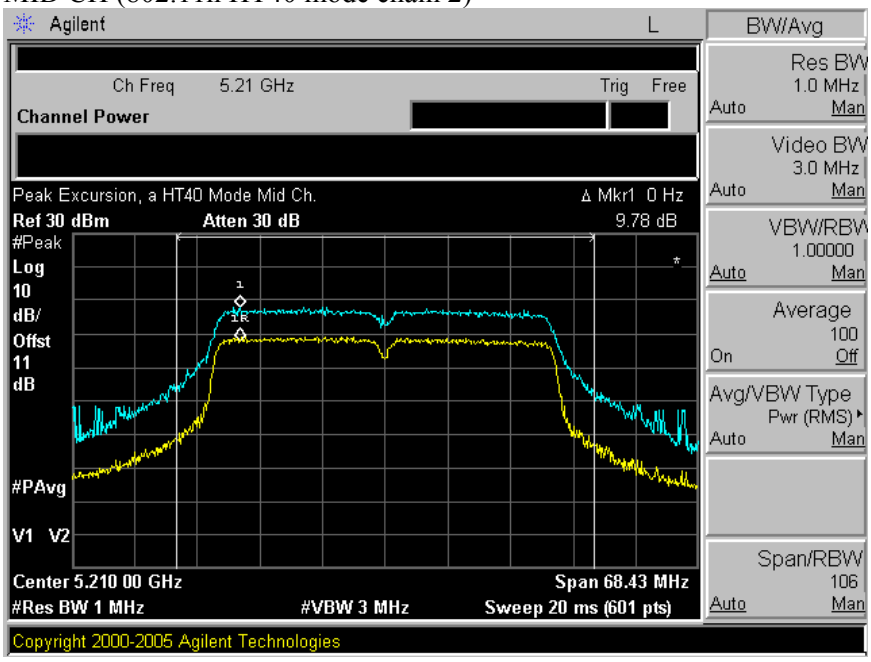


(802.11 HT40 MODE CHAIN 2)

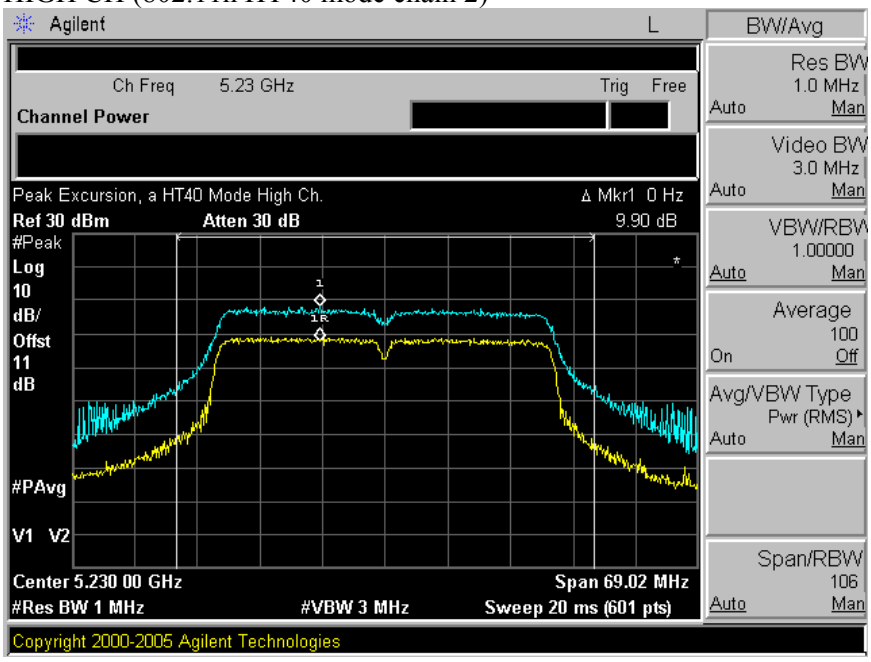
LOW CH (802.11n HT40 mode chain 2)



MID CH (802.11n HT40 mode chain 2)



HIGH CH (802.11n HT40 mode chain 2)



7.1.5. 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.

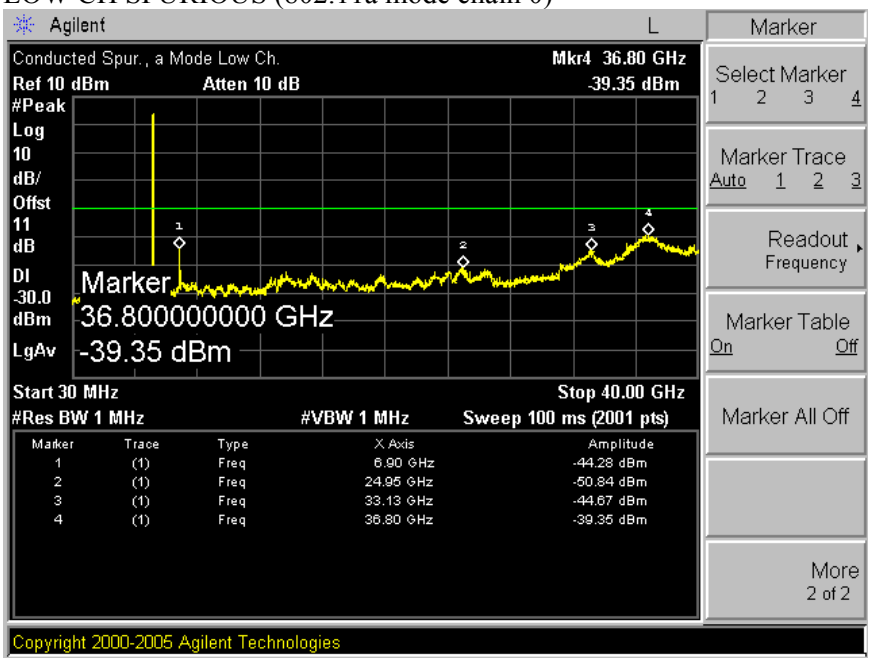
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

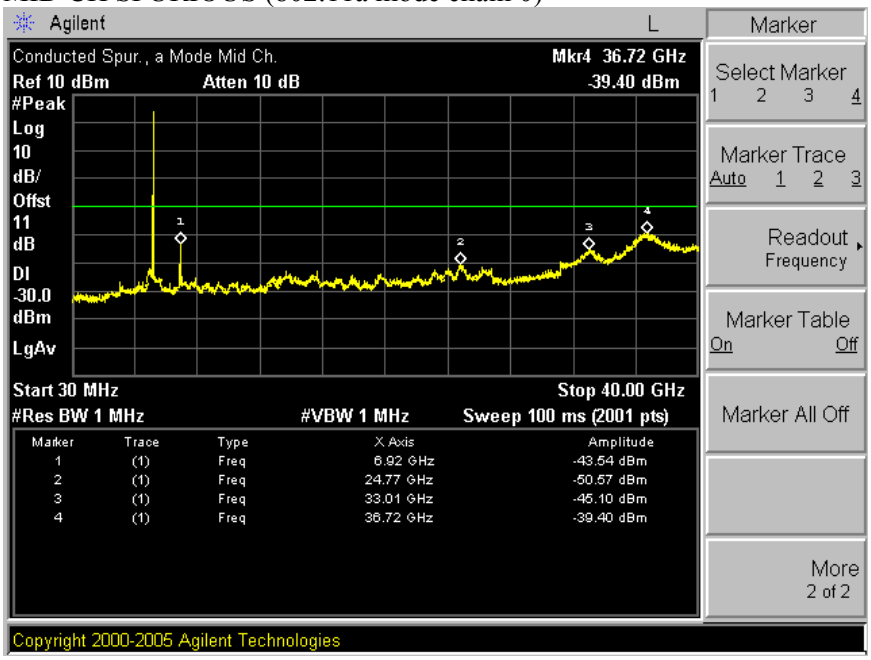
No non-compliance noted:

SPURIOUS EMISSIONS (802.11a MODE CHAIN 0)

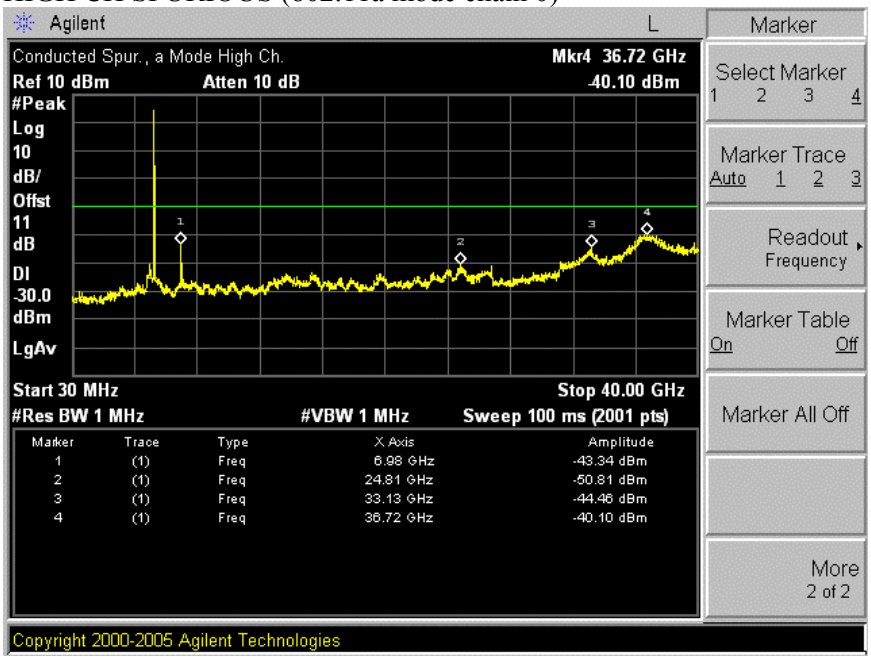
LOW CH SPURIOUS (802.11a mode chain 0)



MID CH SPURIOUS (802.11a mode chain 0)

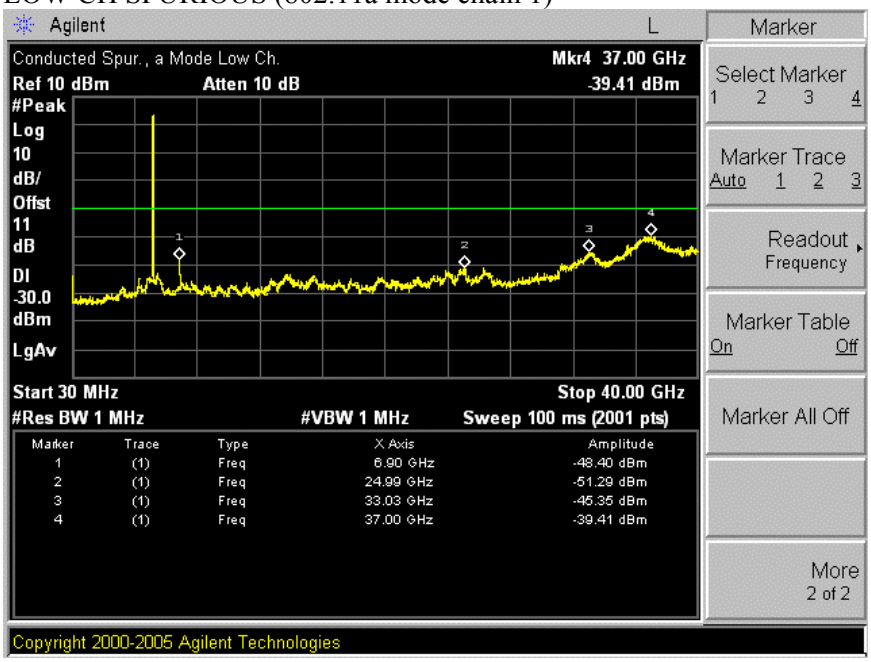


HIGH CH SPURIOUS (802.11a mode chain 0)

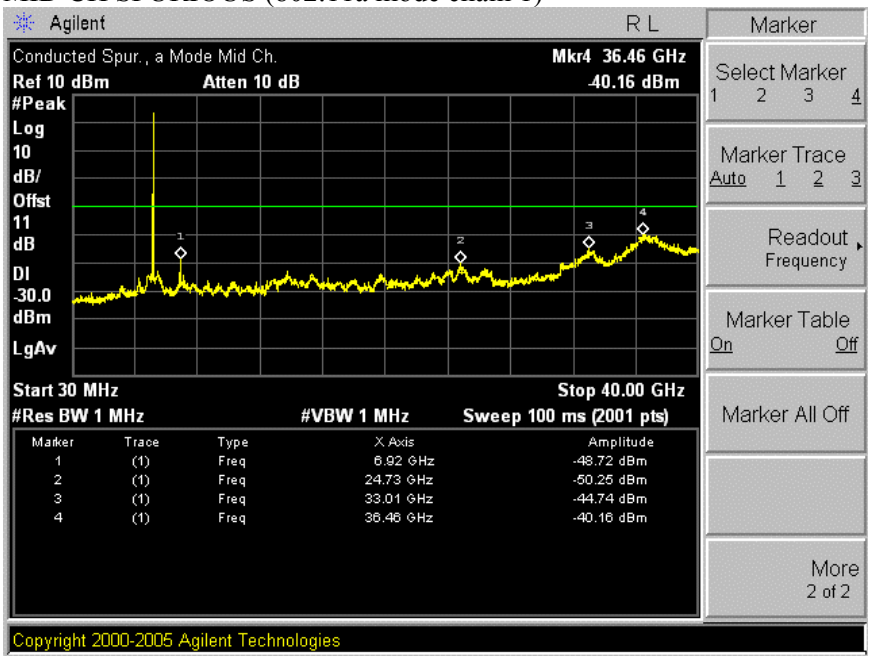


SPURIOUS EMISSIONS (802.11a MODE CHAIN 1)

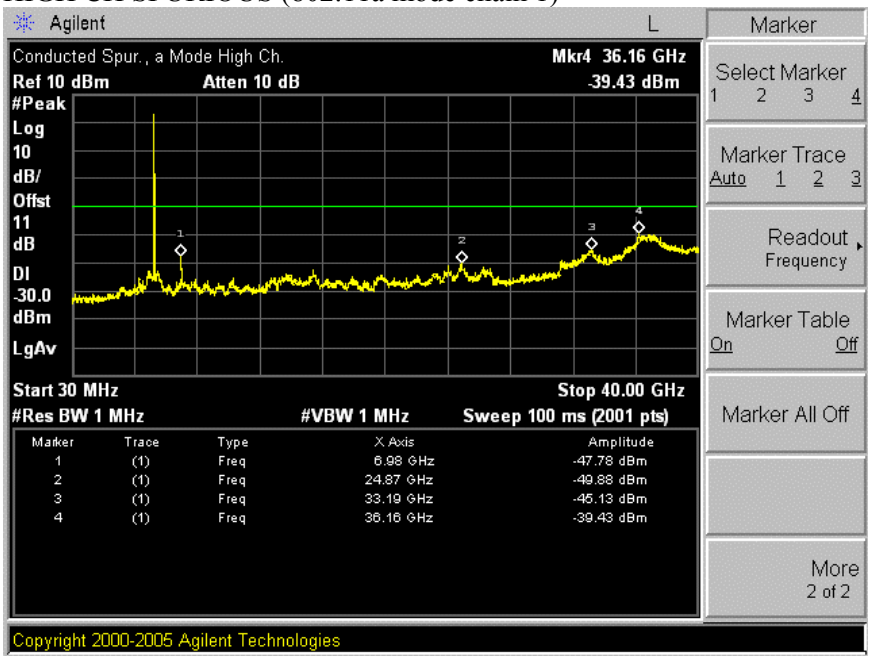
LOW CH SPURIOUS (802.11a mode chain 1)



MID CH SPURIOUS (802.11a mode chain 1)

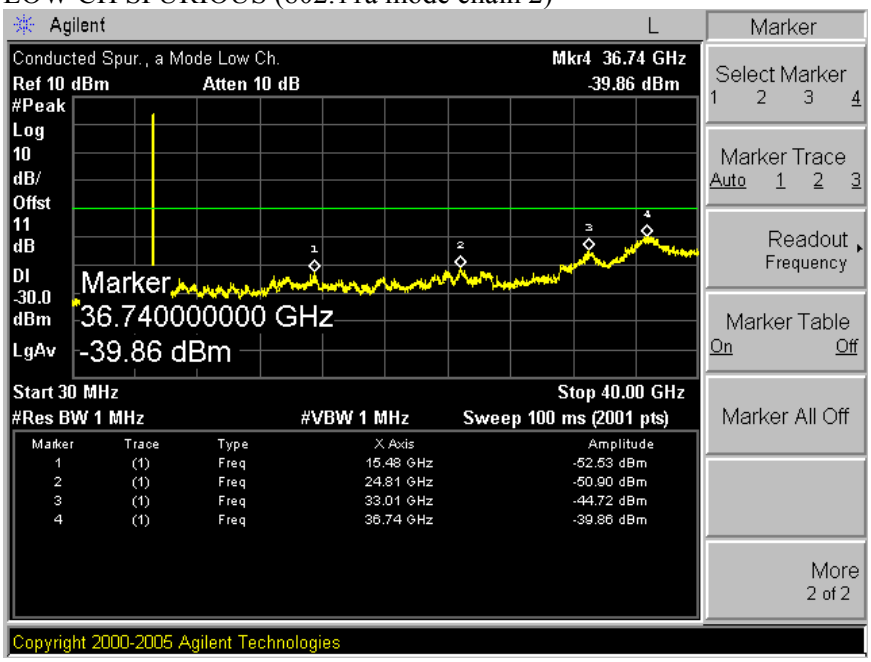


HIGH CH SPURIOUS (802.11a mode chain 1)

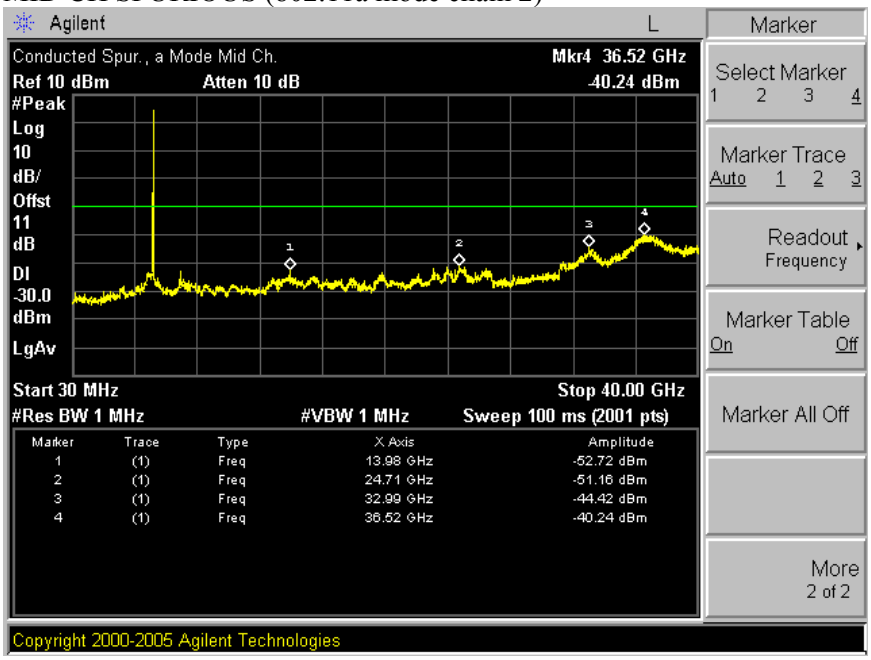


SPURIOUS EMISSIONS (802.11a MODE CHAIN 2)

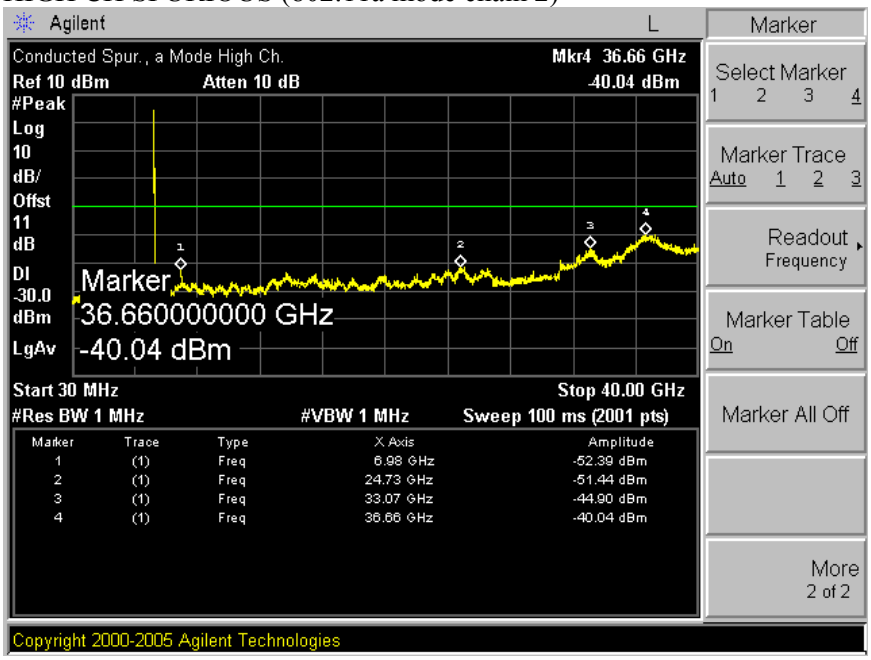
LOW CH SPURIOUS (802.11a mode chain 2)



MID CH SPURIOUS (802.11a mode chain 2)

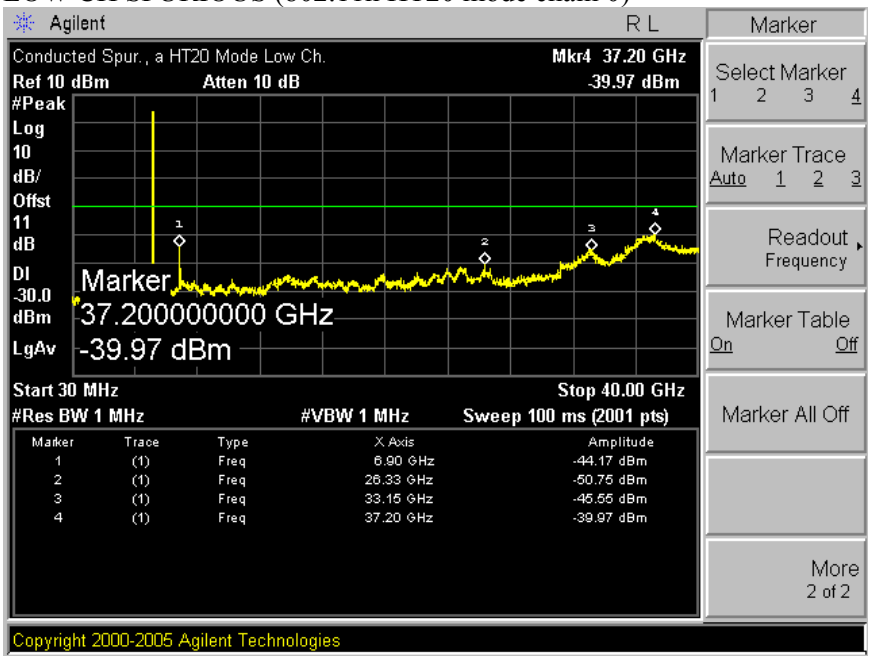


HIGH CH SPURIOUS (802.11a mode chain 2)



SPURIOUS EMISSIONS (802.11n HT20 MODE CHAIN 0)

LOW CH SPURIOUS (802.11n HT20 mode chain 0)



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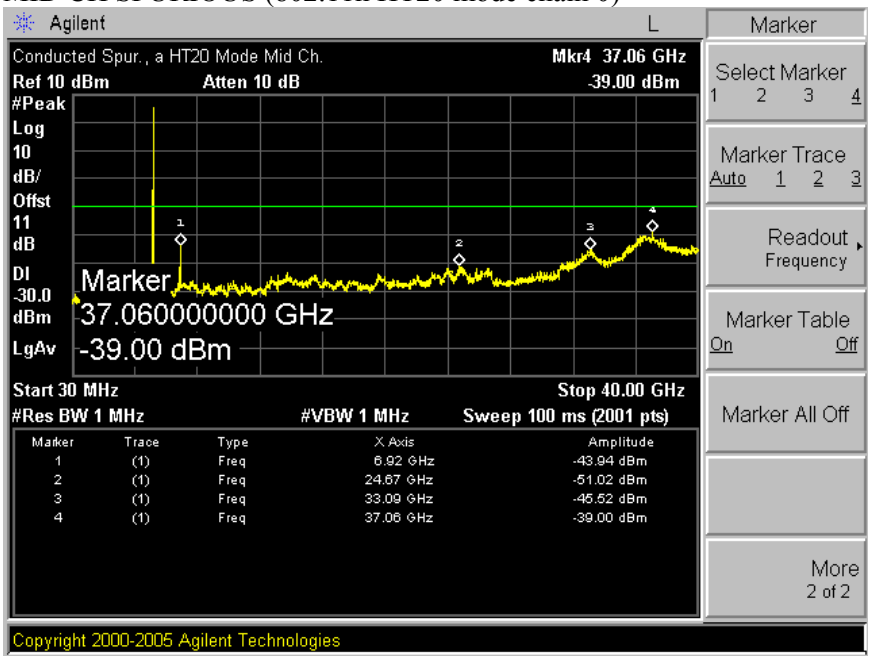
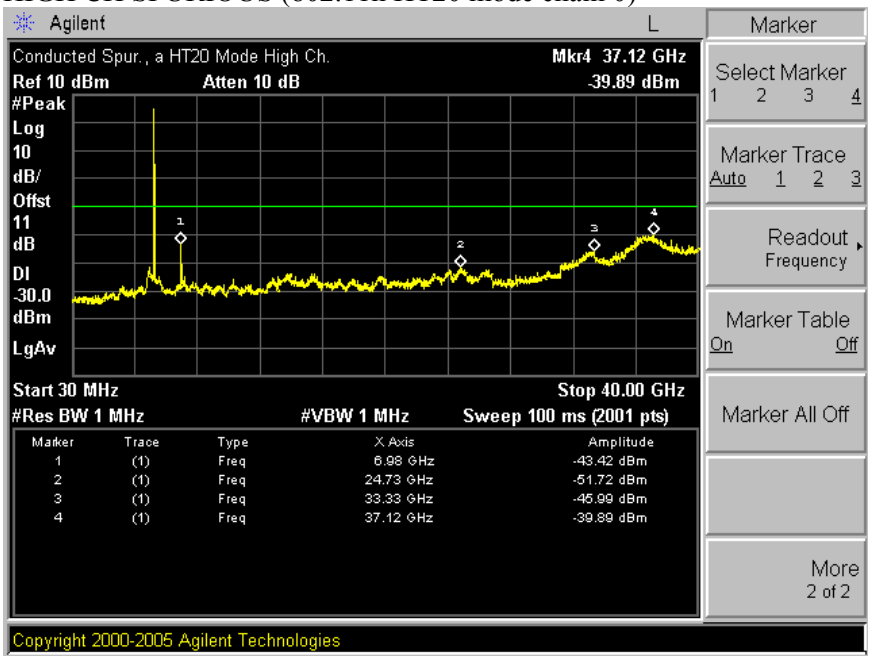
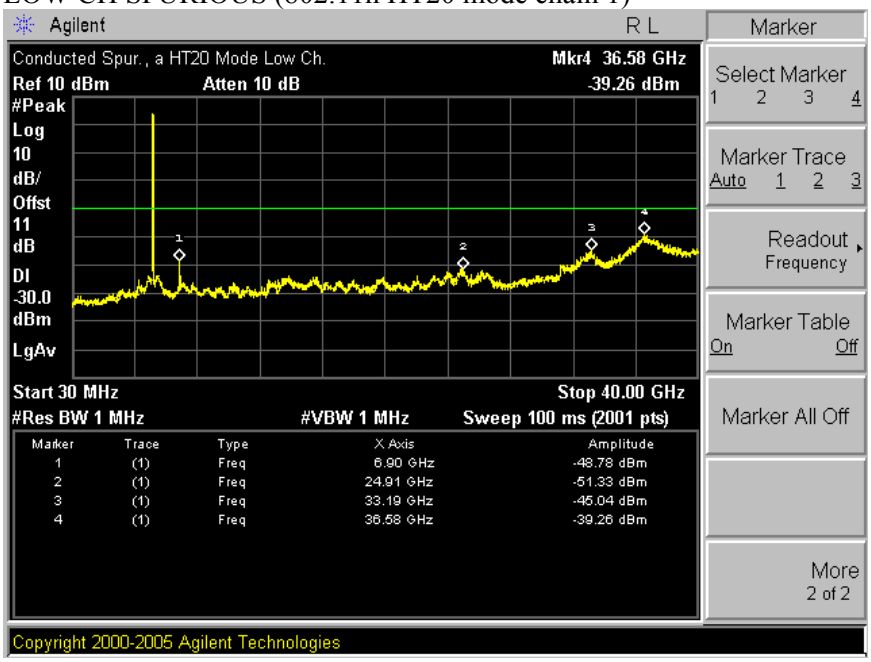


HIGH CH SPURIOUS (802.11n HT20 mode chain 0)

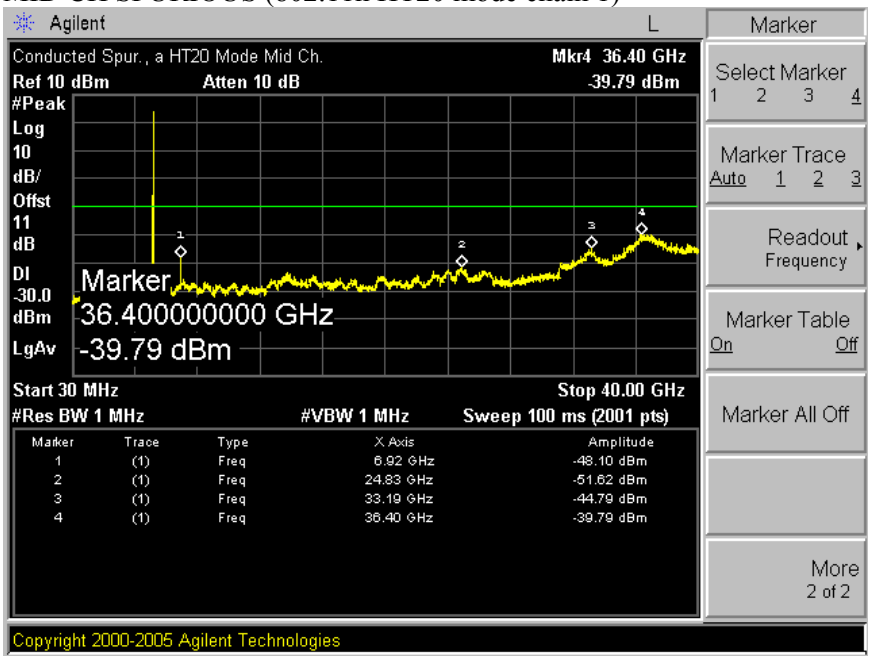


SPURIOUS EMISSIONS (802.11n HT20 MODE CHAIN 1)

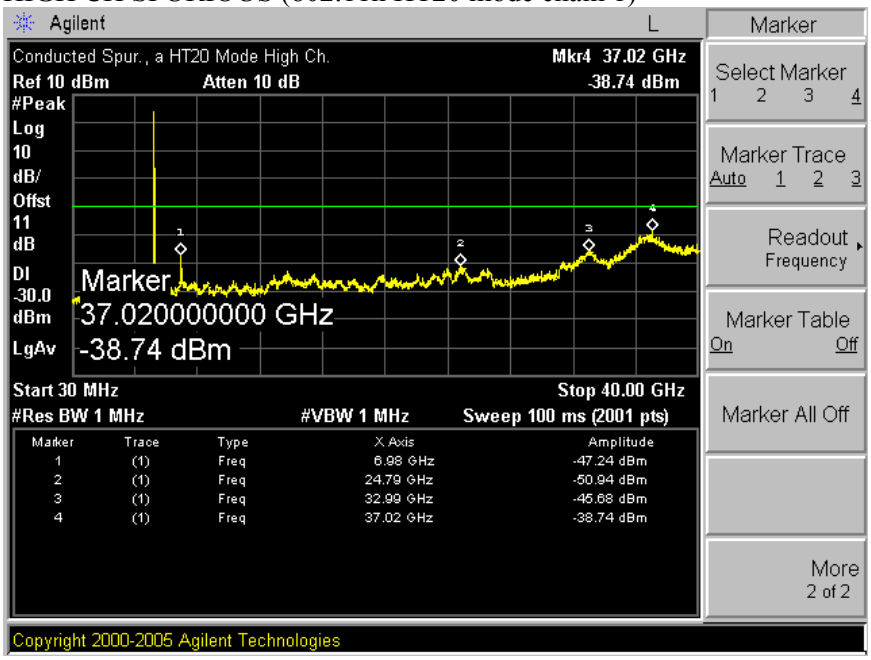
LOW CH SPURIOUS (802.11n HT20 mode chain 1)



MID CH SPURIOUS (802.11n HT20 mode chain 1)

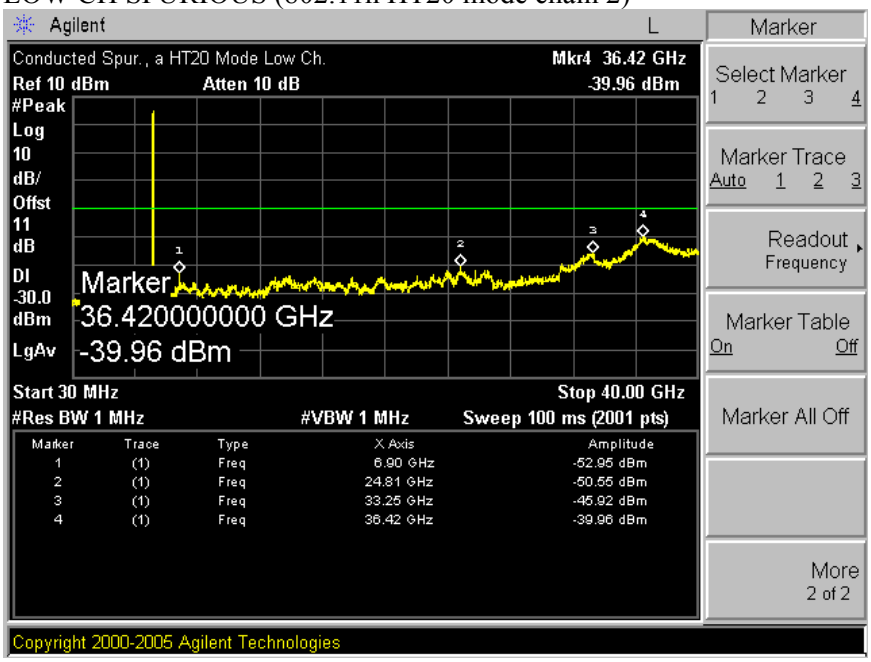


HIGH CH SPURIOUS (802.11n HT20 mode chain 1)

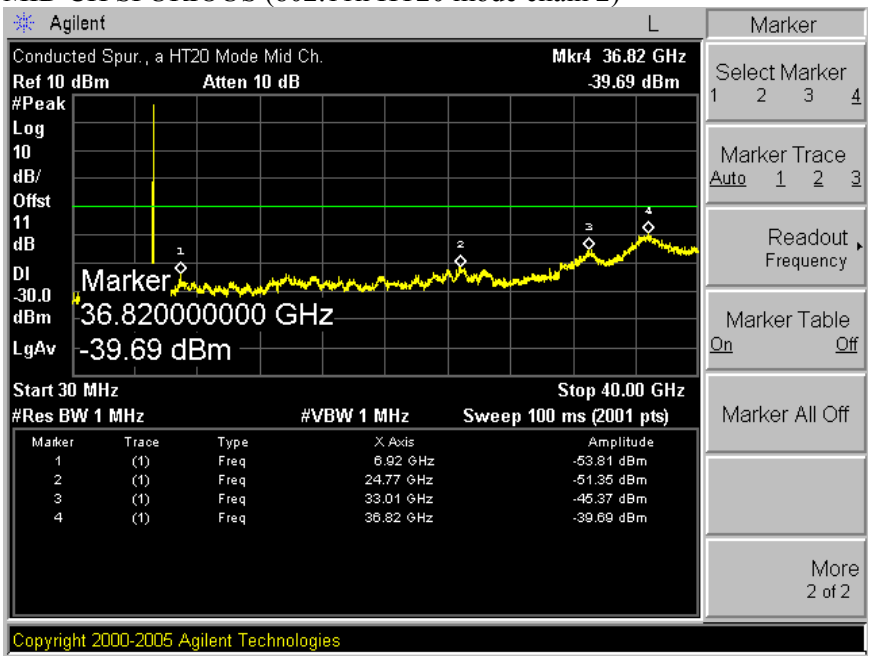


SPURIOUS EMISSIONS (802.11 HT20 MODE CHAIN 2)

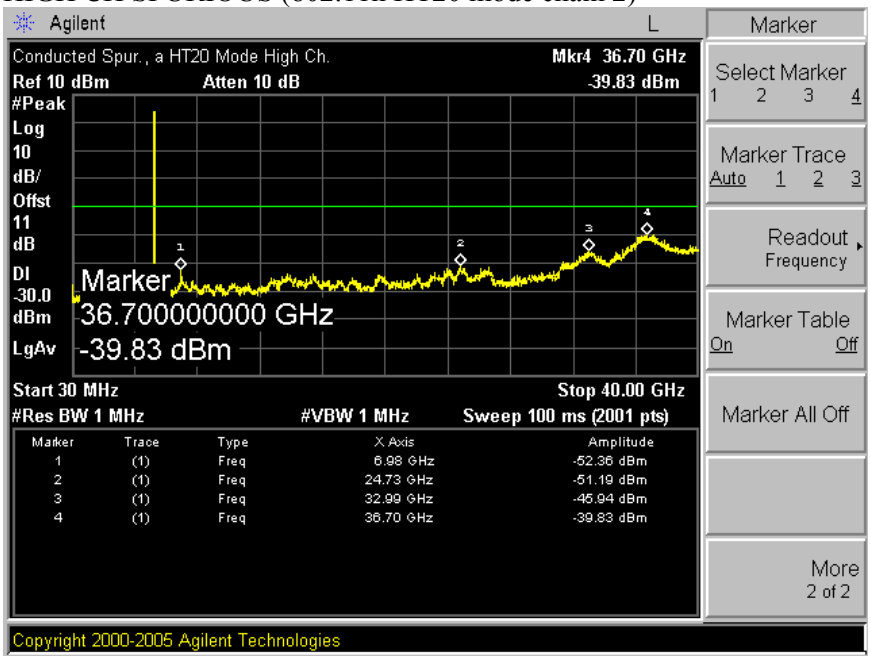
LOW CH SPURIOUS (802.11n HT20 mode chain 2)



MID CH SPURIOUS (802.11n HT20 mode chain 2)

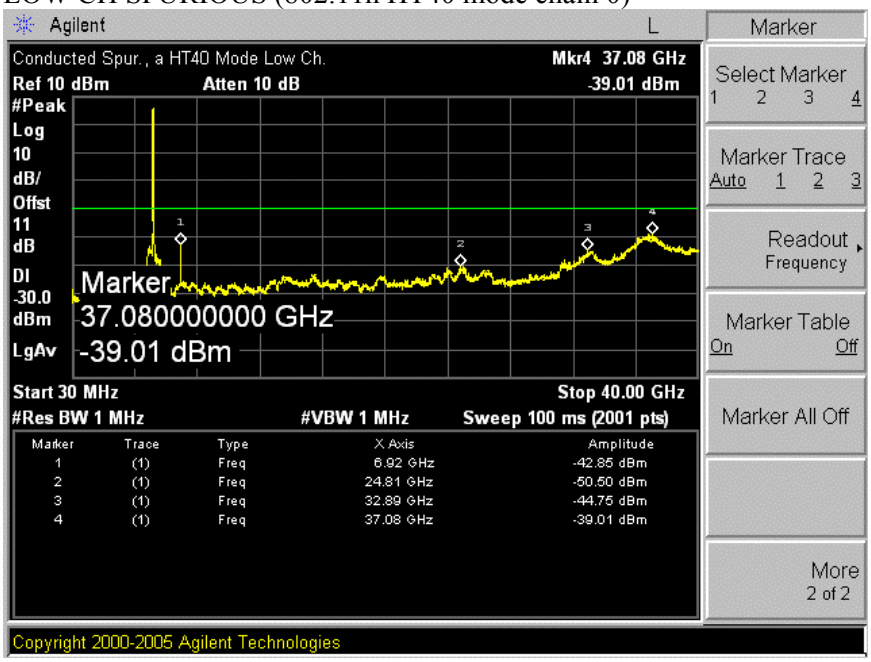


HIGH CH SPURIOUS (802.11n HT20 mode chain 2)

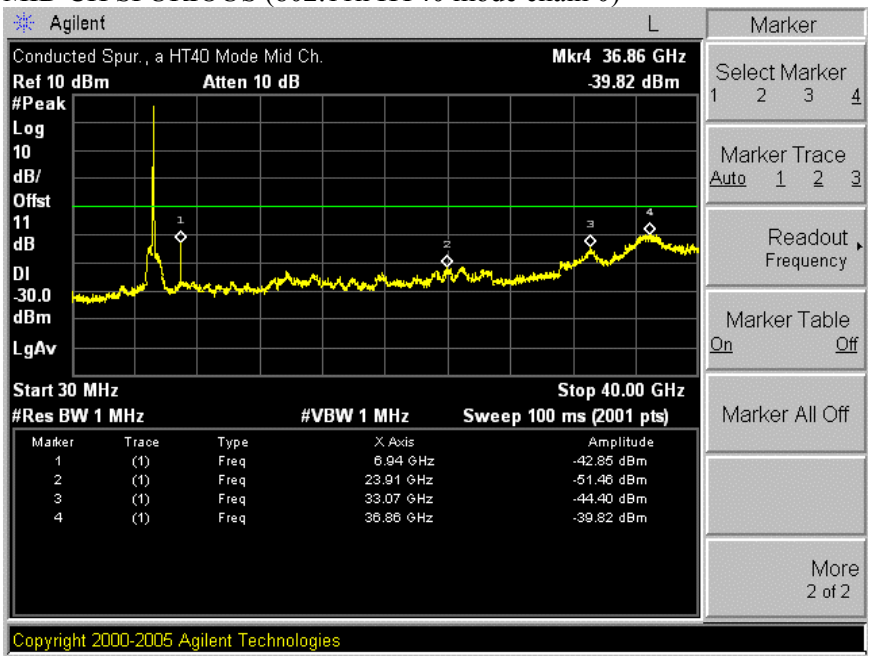


SPURIOUS EMISSIONS (802.11 HT40 MODE CHAIN 0)

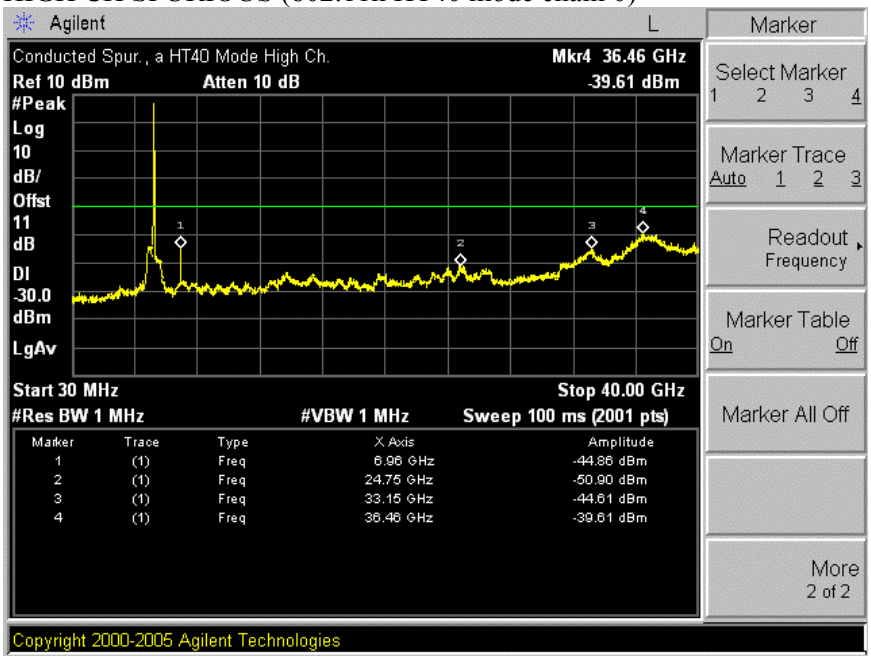
LOW CH SPURIOUS (802.11n HT40 mode chain 0)



MID CH SPURIOUS (802.11n HT40 mode chain 0)

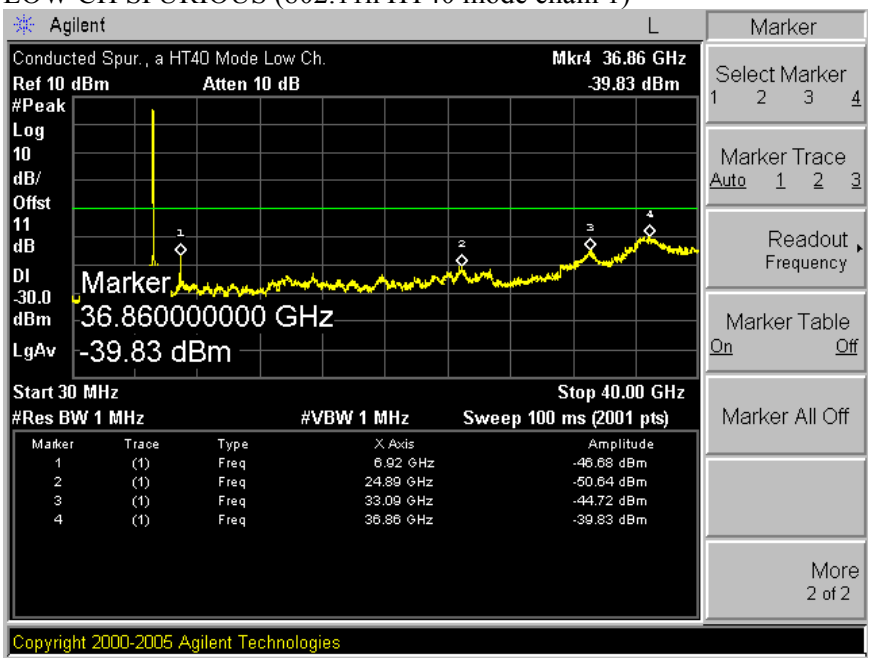


HIGH CH SPURIOUS (802.11n HT40 mode chain 0)

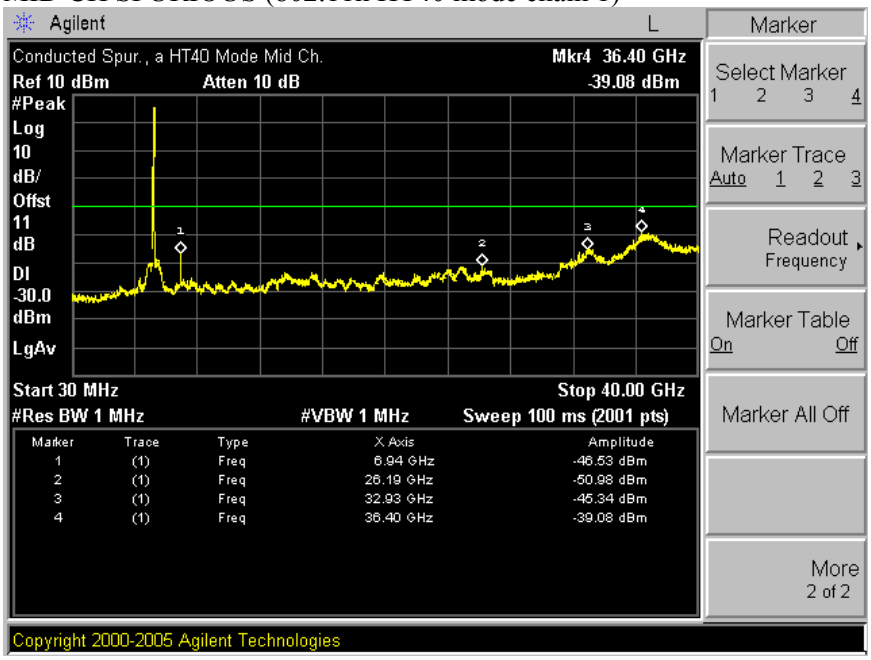


SPURIOUS EMISSIONS (802.11 HT40 MODE CHAIN 1)

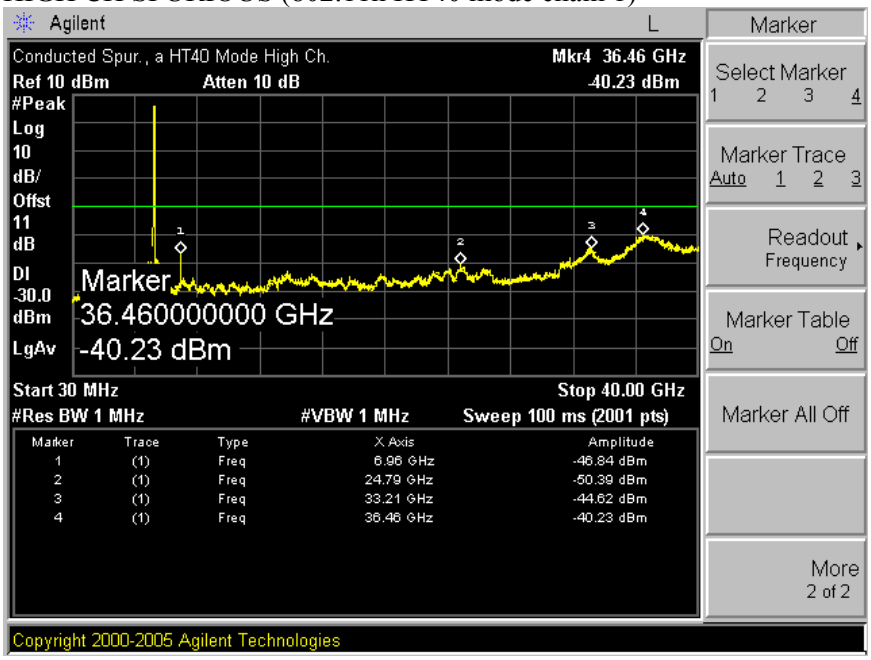
LOW CH SPURIOUS (802.11n HT40 mode chain 1)



MID CH SPURIOUS (802.11n HT40 mode chain 1)

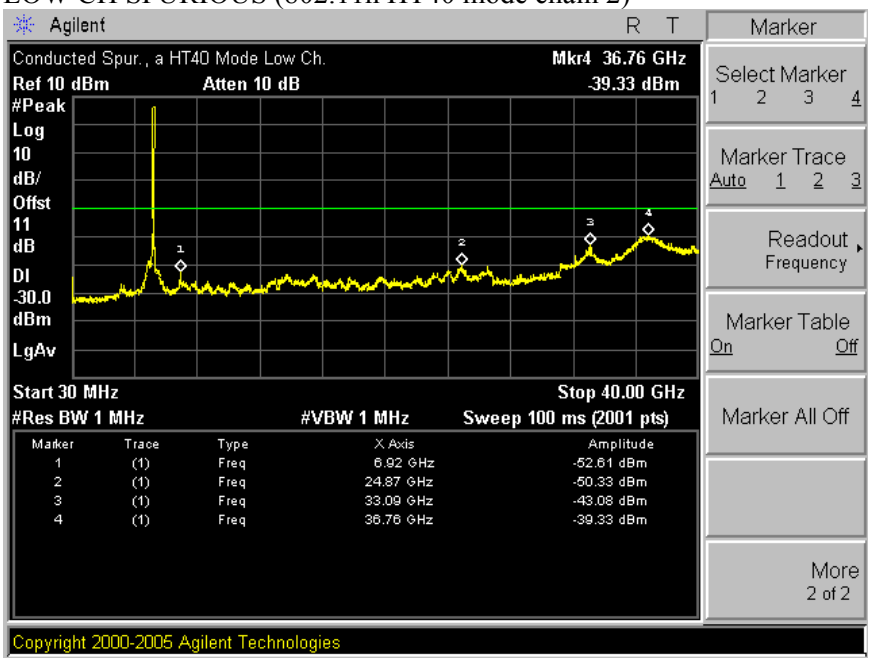


HIGH CH SPURIOUS (802.11n HT40 mode chain 1)

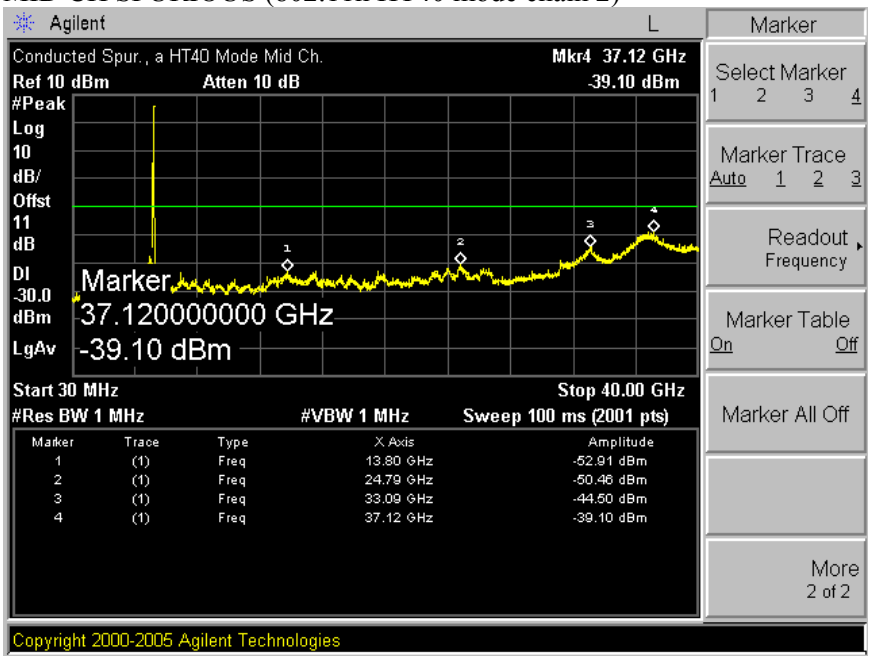


SPURIOUS EMISSIONS (802.11 HT40 MODE CHAIN 2)

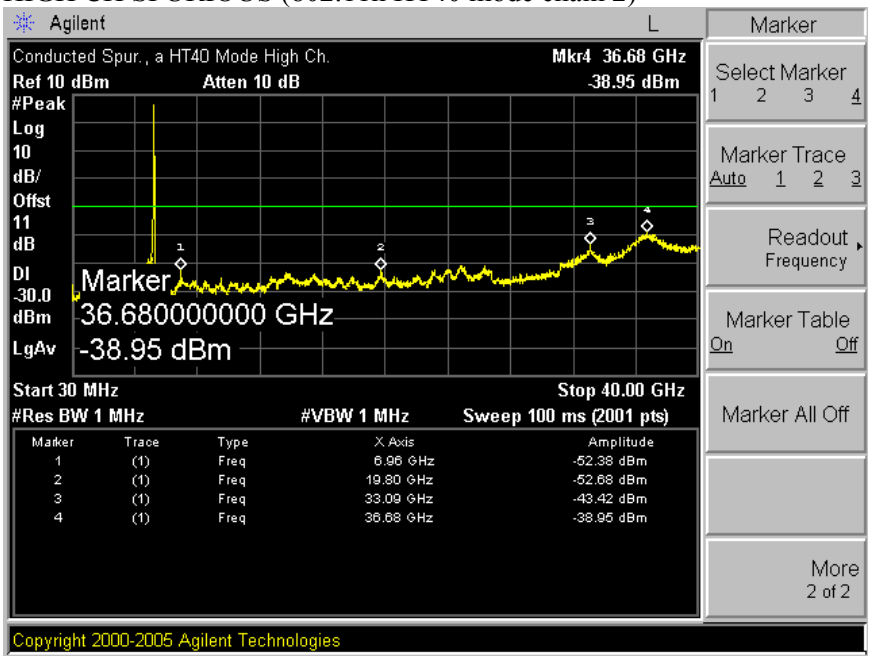
LOW CH SPURIOUS (802.11n HT40 mode chain 2)



MID CH SPURIOUS (802.11n HT40 mode chain 2)

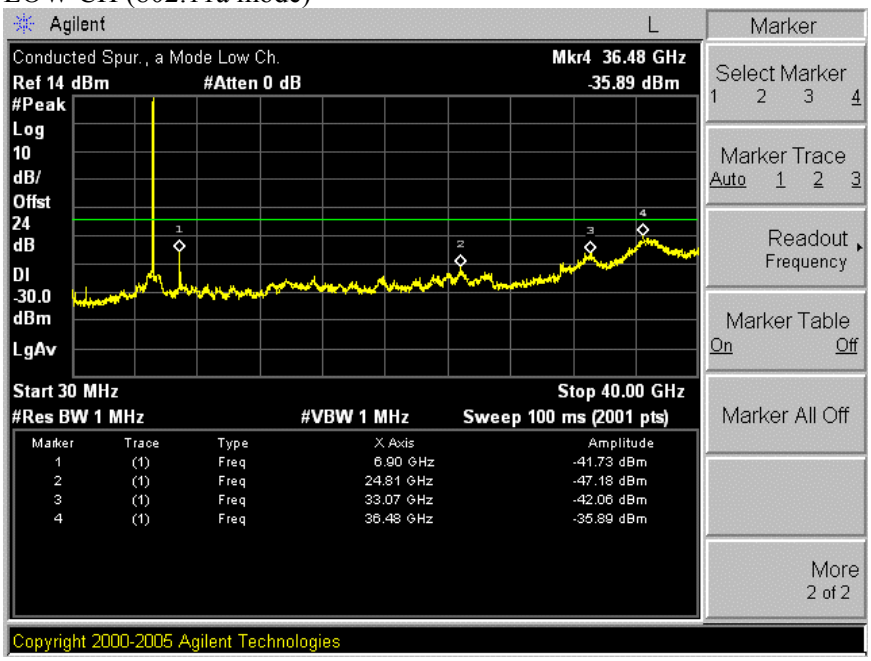


HIGH CH SPURIOUS (802.11n HT40 mode chain 2)

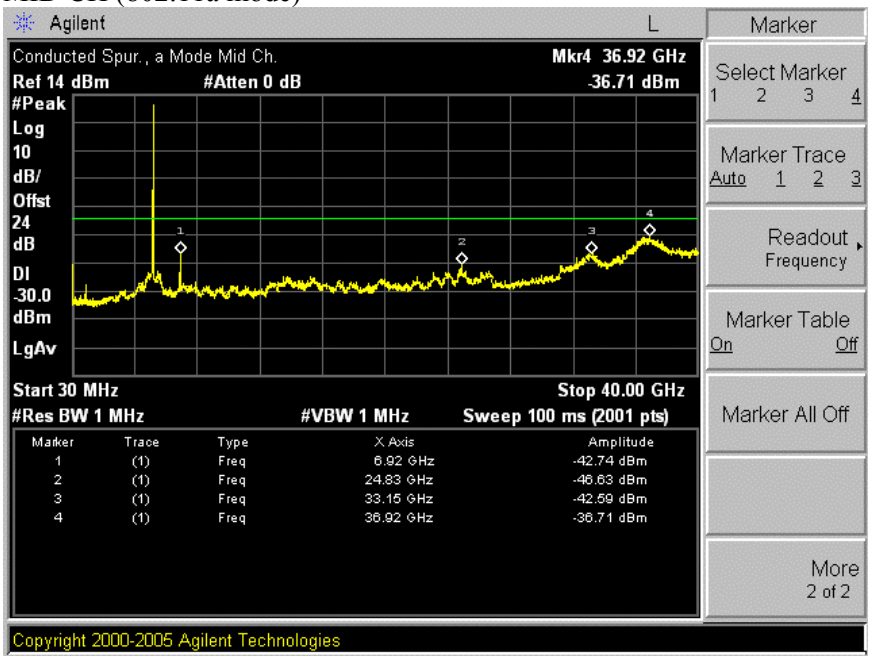


(802.11a MODE)

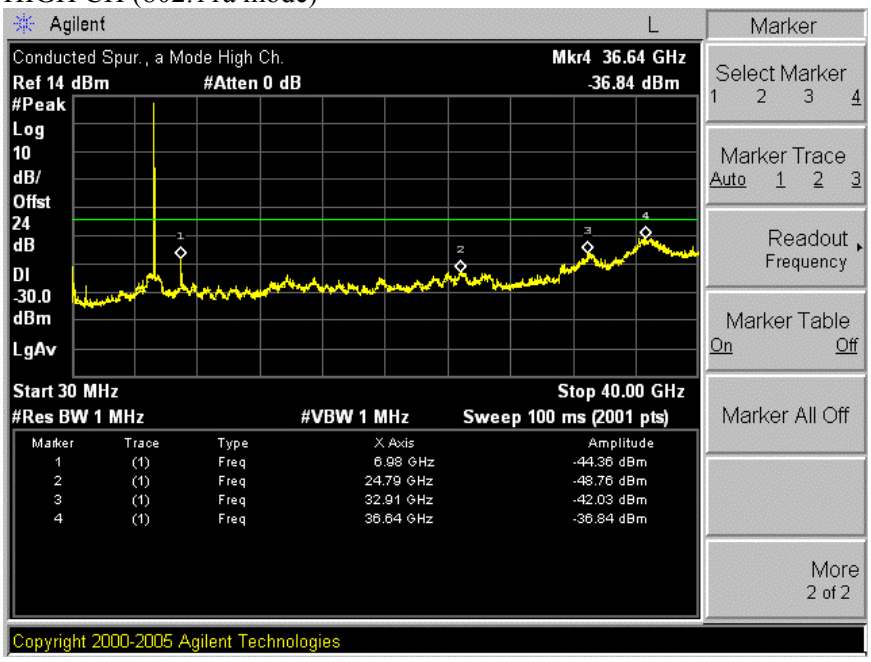
LOW CH (802.11a mode)



MID CH (802.11a mode)

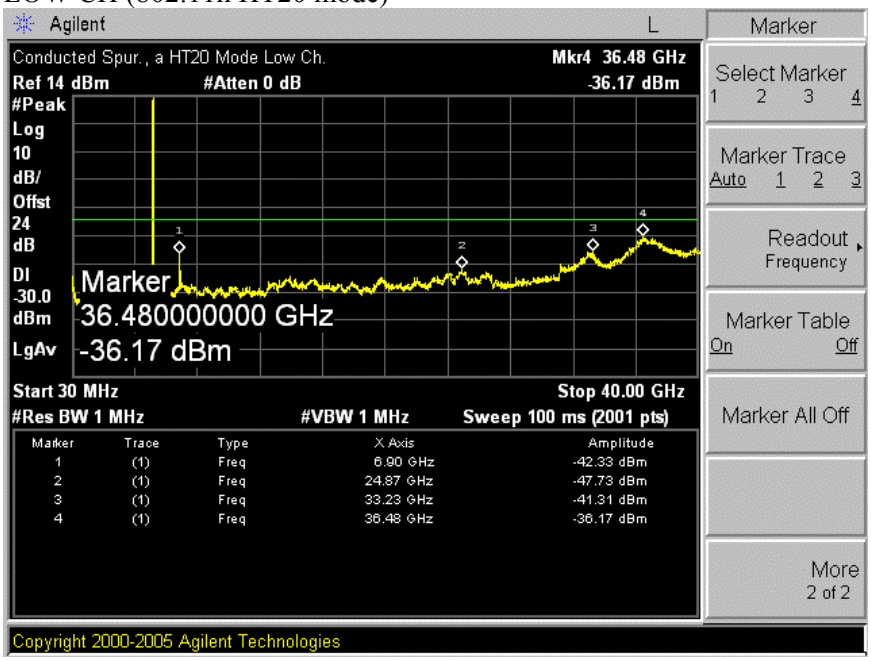


HIGH CH (802.11a mode)

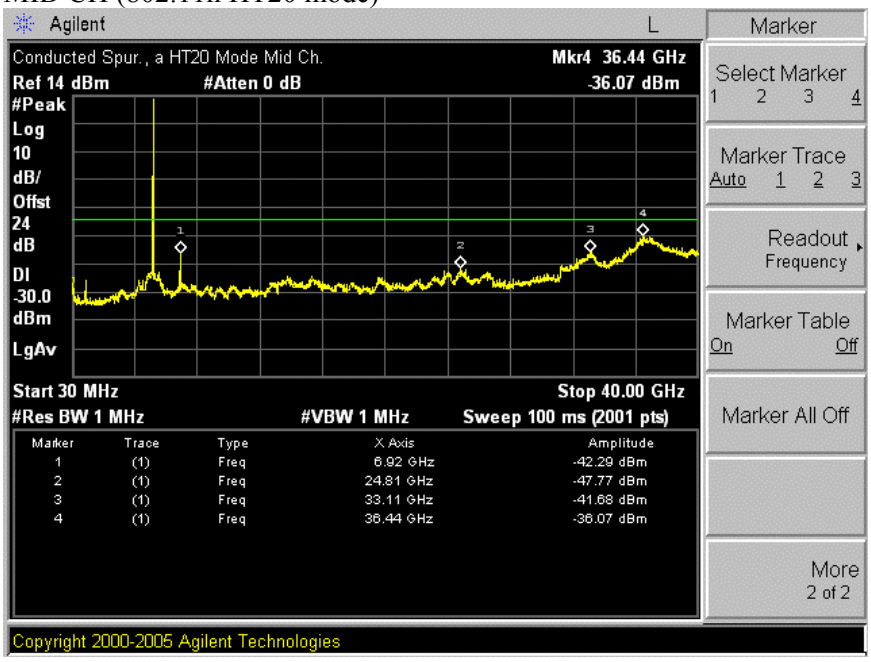


(802.11n HT20 MODE)

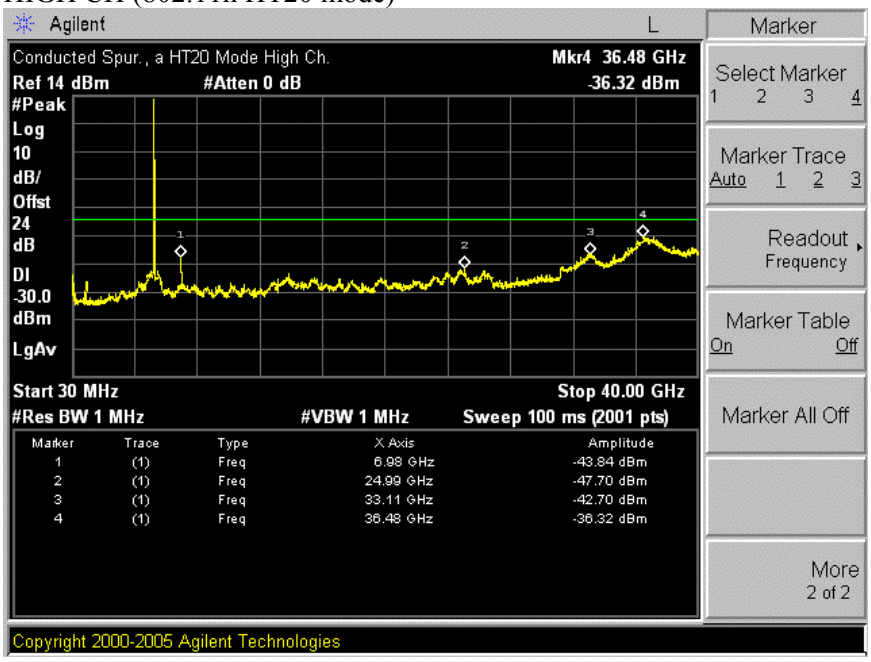
LOW CH (802.11n HT20 mode)



MID CH (802.11n HT20 mode)

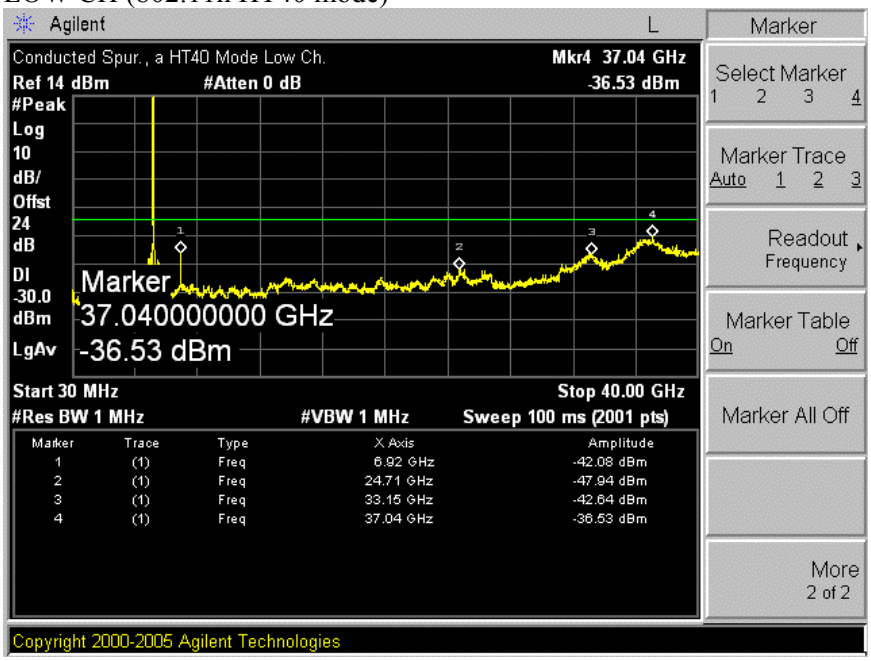


HIGH CH (802.11n HT20 mode)

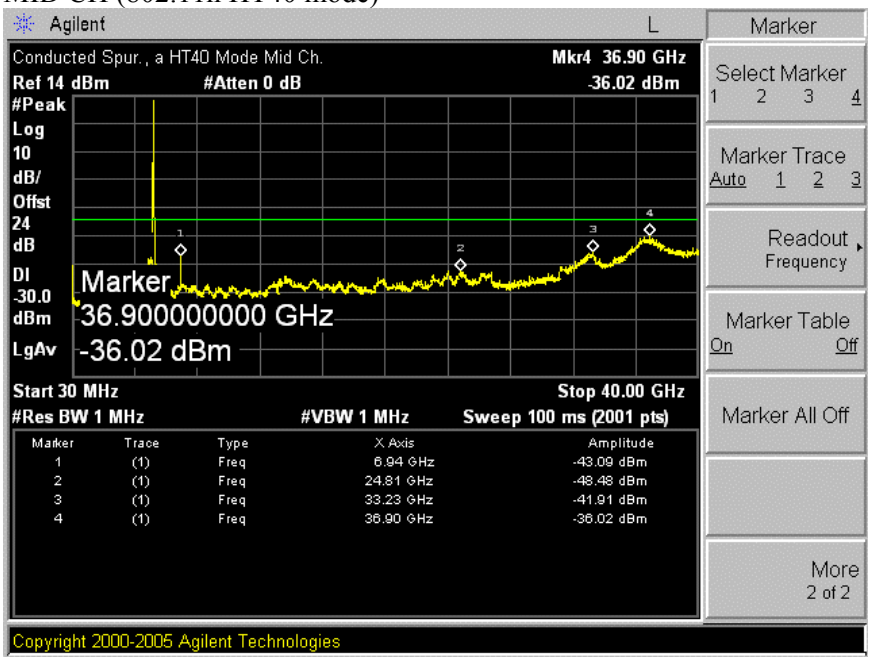


(802.11 HT40 MODE)

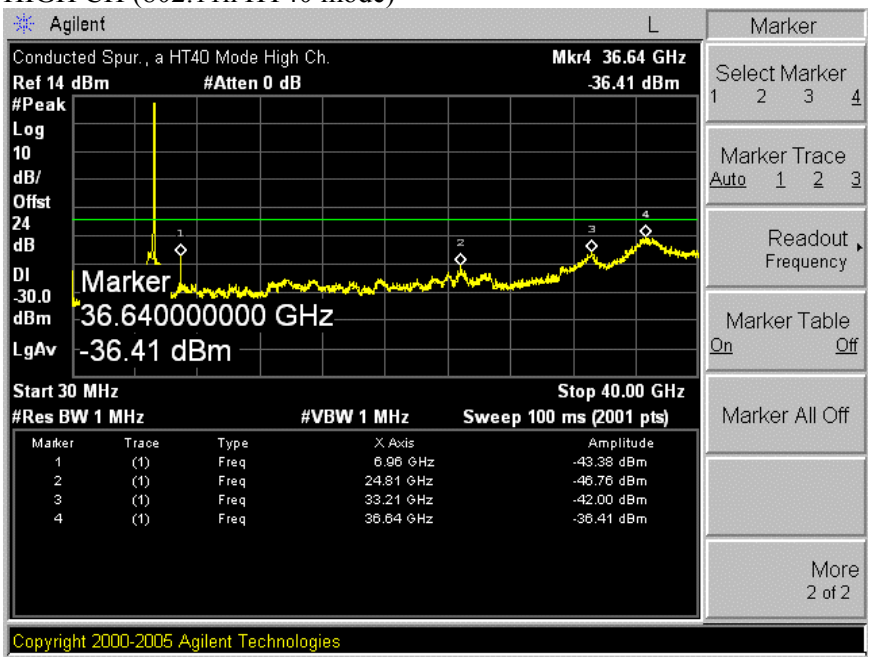
LOW CH (802.11n HT40 mode)



MID CH (802.11n HT40 mode)



HIGH CH (802.11n HT40 mode)



7.1.6. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

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

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	30

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

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density
NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

CALCULATIONS

Given

E = √ (30 * P * G) / d

and

S = E ^ 2 / 3770

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

Combining equations yields:

S = (30 * P * G) / (3770 * (d ^ 2))

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

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

and substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

S = 0.0795 * 10 ^ ((P + G) / 10) / (d^2)

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW/cm^2

LIMITS

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

RESULTS

No non-compliance noted:

Band (MHz)	Power Density Limit (mW/cm^2)	Total Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
5150 to 5250	1.0	16.94	3.00	2.80

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

7.2. RADIATED EMISSIONS

7.2.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

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

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

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

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

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

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

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

TEST PROCEDURE

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

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

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

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

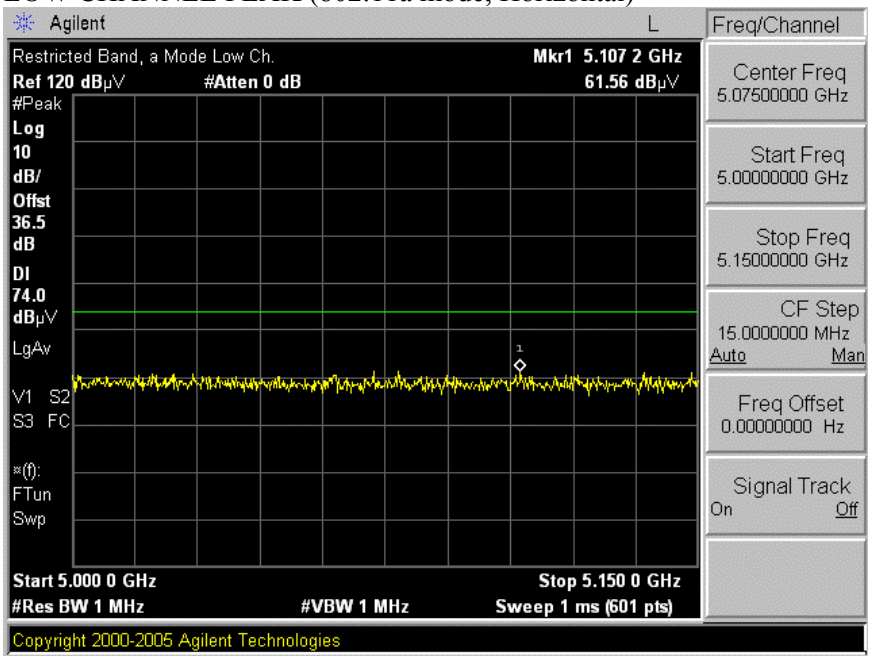
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

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

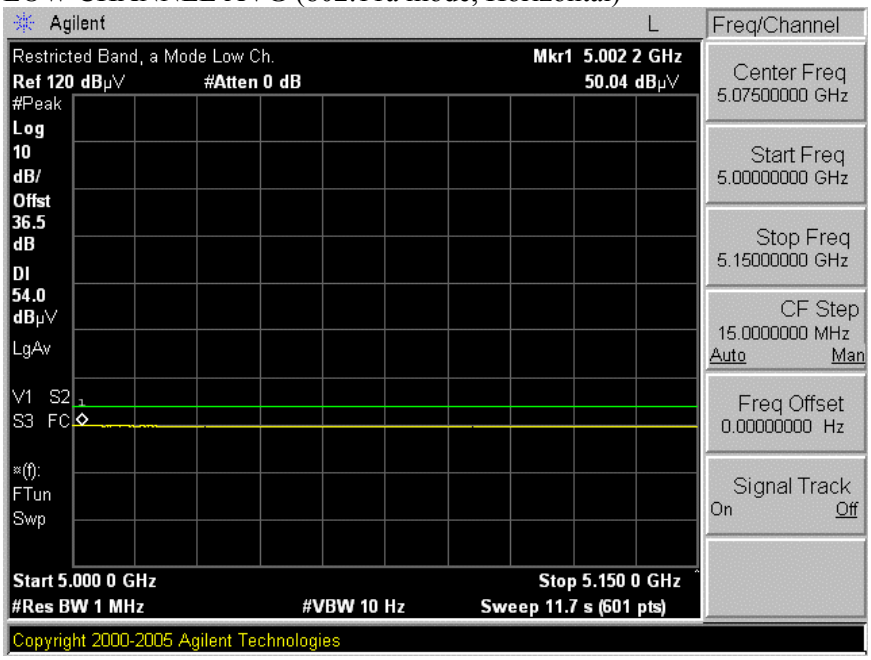
7.2.2. TRANSMITTER ABOVE 1 GHz FOR 5150 TO 5250 MHz BAND

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL)

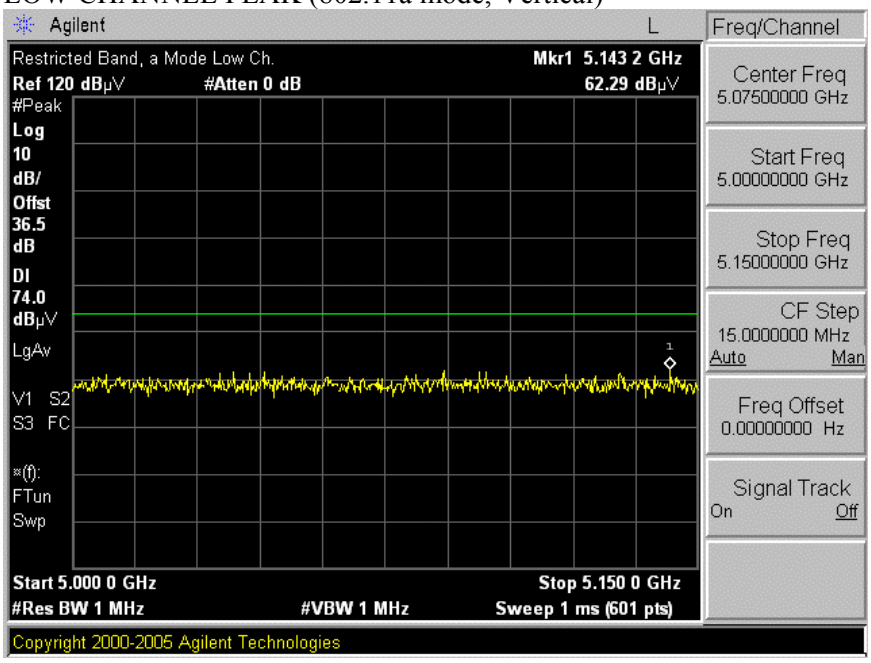
LOW CHANNEL PEAK (802.11a mode, Horizontal)



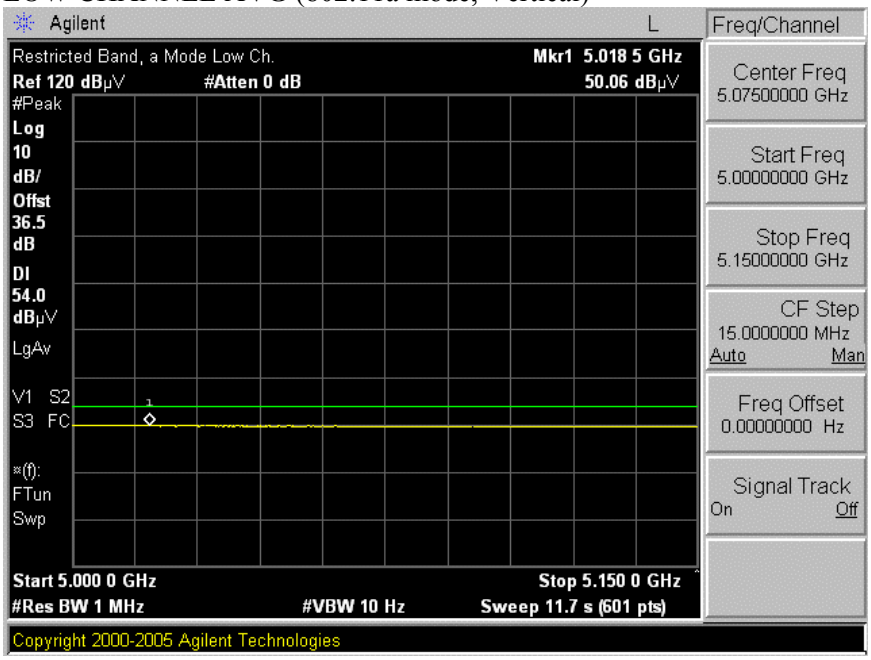
LOW CHANNEL AVG (802.11a mode, Horizontal)



LOW CHANNEL PEAK (802.11a mode, Vertical)

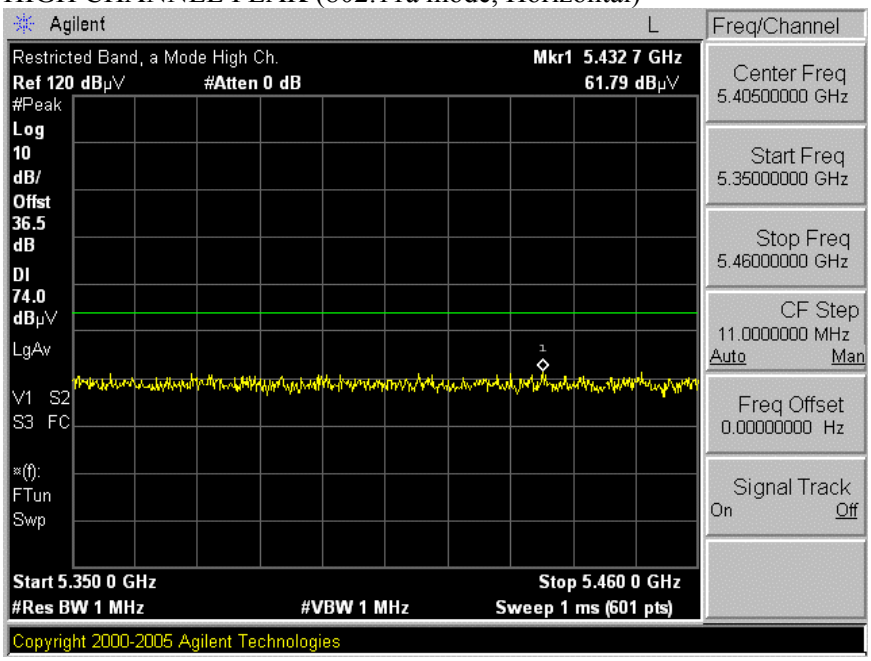


LOW CHANNEL AVG (802.11a mode, Vertical)

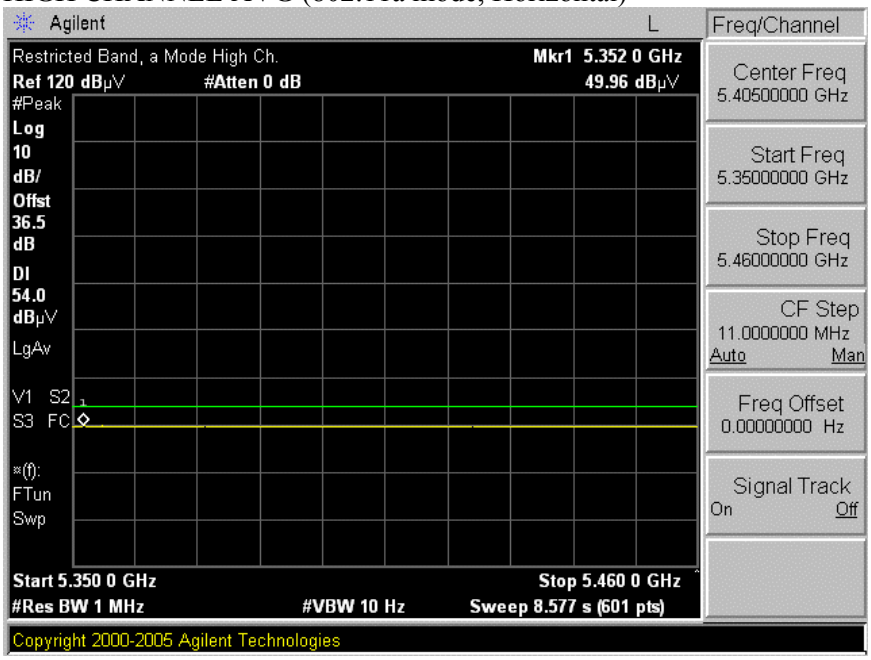


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL)

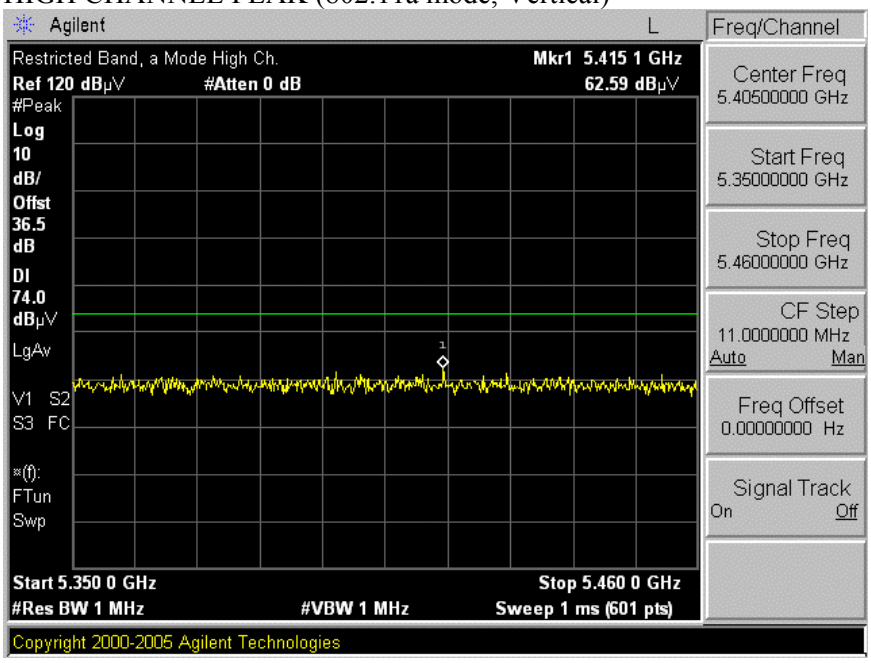
HIGH CHANNEL PEAK (802.11a mode, Horizontal)



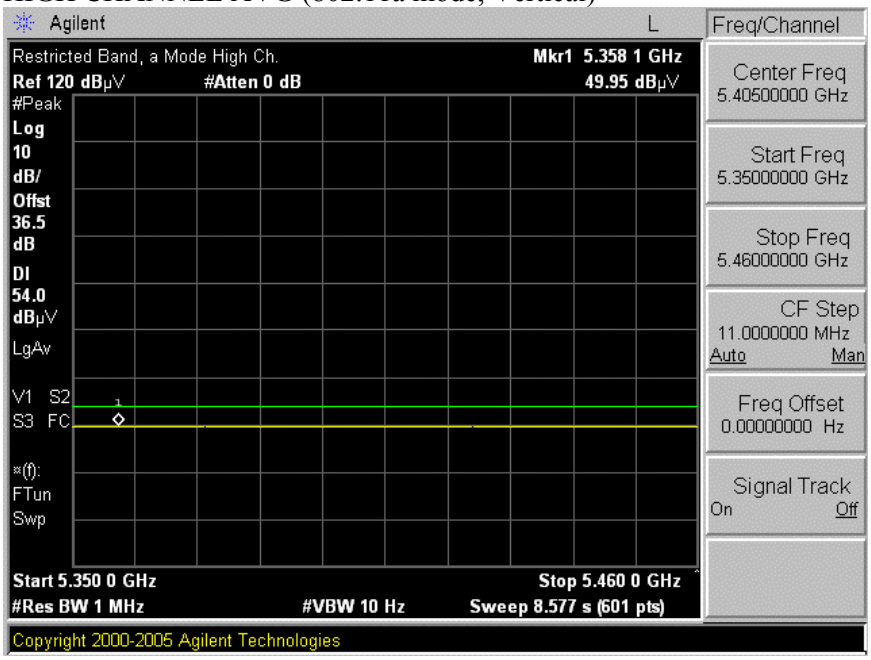
HIGH CHANNEL AVG (802.11a mode, Horizontal)



HIGH CHANNEL PEAK (802.11a mode, Vertical)



HIGH CHANNEL AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

08/07/06 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

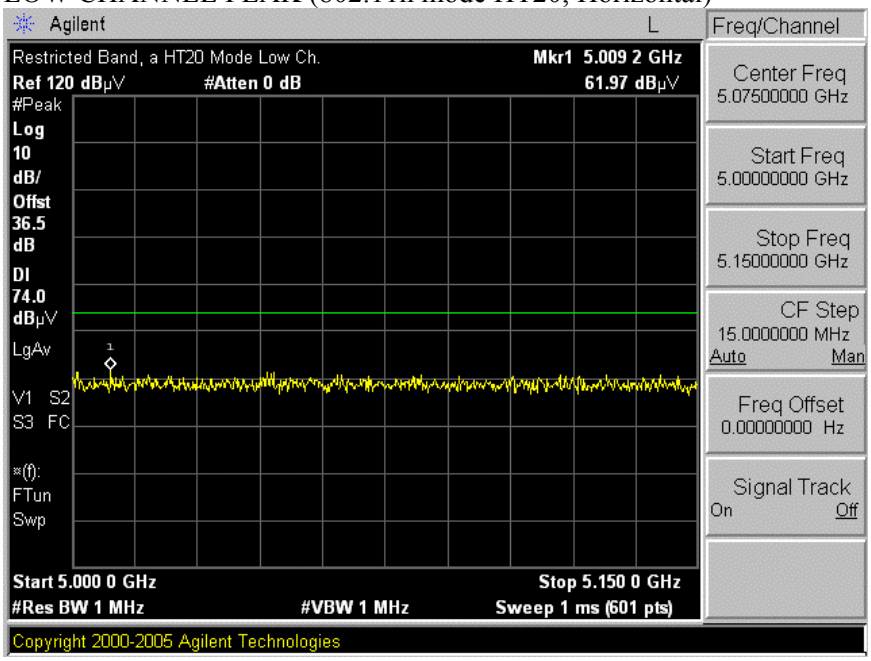
Test Engr:William Zhuang
Project #:06U10333
Company:Apple Computers Inc.
EUT Descrip.:802.11 a/b/g/n Access Point w/1 Antenna Type
EUT M/N:A1143
Test Target:
Mode Oper:Tx On, a Mode 6 Mbps, 5.2GHz

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

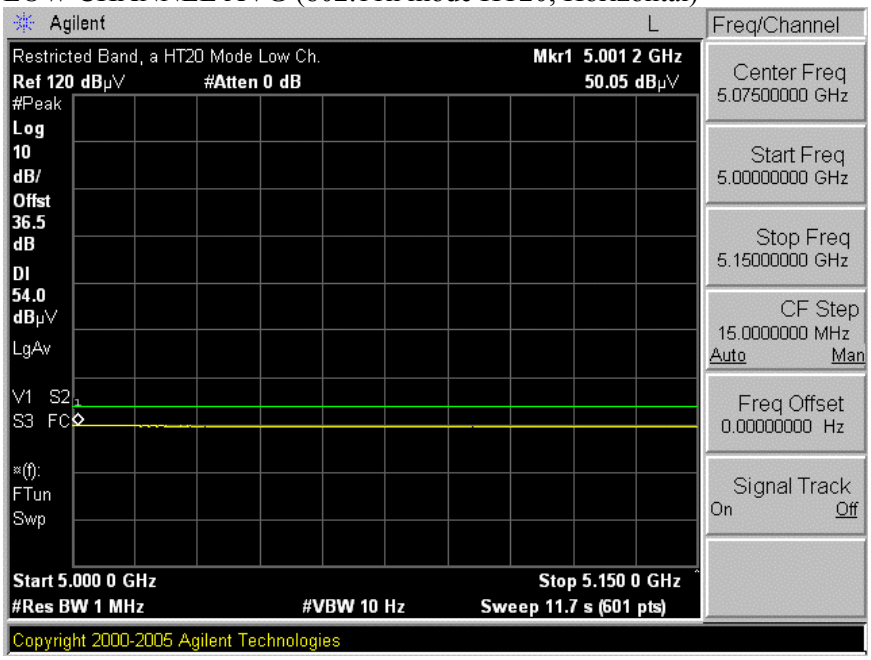
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. 5180MHz, Art: 9.5dBm															
10.360	3.0	47.1	35.6	37.0	5.1	-39.2	0.0	0.8	50.8	39.2	74.0	54.0	-23.2	-14.8	V
10.360	3.0	48.4	35.4	37.0	5.1	-39.2	0.0	0.8	52.0	39.1	74.0	54.0	-22.0	-14.9	H
15.540	3.0	49.4	38.1	38.1	7.6	-41.3	0.0	0.7	54.5	43.2	74.0	54.0	-19.5	-10.8	H
15.540	3.0	50.0	38.1	38.1	7.6	-41.3	0.0	0.7	55.1	43.1	74.0	54.0	-18.9	-10.9	V
Mid Ch. 5200MHz, Art: 9.0dBm															
10.400	3.0	46.5	35.4	37.0	5.1	-39.3	0.0	0.8	50.2	39.0	74.0	54.0	-23.8	-15.0	V
10.400	3.0	47.3	35.4	37.0	5.1	-39.3	0.0	0.8	50.9	39.1	74.0	54.0	-23.1	-14.9	H
15.600	3.0	50.5	38.7	37.9	7.5	-41.2	0.0	0.7	55.4	43.6	74.0	54.0	-18.6	-10.4	H
15.600	3.0	51.0	38.6	37.9	7.5	-41.2	0.0	0.7	55.9	43.6	74.0	54.0	-18.1	-10.4	V
High Ch. 5240MHz, Art: 9.0dBm															
10.480	3.0	47.5	35.4	37.0	5.1	-39.3	0.0	0.8	51.2	39.1	74.0	54.0	-22.8	-14.9	V
10.480	3.0	46.7	35.5	37.0	5.1	-39.3	0.0	0.8	50.3	39.1	74.0	54.0	-23.7	-14.9	H
15.720	3.0	50.2	38.3	37.6	7.5	-41.2	0.0	0.7	54.8	43.0	74.0	54.0	-19.2	-11.0	H
15.720	3.0	50.0	38.3	37.6	7.5	-41.2	0.0	0.7	54.7	42.9	74.0	54.0	-19.3	-11.1	V

RESTRICTED BANDEDGE (802.11n MODE HT20, LOW CHANNEL)

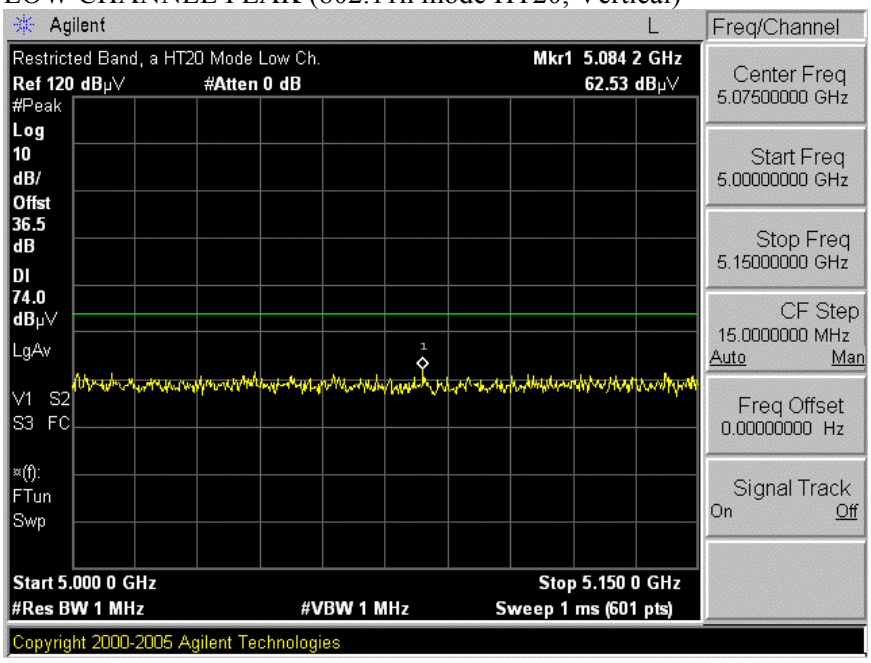
LOW CHANNEL PEAK (802.11n mode HT20, Horizontal)



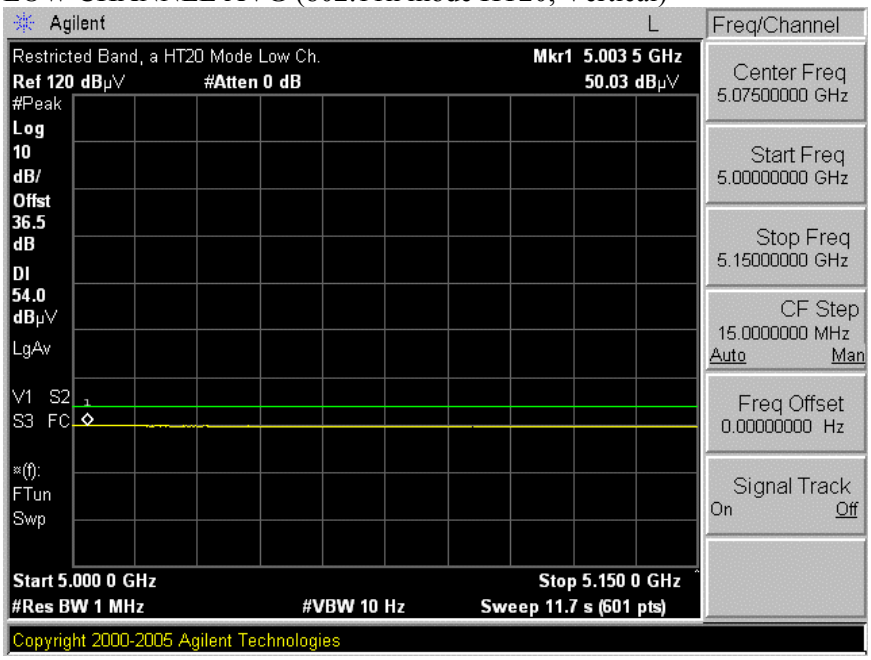
LOW CHANNEL AVG (802.11n mode HT20, Horizontal)



LOW CHANNEL PEAK (802.11n mode HT20, Vertical)

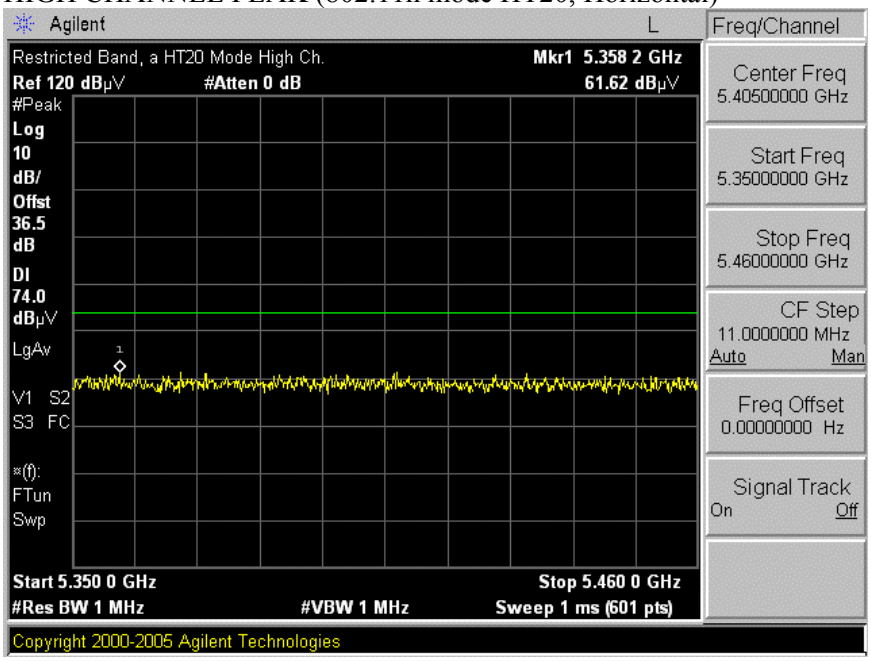


LOW CHANNEL AVG (802.11n mode HT20, Vertical)

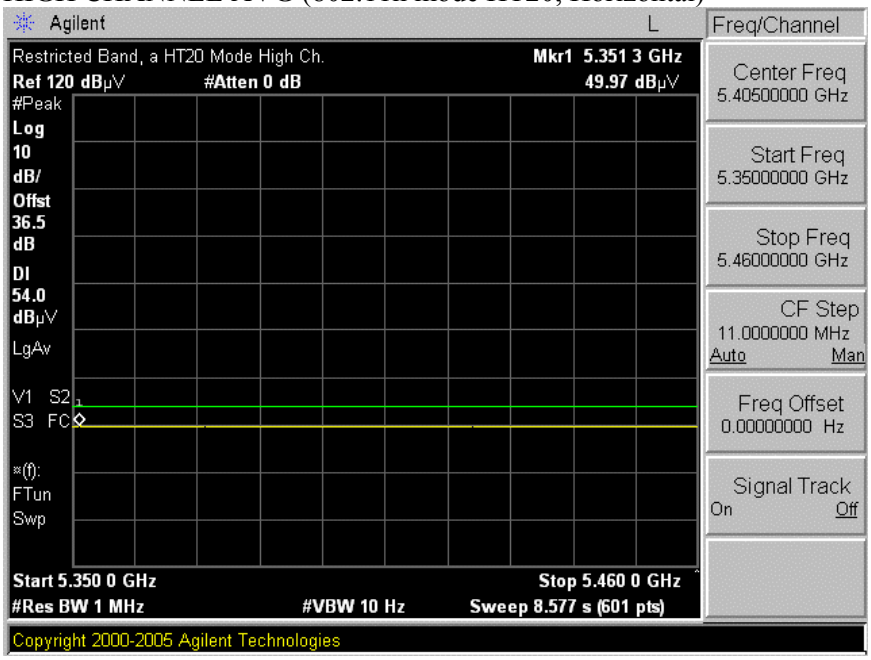


RESTRICTED BANDEDGE (802.11n MODE HT20, HIGH CHANNEL)

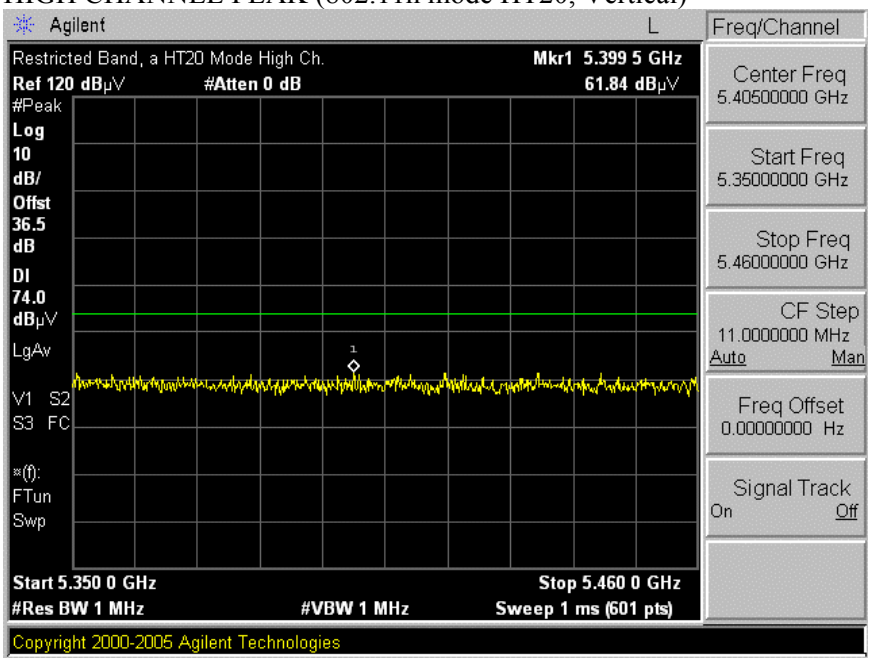
HIGH CHANNEL PEAK (802.11n mode HT20, Horizontal)



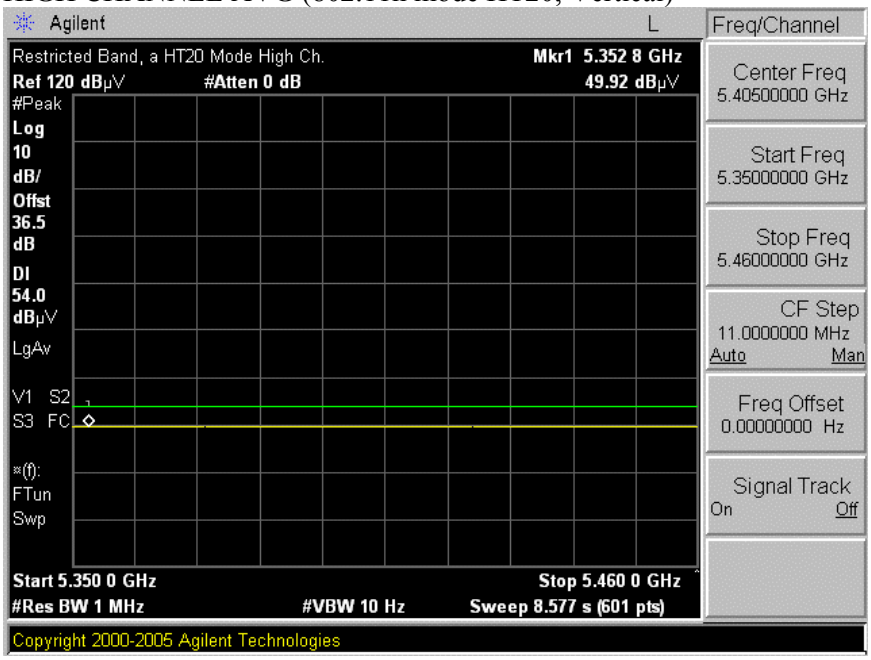
HIGH CHANNEL AVG (802.11n mode HT20, Horizontal)



HIGH CHANNEL PEAK (802.11n mode HT20, Vertical)



HIGH CHANNEL AVG (802.11n mode HT20, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11n MODE HT20)

08/07/06 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

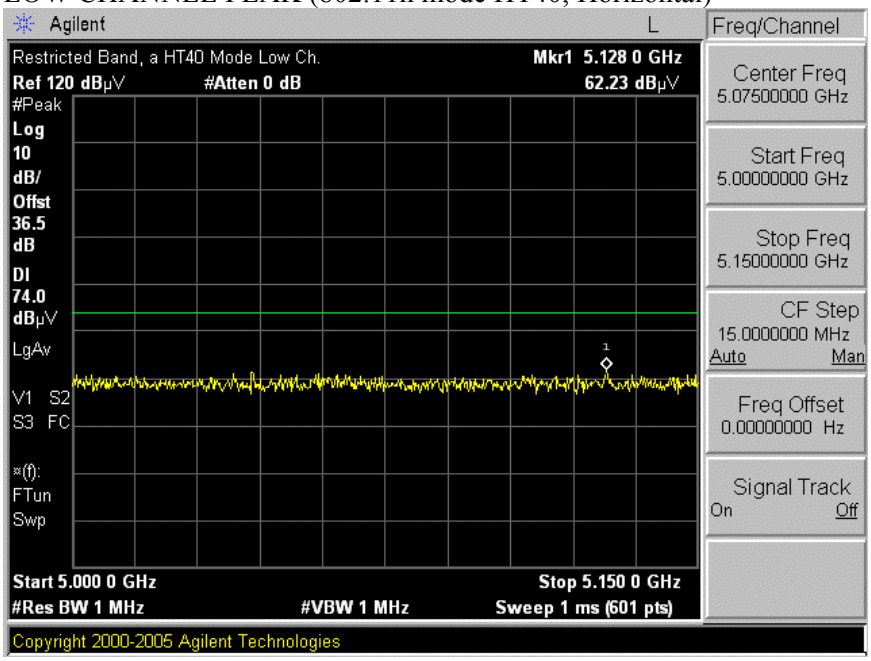
Test Engr:William Zhuang
Project #:06U10333
Company:Apple Computers Inc.
EUT Descrip.:802.11 a/b/g/n Access Point w/1 Antenna Type
EUT M/N:A1143
Test Target:
Mode Oper:Tx On, a HT20 Mode MCS0, 5.2GHz

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

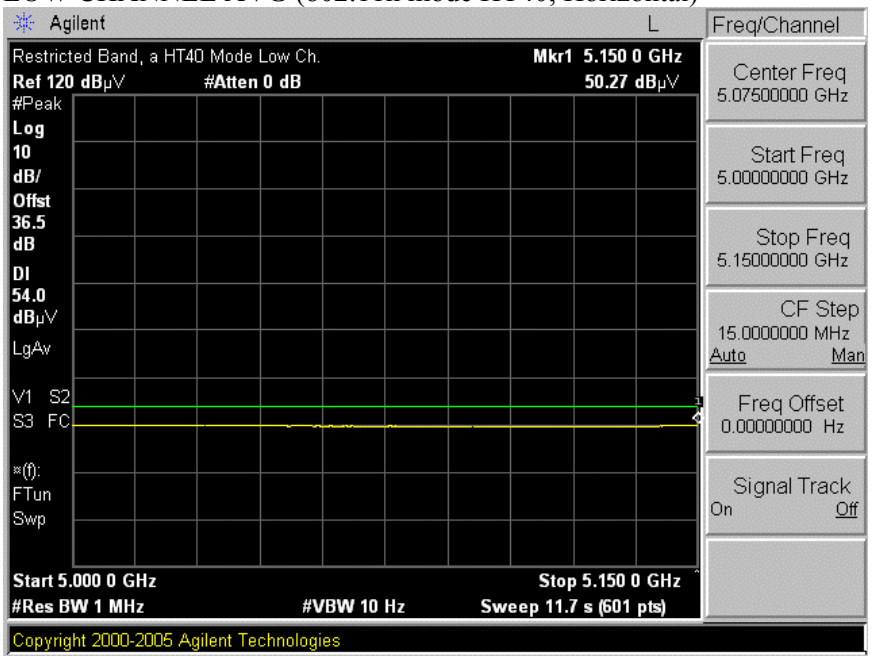
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. 5180MHz, Art: 11dBm															
10.360	3.0	47.2	35.1	37.0	5.1	-39.2	0.0	0.8	50.9	38.8	74.0	54.0	-23.1	-15.2	V
10.360	3.0	46.8	35.1	37.0	5.1	-39.2	0.0	0.8	50.5	38.8	74.0	54.0	-23.5	-15.2	H
15.540	3.0	49.6	38.1	38.1	7.6	-41.3	0.0	0.7	54.7	43.2	74.0	54.0	-19.3	-10.8	H
15.540	3.0	49.2	38.0	38.1	7.6	-41.3	0.0	0.7	54.3	43.1	74.0	54.0	-19.7	-10.9	V
Mid Ch. 5200MHz, Art: 11dBm															
10.400	3.0	45.5	34.7	37.0	5.1	-39.3	0.0	0.8	49.2	38.4	74.0	54.0	-24.8	-15.6	V
10.400	3.0	46.3	34.8	37.0	5.1	-39.3	0.0	0.8	50.0	38.5	74.0	54.0	-24.0	-15.5	H
15.600	3.0	50.2	38.4	37.9	7.5	-41.2	0.0	0.7	55.1	43.4	74.0	54.0	-18.9	-10.6	H
15.600	3.0	50.0	38.3	37.9	7.5	-41.2	0.0	0.7	55.0	43.3	74.0	54.0	-19.0	-10.7	V
High Ch. 5240MHz, Art: 11dBm															
10.480	3.0	46.2	35.3	37.0	5.1	-39.3	0.0	0.8	49.9	39.0	74.0	54.0	-24.1	-15.0	V
10.480	3.0	47.0	35.4	37.0	5.1	-39.3	0.0	0.8	50.6	39.1	74.0	54.0	-23.4	-14.9	H
15.720	3.0	50.4	38.1	37.6	7.5	-41.2	0.0	0.7	55.0	42.8	74.0	54.0	-19.0	-11.2	H
15.720	3.0	50.2	38.1	37.6	7.5	-41.2	0.0	0.7	54.9	42.8	74.0	54.0	-19.1	-11.2	V

RESTRICTED BANDEDGE (802.11n MODE HT40, LOW CHANNEL)

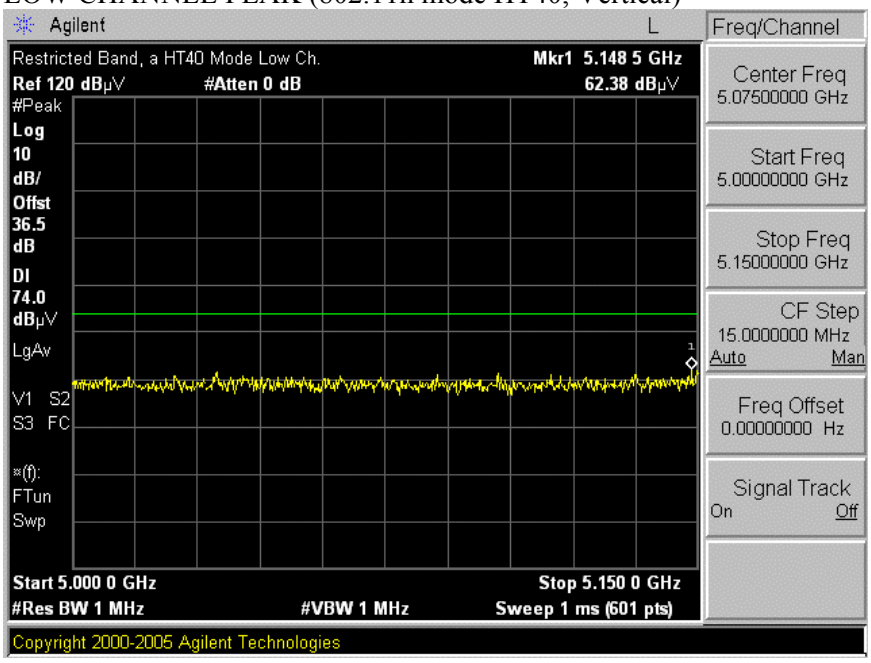
LOW CHANNEL PEAK (802.11n mode HT40, Horizontal)



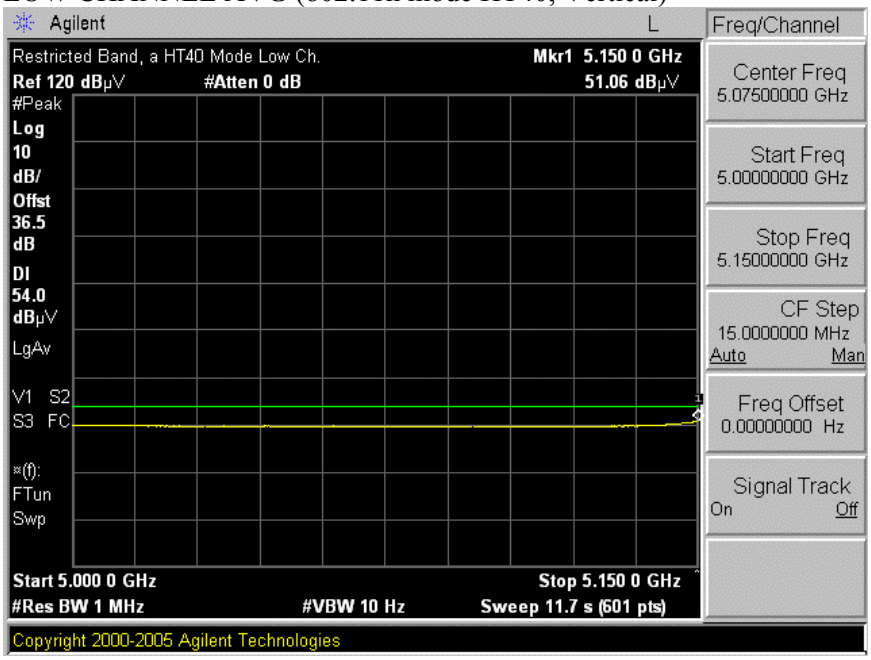
LOW CHANNEL AVG (802.11n mode HT40, Horizontal)



LOW CHANNEL PEAK (802.11n mode HT40, Vertical)

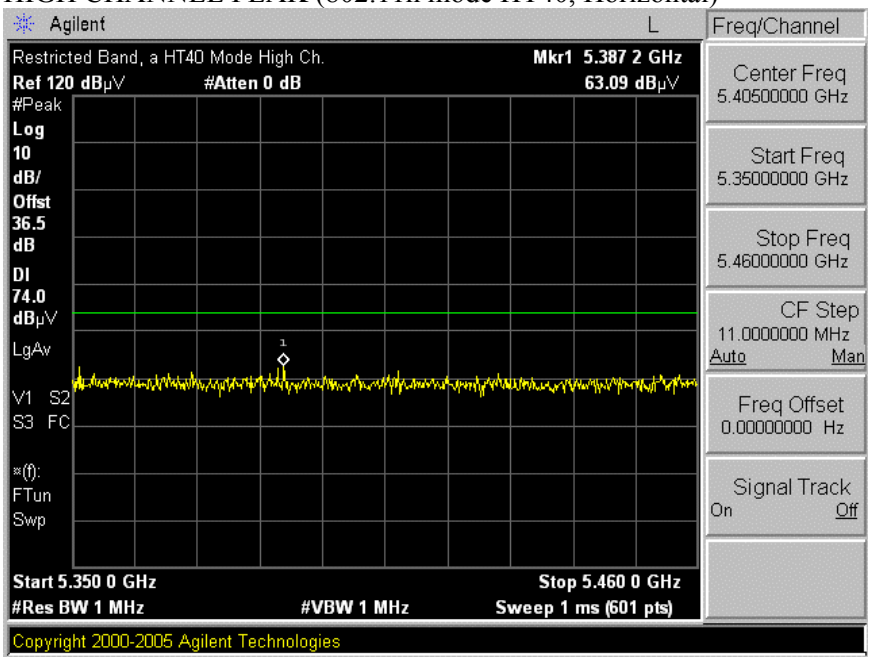


LOW CHANNEL AVG (802.11n mode HT40, Vertical)

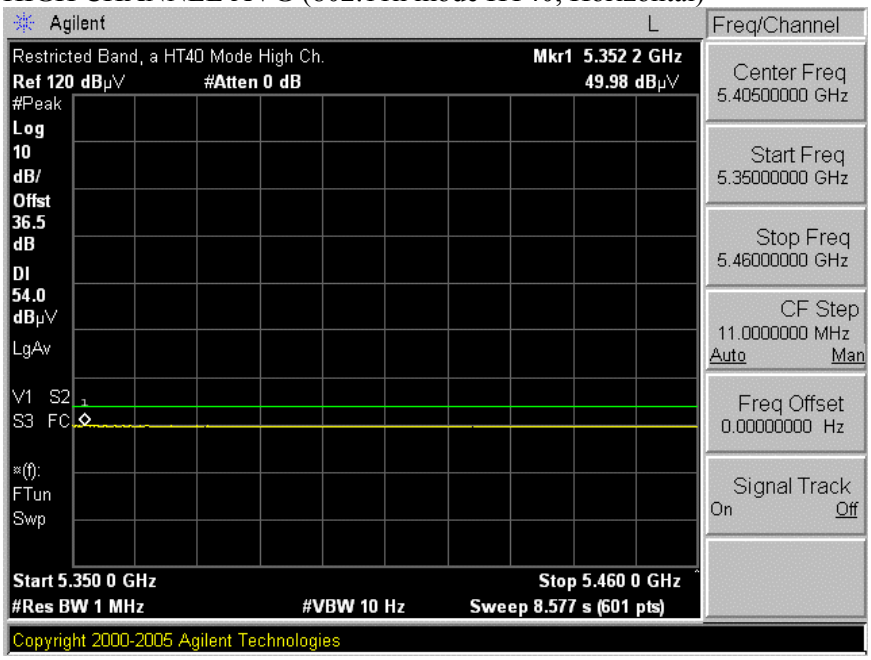


RESTRICTED BANDEDGE (802.11n MODE HT40, HIGH CHANNEL)

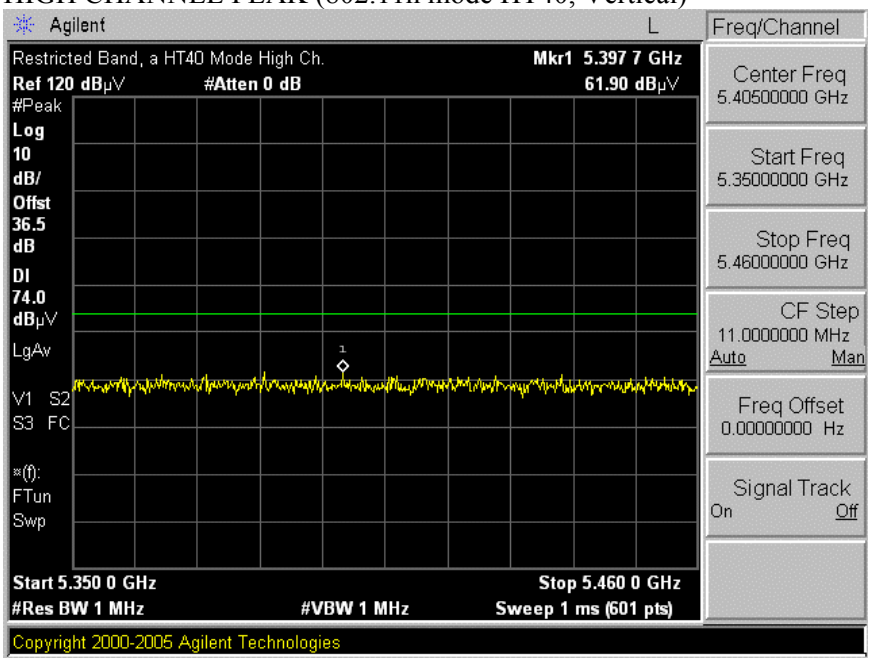
HIGH CHANNEL PEAK (802.11n mode HT40, Horizontal)



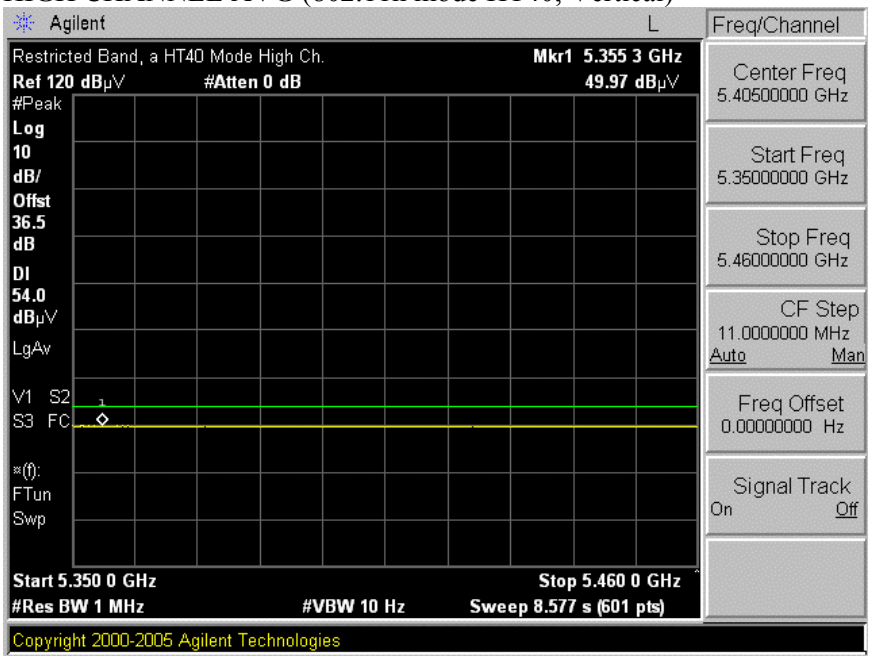
HIGH CHANNEL AVG (802.11n mode HT40, Horizontal)



HIGH CHANNEL PEAK (802.11n mode HT40, Vertical)



HIGH CHANNEL AVG (802.11n mode HT40, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11n MODE HT40)

08/04/06 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr:William Zhuang
Project #:06U10333
Company:Apple Computers Inc.
EUT Descrip.:802.11 a/b/g/n Access Point w/1 Antenna Type
EUT M/N:A1143
Test Target:
Mode Oper:Tx On, a HT40 Mode MCS0, 5.2GHz

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. 5190MHz, Art: 14.5dBm															
10.380	3.0	45.5	34.6	37.0	5.1	-39.3	0.0	0.8	49.1	38.3	74.0	54.0	-24.9	-15.7	V
10.380	3.0	47.5	34.5	37.0	5.1	-39.3	0.0	0.8	51.2	38.2	74.0	54.0	-22.8	-15.8	H
Mid Ch. 5210MHz, Art: 14.5dBm															
10.420	3.0	45.3	34.2	37.0	5.1	-39.3	0.0	0.8	49.0	37.8	74.0	54.0	-25.0	-16.2	V
10.420	3.0	46.1	34.2	37.0	5.1	-39.3	0.0	0.8	49.7	37.8	74.0	54.0	-24.3	-16.2	H
High Ch. 5230MHz, Art: 14.5dBm															
10.460	3.0	46.5	34.2	37.0	5.1	-39.3	0.0	0.8	50.2	37.9	74.0	54.0	-23.8	-16.1	V
10.460	3.0	44.8	34.1	37.0	5.1	-39.3	0.0	0.8	48.4	37.8	74.0	54.0	-25.6	-16.2	H

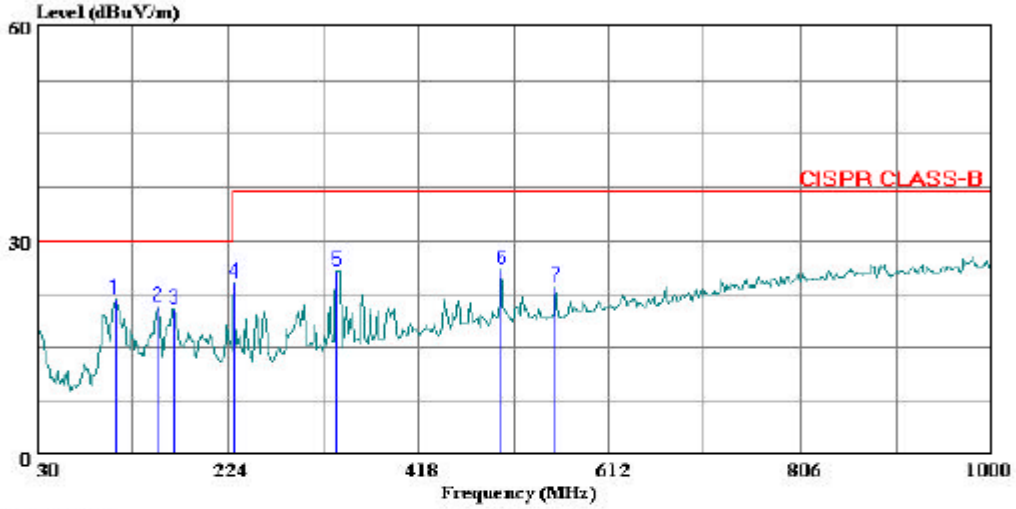
7.2.3. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

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

HORIZONTAL DATA

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 6 File#: apple.EMI Date: 08-01-2006 Time: 14:55:56



(Audix ATC)
Trace: 5 Ref Trace:

Condition: CISPR CLASS-B HORIZONTAL
Test Operator: : Chin Pang
Company: : Apple
Project #: : 06U10333
Configuration: : EUT/Laptop
Mode of Operation: TX

Page: 1

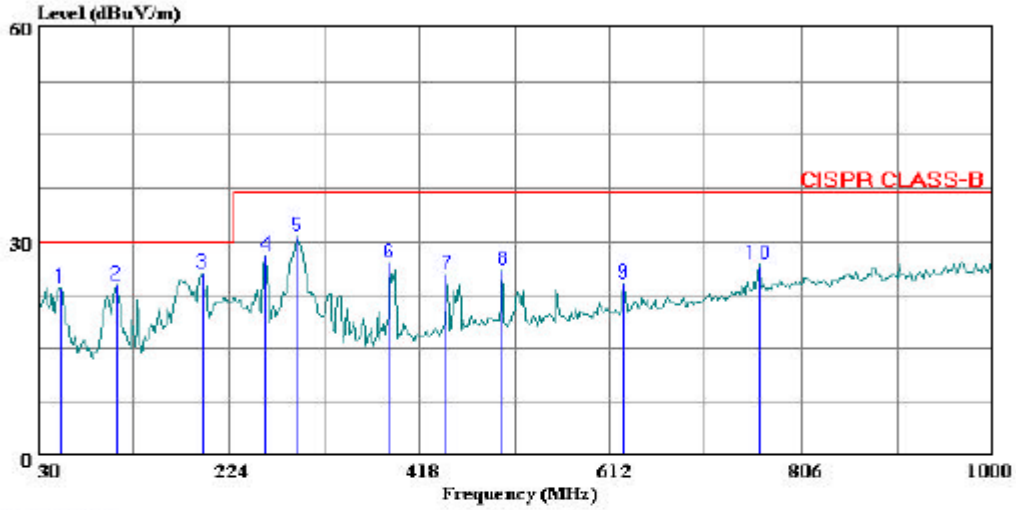
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	109.540	8.33	13.44	21.77	30.00	-8.24	Peak
2	153.190	6.78	14.03	20.81	30.00	-9.19	Peak
3	169.680	6.89	13.40	20.29	30.00	-9.71	Peak
4	230.790	10.97	13.08	24.05	37.00	-12.95	Peak
5	335.550	9.13	16.55	25.68	37.00	-11.32	Peak
6	502.390	5.77	20.24	26.01	37.00	-10.99	Peak
7	557.680	2.58	20.92	23.50	37.00	-13.50	Peak

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

VERTICAL DATA

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 4 File#: apple.EMI Date: 08-01-2006 Time: 14:48:31



(Audix ATC)
Trace: 3 Ref Trace:

Condition: CISPR CLASS-B VERTICAL
Test Operator: : Chin Pang
Company: : Apple
Project #: : 06U10333
Configuration: : EUT/Laptop
Mode of Operation: TX

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	53.280	14.61	8.94	23.55	30.00	-6.45	Peak
2	109.540	10.54	13.44	23.98	30.00	-6.03	Peak
3	196.840	11.55	14.00	25.55	30.00	-4.45	Peak
4	261.830	13.59	14.35	27.94	37.00	-9.06	Peak
5	293.840	15.29	15.42	30.71	37.00	-6.29	Peak
6	387.930	9.18	17.77	26.95	37.00	-10.05	Peak
7	446.130	6.33	19.09	25.42	37.00	-11.58	Peak
8	502.390	5.65	20.24	25.89	37.00	-11.11	Peak
9	625.580	2.09	21.95	24.04	37.00	-12.96	Peak
10	761.380	2.85	24.02	26.87	37.00	-10.13	Peak

7.3. FREQUENCY STABILITY

LIMIT

§15.407 (g) Manufacturers of UNII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation as specified in the user manual.

TEST PROCEDURE

Frequency stability versus environmental temperature
The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed through attenuators. The EUT was placed inside the temperature chamber. After the temperature stabilized for approximately 20 minutes, the frequency of the output signal was recorded from the counter.

Frequency Stability versus Input Voltage
At room temperature (25±5°C), an external variable DC power supply was connected to the EUT. The frequency of the transmitter was measured for 115%, 100% and 85% of the nominal operating input voltage.

RESULTS

Low Channel (5180 MHz)

Reference Frequency at 20 deg C and 115 VAC

Supply Voltage (VAC)	Temperature (deg C)	Frequency (MHz)	Delta (kHz)	Delta (ppm)
115.00	20	5319.9186	Reference	Reference
115.00	-30	5319.9823	-63.700	-11.974
115.00	50	5319.9045	14.100	2.650
97.75	20	5319.9176	1.000	0.188
132.25	20	5319.9183	0.300	0.056

7.4. POWERLINE CONDUCTED EMISSIONS

LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

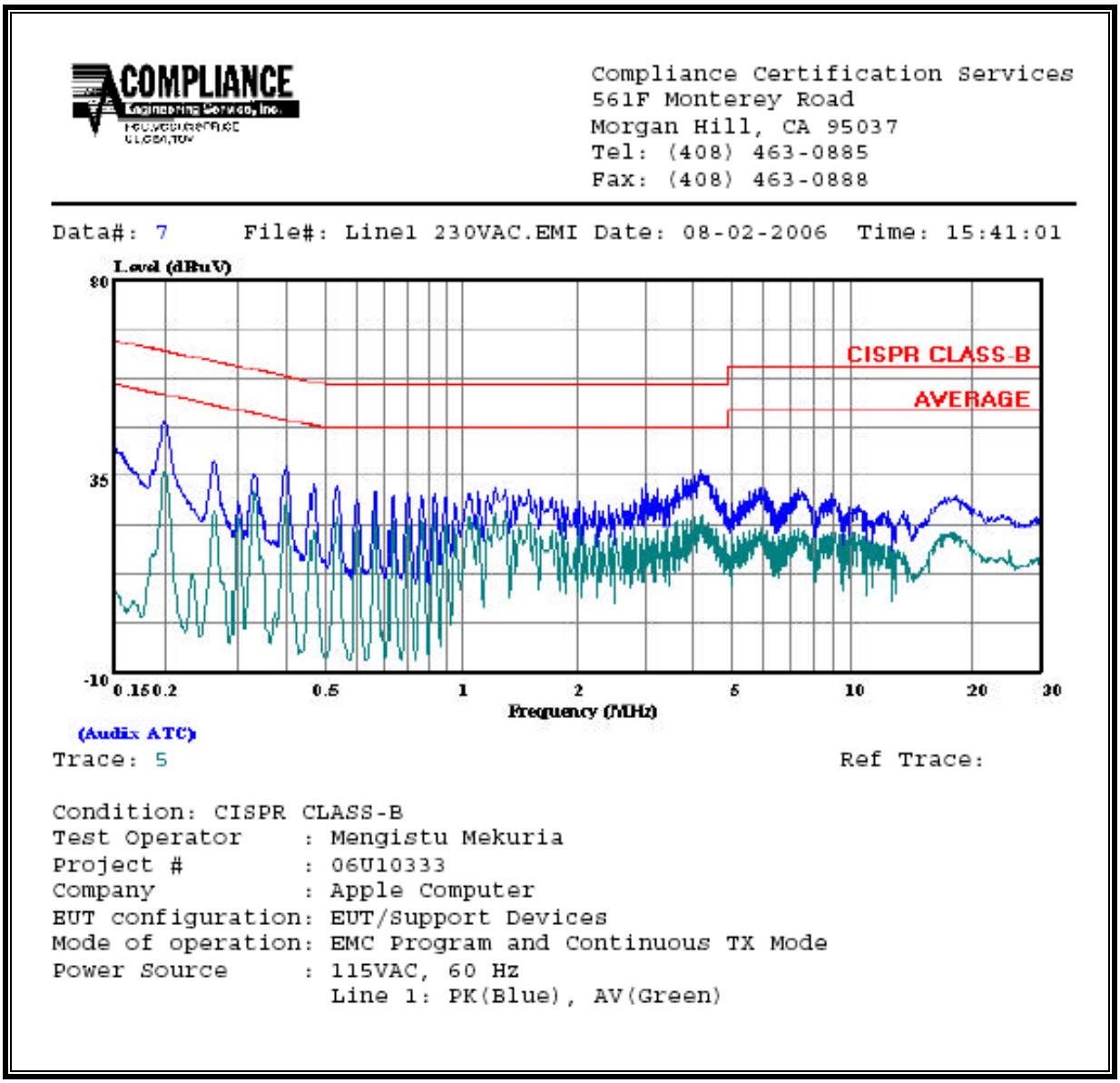
RESULTS

No non-compliance noted:

6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.20	47.50	--	--	0.00	63.69	53.69	-16.19	-6.19	L1
0.40	36.98	--	--	0.00	57.85	47.85	-20.87	-10.87	L1
4.34	35.76	--	--	0.00	56.00	46.00	-20.24	-10.24	L1
0.20	46.80	--	--	0.00	63.69	53.69	-16.89	-6.89	L2
0.40	36.50	--	--	0.00	57.85	47.85	-21.35	-11.35	L2
6.06	33.48	--	--	0.00	60.00	50.00	-26.52	-16.52	L2
6 Worst Data									

LINE 1 RESULTS



LINE 2 RESULTS