



Radio Test Report: EDCS - 1392822

CP-DX80

Desktop TelePresence

5250-5350 MHz

Against the following Specifications:

CFR47 Part 15.407

RSS210

Cisco Systems

EMC Laboratory

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Approved By: See EDCS

Title: See EDCS

This report replaces any previously entered test report under EDCS - 1392822



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SECTION 1: OVERVIEW	3
1.1 TEST SUMMARY	3
SECTION 2: ASSESSMENT INFORMATION	4
2.1 GENERAL	4
2.4 TESTING FACILITIES	5
2.6 EUT DESCRIPTION	6
SECTION 4: SAMPLE DETAILS	8
4.1 SAMPLE DETAILS	8
4.2 SYSTEM DETAILS	8
4.3 MODE OF OPERATION DETAILS	8
SECTION 5: MODIFICATIONS	8
5.1 SAMPLE MODIFICATIONS PERFORMED DURING ASSESSMENT	8
APPENDIX A: EMISSION TEST RESULTS	9
TARGET MAXIMUM CHANNEL POWER	9
THE FOLLOWING TABLE DETAILS THE MAXIMUM SUPPORTED TOTAL CHANNEL POWER FOR ALL OPERATING MODES.	9
99% AND 26dB BANDWIDTH	10
PEAK OUTPUT POWER FOR 802.11N HT20	20
POWER SPECTRAL DENSITY	24
PEAK EXCURSION	32
PEAK EXCURSION FOR 802.11A	32
PEAK EXCURSION FOR 802.11N HT20:	35
PEAK EXCURSION FOR 802.11N HT40:	38
CONDUCTED SPURIOUS EMISSIONS	41
CONDUCTED BAND EDGE	48
APPENDIX B: EMISSION TEST RESULTS	53
RADIATED SPURIOUS EMISSIONS	53
CO-LOCATION RADIATED SPURIOUS EMISSIONS	80
MAXIMUM PERMISSIBLE EXPOSURE (MPE) CALCULATIONS	94
APPENDIX C: TEST EQUIPMENT USED TO PERFORM THE TEST	96

Section 1: Overview

1.1 Test Summary

samples were assessed against the tests detailed in section 3 under the requirements of the following specifications:

Emission	Immunity
CFR47 Part 15.407 RSS210	N/A

The specifications listed above represent actual tests performed to demonstrate compliance against the specifications and basic standards listed on the front cover of this report. This list is not a one to one match to the front cover for one or more of the following reasons.

1. Basic standards call up many different test phenomena specifications such as the 61000-4-X series. The basic standards define which elements and levels shall be applied from these specifications and as such it is not appropriate to list the individual specifications on the front cover.
2. A Standard listed on the front cover may be required in a particular country but is not appropriate for the particular technologies included in the equipment under test. E.g. You cannot test a DC product to the mains Harmonics requirements in EN61000-3-2. See section 3.2.
3. Test results against a particular standard or specification may be included in a different test report. See section 3.2 for an EDCS reference of this data.
4. Where appropriate, Cisco may have substituted a later revision of a basic standard to those referenced in the specification on the front sheet of this test report. This decision was based upon improved test methodology and repeatability and/or where the newer revision represented a more stringent test.
5. Where relevant, testing has been carried out to the requirements of both EN and IEC Specifications. This was possible because of the similarities of the test methods involved and the Cisco EMC test procedures.
6. Testing may have been performed to an equivalent test that satisfies the requirements of the standards and specifications listed on the front cover of the report. See section 3.2.
7. Where radiated emissions testing has been performed to EN55022/CISPR22 the additional requirements of VCCI: V- 3/2006.04, EN55022: 1994 +A1/2 and CAN/CSA- CISPR 22-02 have also been evaluated unless otherwise stated.
8. Testing to the requirements of CFR47 Part 15 was performed against the CISPR22 limits. The results are therefore deemed satisfactory evidence of compliance with Industry Canada Interference Causing Equipment Standard ICES-003.
9. Where assessment has been performed to CISPR24, all the applicable test requirements may have not been covered. Refer to the results section for the tests performed.

Notes:

- 1) Where a specification listed on the front cover of this report has deviations from the basic standards listed above, the additional technical requirements of the specification were also assessed.
- 2) Where appropriate, Cisco may have substituted a later revision of a basic standard to those referenced in the specification on the front sheet of this test report. This decision was based upon improved test methodology and repeatability and/or where the newer revision represented a more stringent test.
- 3) Where relevant, testing has been carried out to the requirements of both EN and IEC Specifications. This was possible because of the similarities of the test methods involved and the Cisco EMC test procedures.



Section 2: Assessment Information

2.1 General

This report contains an assessment of an apparatus against Electromagnetic Compatibility Standards based upon tests carried out on the samples submitted. The testing was performed by and for the use of Cisco systems Inc:

With regard to this assessment, the following points should be noted:

- a) The results contained in this report relate only to the items tested and were obtained in the period between the date of the initial assessment and the date of issue of the report. Manufactured products will not necessarily give identical results due to production and measurement tolerances.
- b) The apparatus was set up and exercised using the configuration and modes of operation defined in this report only.
- c) Where relevant, the apparatus was only assessed using the susceptibility criteria defined in this report and the Test Assessment Plan (TAP).
- d) All testing was performed under the following environmental conditions:
 - Temperature 15°C to 35°C (54°F to 95°F)
 - Atmospheric Pressure 860mbar to 1060mbar (25.4" to 31.3")
 - Humidity 10% to 75*%

*[Where applicable] For ESD testing the humidity limits used were 30% to 60% and for EFT/B tests the humidity limits used were 25% to 75%.
- e) All AC testing was performed at one or more of the following supply voltages:
 - 110V 60 Hz (+/-20%)
 - 220V 50 Hz (+/-20%)

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2.2 Date of testing

6-February-2014

2.3 Report Issue Date

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2.4 Testing facilities

This assessment was performed by:

Testing Laboratory

Cisco Systems, Inc.,
170 West Tasman Drive
San Jose, CA 95134,
USA

Registration Numbers for Industry Canada

Cisco System Site	Site Identifier
Building P, 5m Chamber	Company #: 2461N-1

Test Engineers

Johanna Knudsen, Jose Aguirre

2.5 Equipment Assessed (EUT)

CP-DX80



2.6 EUT Description

The CP-DX80 is a 23 inch HD1080p video capable personal desktop collaboration endpoint that extends the DX series portfolio utilizing Android OS 4.1.1 (EX-60 replacement).

23 inch touch LDF

16 GB eMMC Flash memory (only 8 GB available) & 2 GB RAM

2 Gigabit Ethernet ports (1 for Network Uplink & 1 for Laptop connection)

3 standard A USB ports (2 in the back and 1 on the right side)

1 standard B USB port (with ADB support)

1 micro B USB port

1 HDMI for video out (to external monitor) with a maximum resolution of 1920 x 1200

1 HDMI for video in (from laptop)

1 micro SD card slot

1 Kensington Lock

Wi-Fi (802.11 a/b/g/n) & Bluetooth 3.0

Marvell 88W8787 - Wi-Fi + Bluetooth chip

Murata module LBEH1ZNRZC-TEMP, supports 802.11/a/b/g/n + Bluetooth 3.0 chip

SDIO interface to WLAN – Omap4 SD host controller port 5

PCM (McBSP1) interface to Bluetooth

Single OMAP4470 Architecture, with dual Cortex A9 running at 1.5GHz

Single antenna for 2.4 GHz and 5 GHz bands with diplex inside the module (SISO)

Amphenol SAA CI4671-15-000-R

4.61 dBi peak gain for 2.4 Ghz

7.05 dBi peak gain for 5 GHz

Coexistence between Wi-Fi and Bluetooth (1 antenna utilized)

Supports frequencies/channels 2.412 – 2.472 GHz & 5.180 – 5.825 GHz

Up to 72 Mbps (20 MHz channel), Up to 150 Mbps (40 MHz channel width)

Non- HT20 - 1 to 54 Mbps

HT20 - M0 to M7 (7 to 72 Mbps)

HT40 - M0 to M7 (15 to 150 Mbps)

802.11i security standard (WPA/WPA2)

Section 3: Result Summary

Conducted emissions

Basic Standard	Result
99% and 26dB Bandwidth	Pass
Peak Output Power	Pass
Power Spectral Density	Pass
Peak Excursion	Pass
Conducted Spurious Emissions	Pass
Restricted Band Edge Measurements	Pass

Radiated emissions

Basic Standard	Result
Radiated Spurious and Harmonic Emissions	Pass
Co-Locator Radiated Spurious Emissions	Pass

Section 4: Sample Details

Note: Each sample was evaluated to ensure that its condition was suitable to be used as a test sample prior to the commencement of testing.

4.1 Sample Details

Sample Number	Equipment Details	Serial Number	Part Number
S01	CP-DX80	FOC1801N7WM	CSO 68-00355-01 04 (P2)
S02	CP-DX80	FOC1809N3R2	CSO 68-00355-01 04 (P3A)

The following antennas were evaluated as part of this testing process. The antennas listed reflect the maximum gain allowed for each family type of antenna:

Fixed internal Amphenol Dual Band Antenna at 5GHz, Gain: 7.05 peak (no external antenna can be used)

5150 – 5250MHz: 3.4 dBi
5250 – 5350MHz: 4 dBi
5500 – 5700MHz: 6.1 dBi
5745 – 5850MHz: 7.05 dBi

4.2 System Details

System #	Description	Samples
1	Radio Test Sample - Manufacturing Image	S01
2	Radio Test Sample – Production Image	S02

4.3 Mode of Operation Details

Mode#	Description	Comments
1	802.11 Test Mode	System is placed in a continuous Tx State at various channels per Test Requirements. 802.11a running at 6Mbps, HT20 running at M0 and HT40 running M0. Manufacturing image used.
2	802.11 Test Mode + Bluetooth for co-location	System is placed in a continuous Tx State at various channels per Test Requirements. 802.11a running at 6Mbps, HT20 running at M0 and HT40 running M0. Production image used.

Section 5: Modifications

5.1 Sample Modifications Performed During Assessment

No modifications were performed during assessment.

Appendix A: Emission Test Results

Target Maximum Channel Power

The following table details the maximum supported Total Channel Power for all operating modes.

	Maximum Channel Power (dBm)			
Operating Mode	Frequency (MHz)			
	5260	5280	5300	5320
802.11a, 6 to 54 Mbps	16	16	16	16
802.11n HT20, M0 to M7	15	15	15	15
	5270	5310		
802.11n HT40, M0 to M7	15	15		

99% and 26dB Bandwidth

Connect the antenna port(s) to the spectrum analyzer input. Using the spectrum analyzer Channel Bandwidth mode, configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).

Center Frequency: Frequency from table below
Span: 2 x Nominal Bandwidth (e.g. 40MHz for a 20MHz channel)
Reference Level: 20 dBm
Attenuation: 10 dB
Sweep Time: 5 s
Resolution Bandwidth: 1%-3% of 26 dB Bandwidth
Video Bandwidth: ≥Resolution Bandwidth
X dB Bandwidth: 26 dB
Detector: Peak
Trace: Single

Place the radio in continuous transmit mode. View the transmitter waveform on the spectrum analyzer, and record the pertinent measurements:

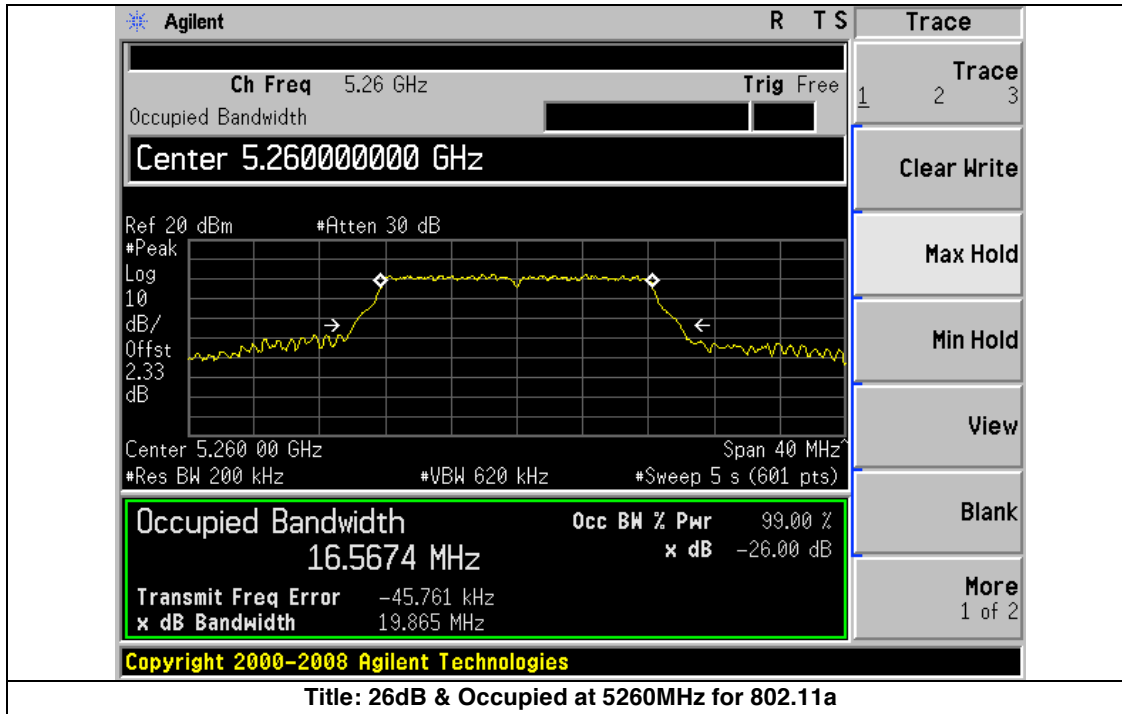
99% and 26dB Bandwidth for 802.11a

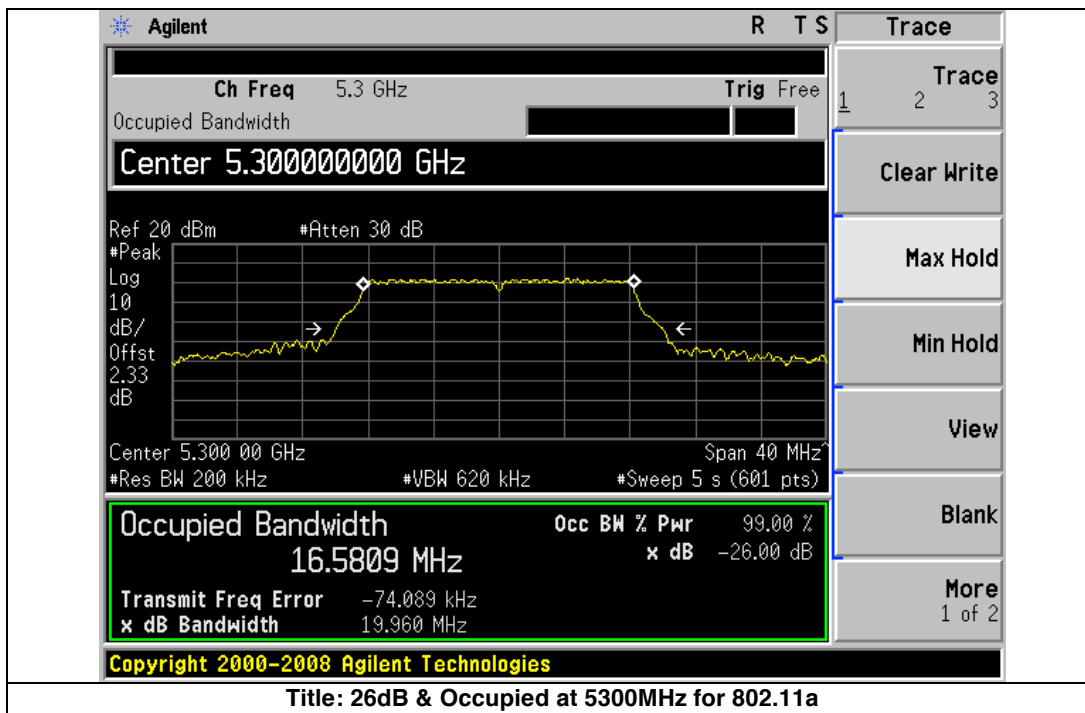
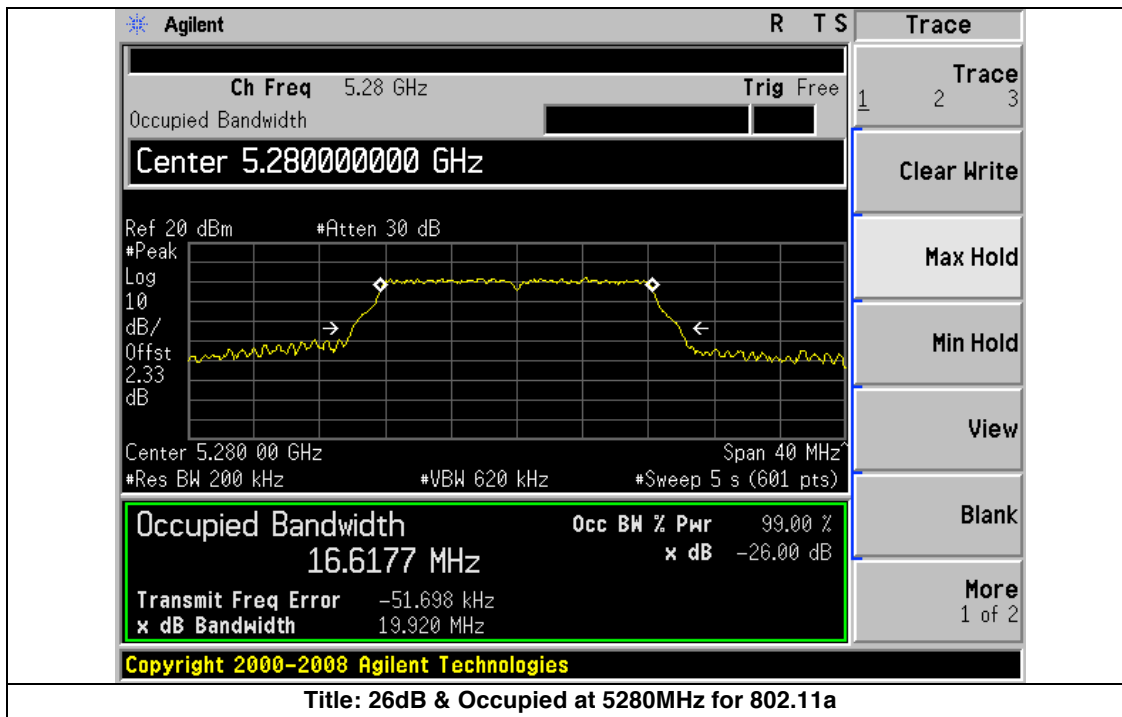
Frequency (MHz)	Data Rate (Mbps)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)
5260	6	16.567	19.865
5280	6	16.618	19.920
5300	6	16.581	19.960
5320	6	16.611	19.906

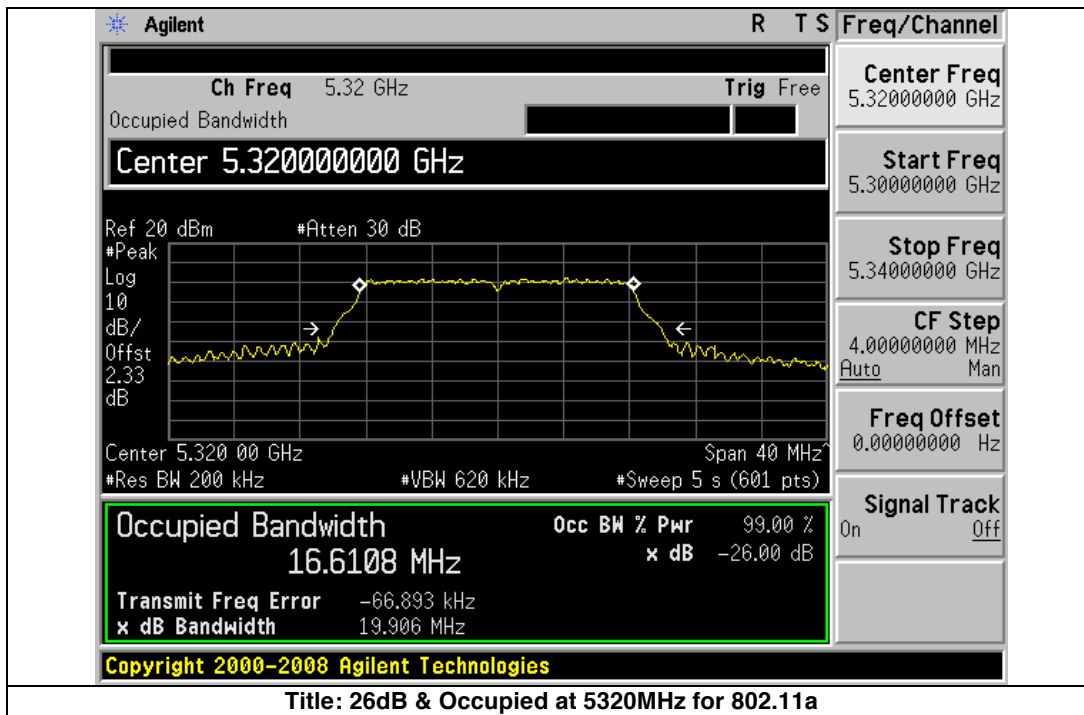
99% and 26dB Bandwidth for 802.11an (HT20)

Frequency (MHz)	Data Rate (Mbps)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)
5240	M0	17.7004	20.209
5260	M0	17.7275	20.236
5280	M0	17.7287	20.281
5300	M0	17.7268	20.249
5320	M0	17.7387	20.263

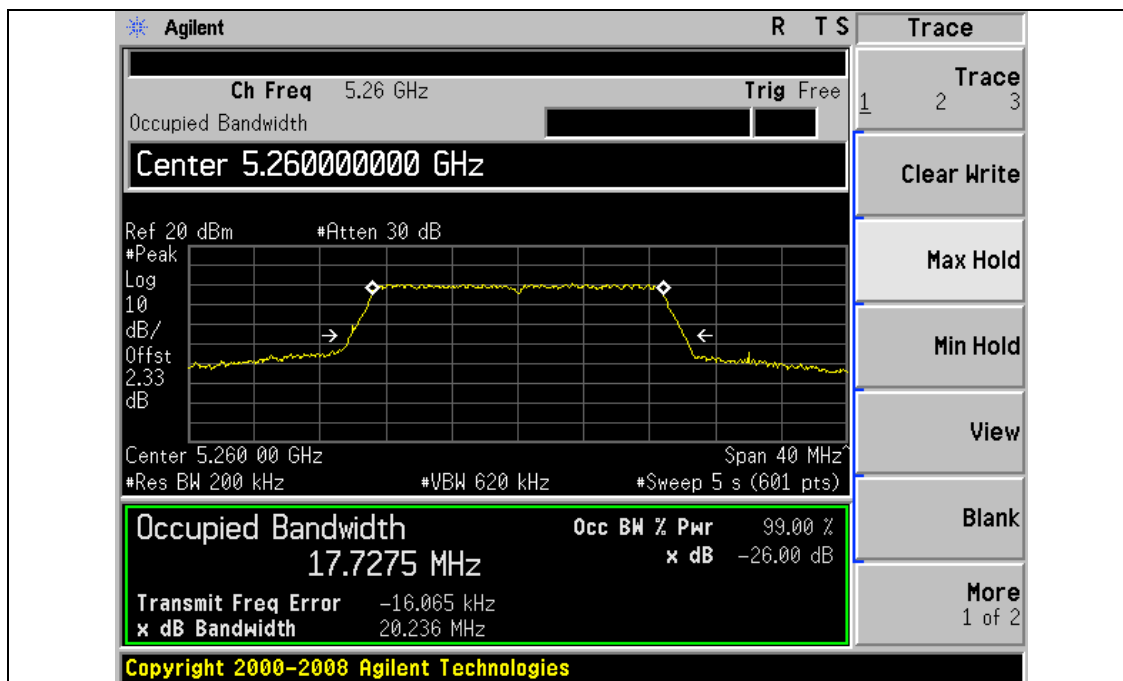
Graphical Test Results for 802.11a:



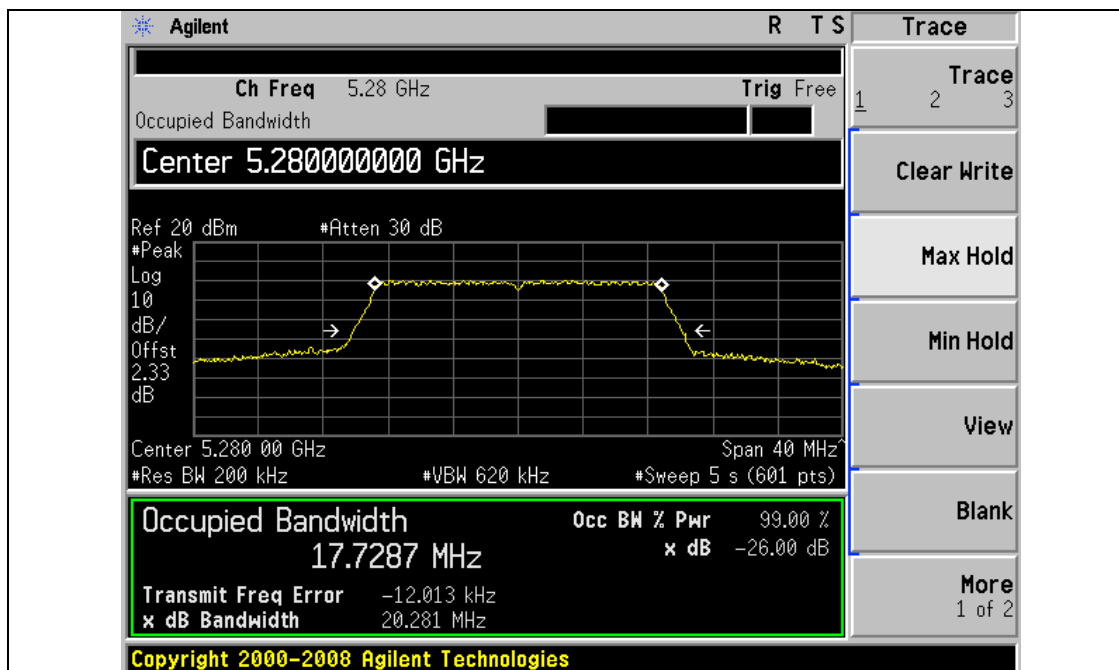




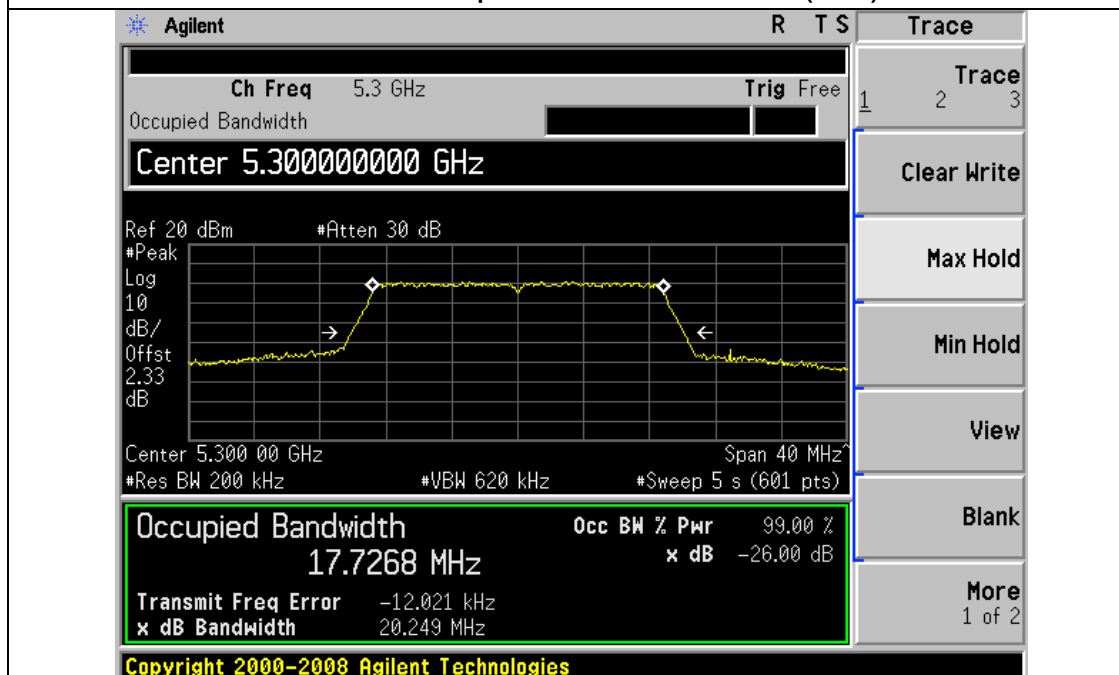
Graphical Test Results for 802.11A (HT20):



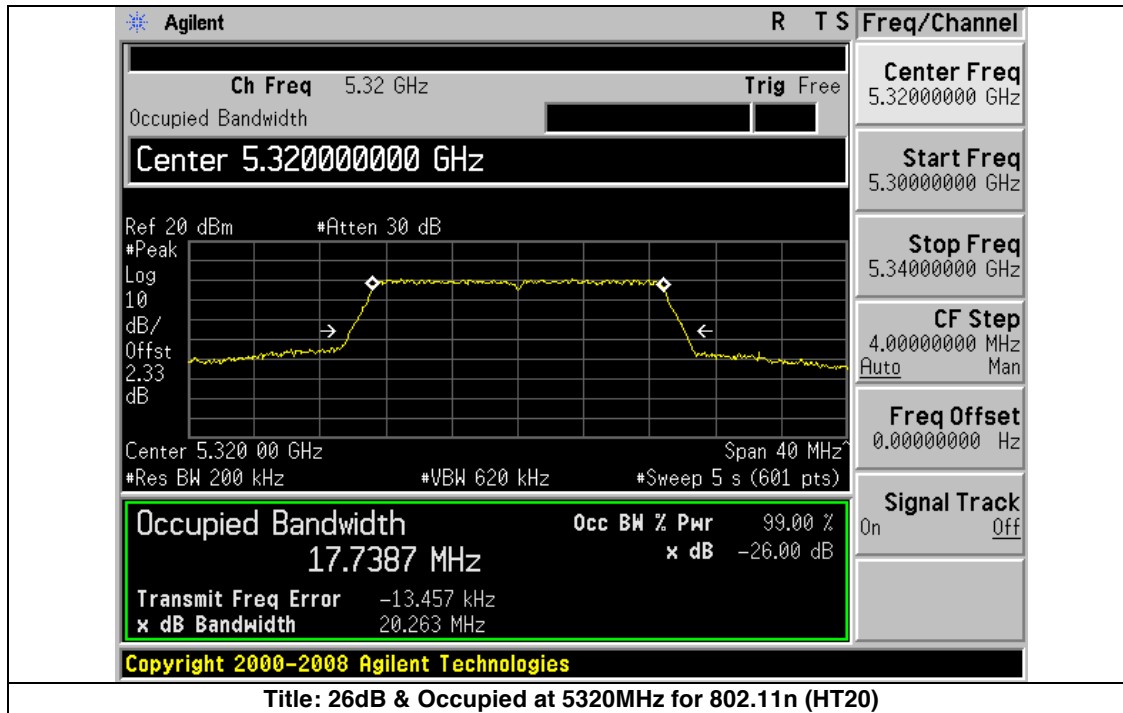
Title: 26dB & Occupied at 5260MHz for 802.11n (HT20)



Title: 26dB & Occupied at 5280MHz for 802.11n (HT20)



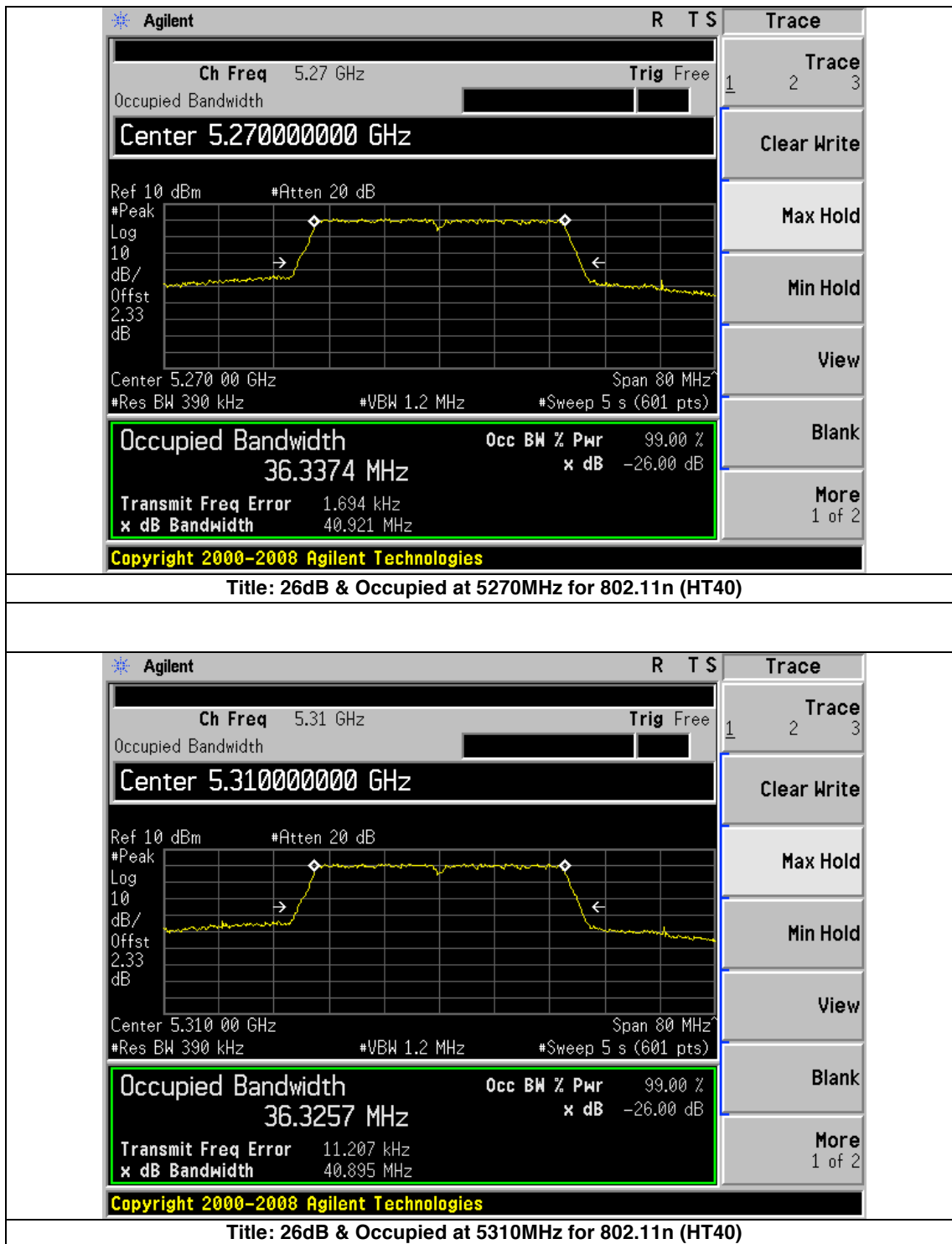
Title: 26dB & Occupied at 5300MHz for 802.11n (HT20)



99% and 26dB Bandwidth for 802.11n (HT40)

Frequency (MHz)	Data Rate (Mbps)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)
5270	M0	36.3374	40.921
5310	M0	36.3257	40.895

Graphical Test Results for 802.11n (HT40):



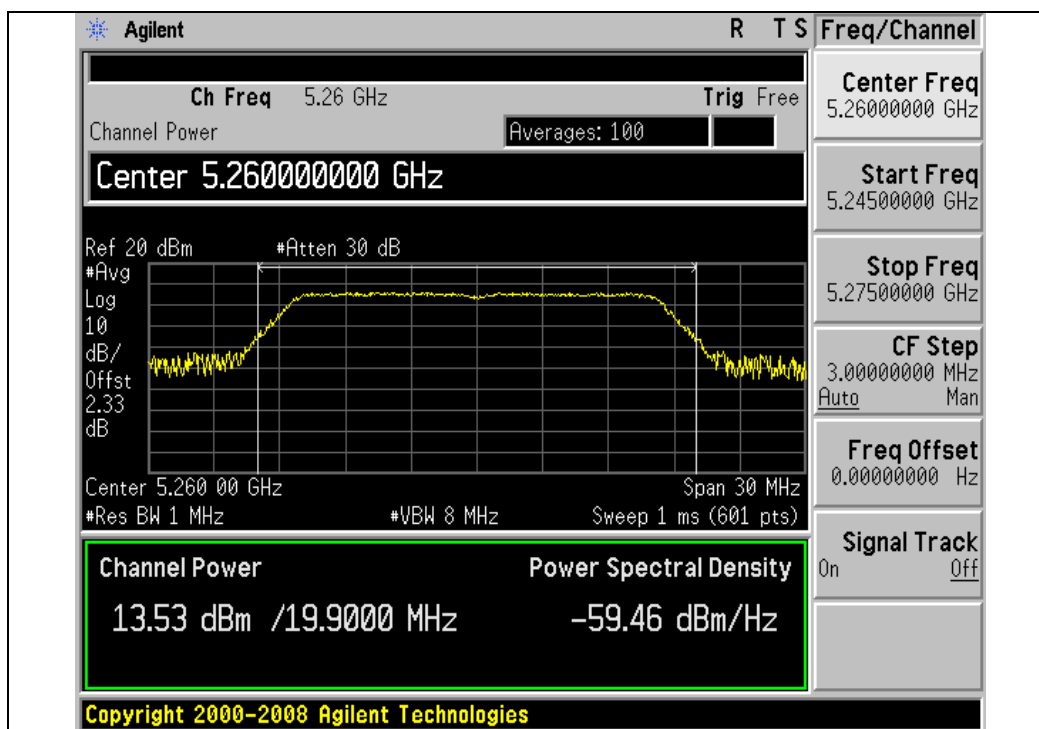
Peak Output Power for 802.11a

15.407 & RSS-210(A9.2):

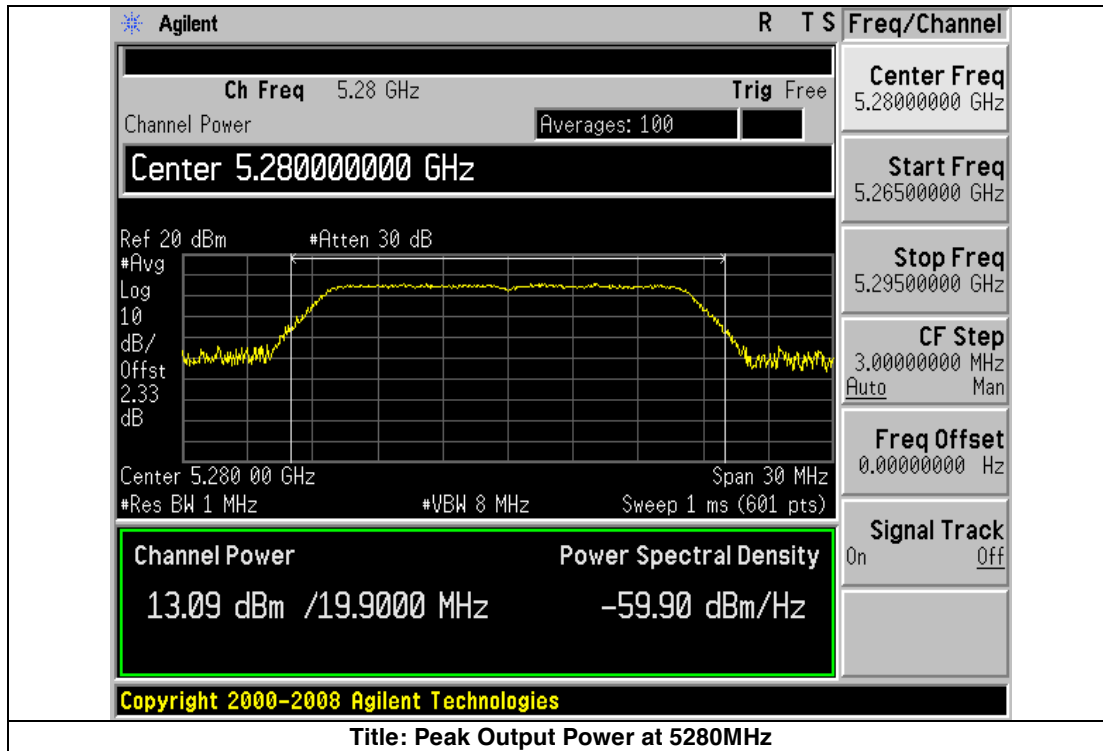
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

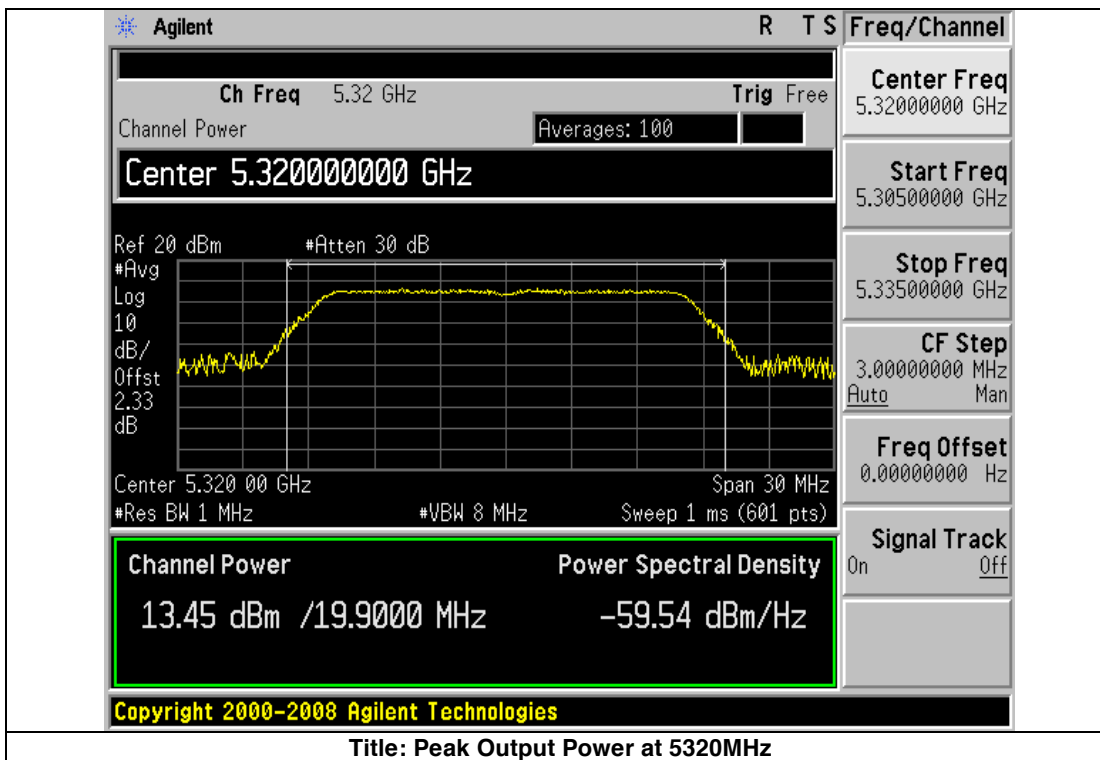
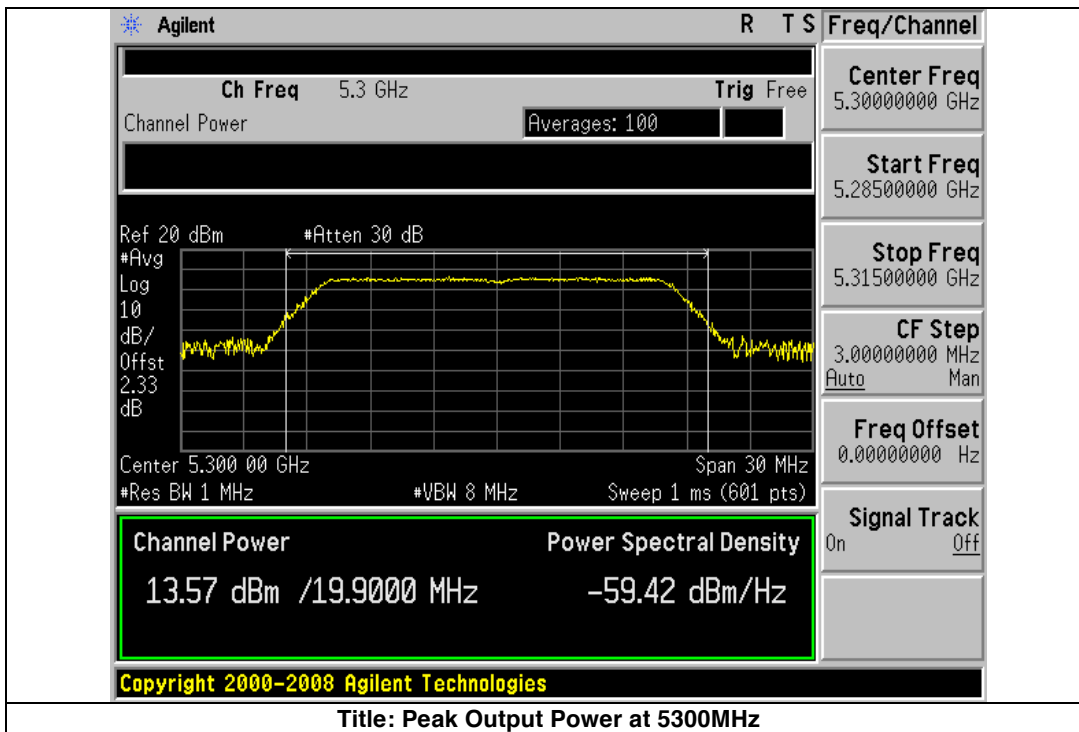
The smallest 26dB bandwidth for all channels is 19.865MHz. The maximum conducted output power is calculated as 11dBm+10*log(19.865MHz) = 23.98dBm. Which is lesser than 250mW.

Frequency (MHz)	Data Rate (Mbps)	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
5260	6	13.53	23.98	-10.45
5280	6	13.09	23.98	-10.89
5300	6	13.57	23.98	-10.41
5320	6	13.45	23.98	-10.53



Title: Peak Output Power at 5260MHz





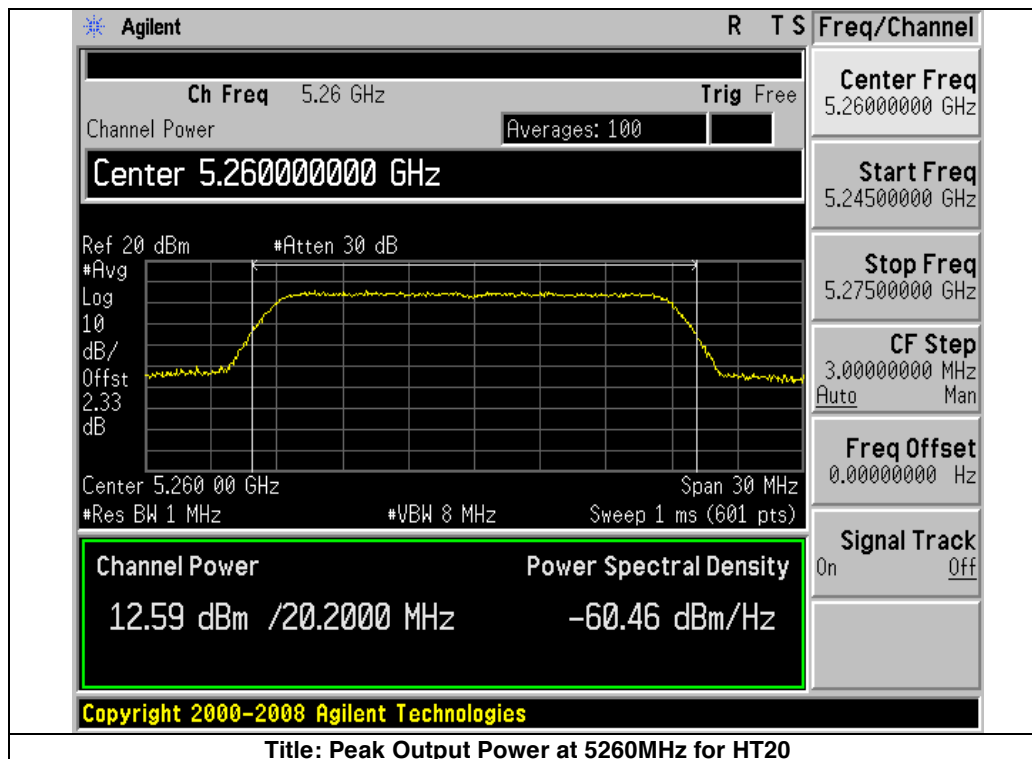
Peak Output Power for 802.11n HT20

15.407 & RSS-210(A9.2):

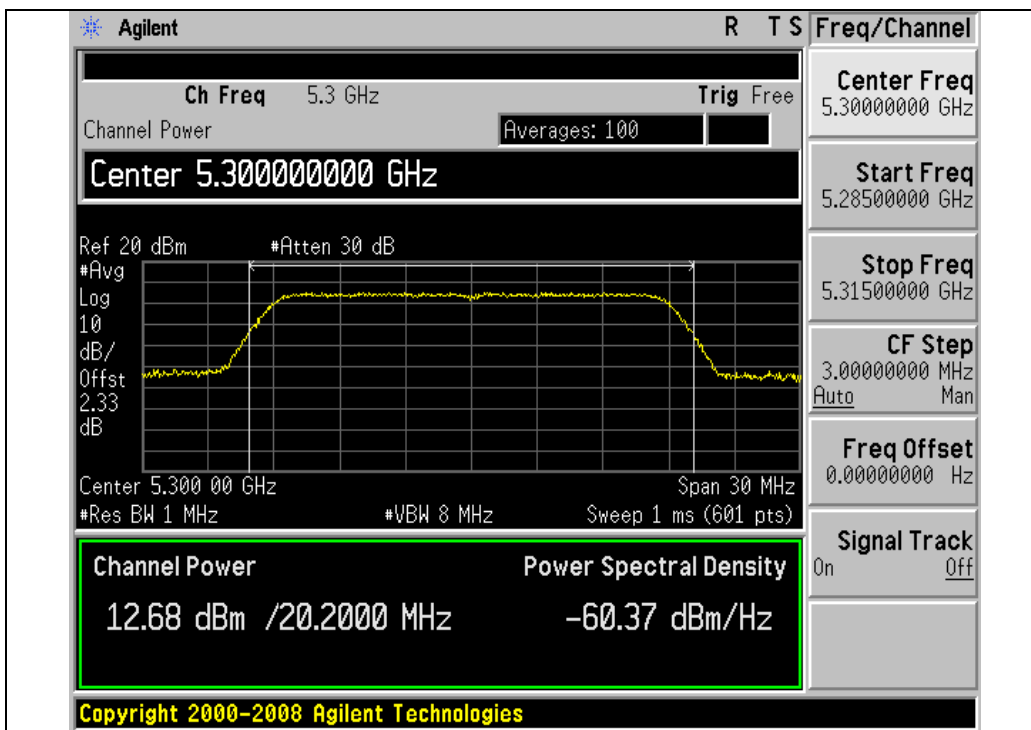
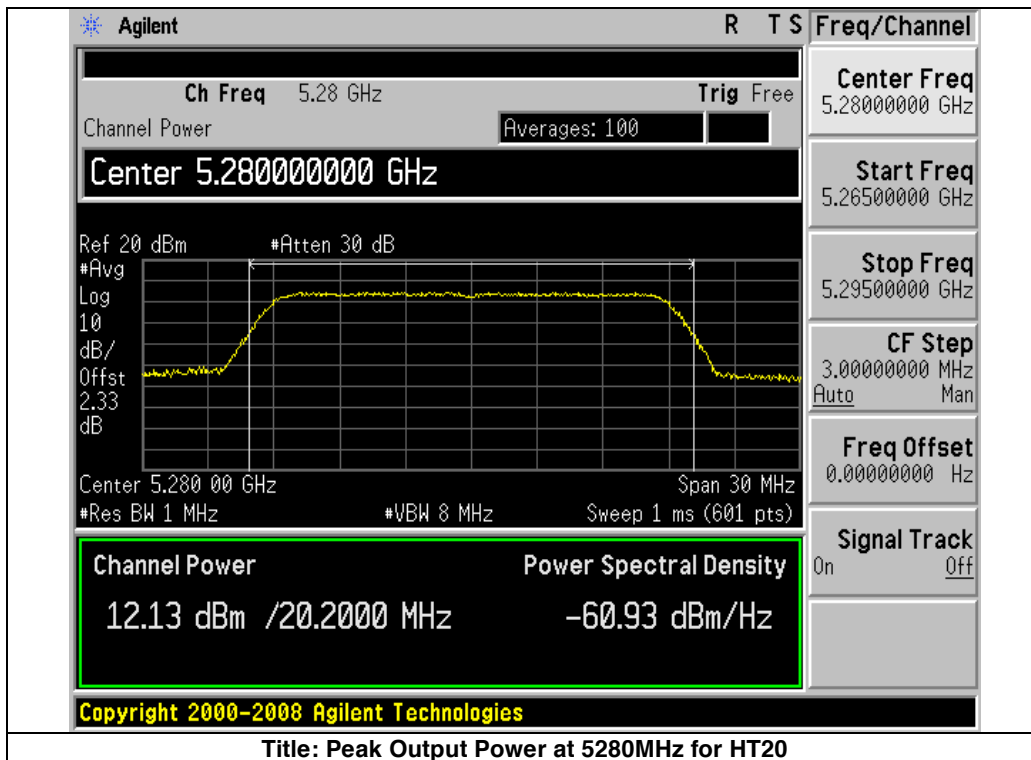
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250mW or $11\text{dBm} + 10 \cdot \log B$, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The smallest 26dB bandwidth for all channels is 19.858MHz. The maximum conducted output power is calculated as $11\text{dBm} + 10 \cdot \log(19.858\text{MHz}) = 24\text{dBm}$. Which is equal to 250mW.

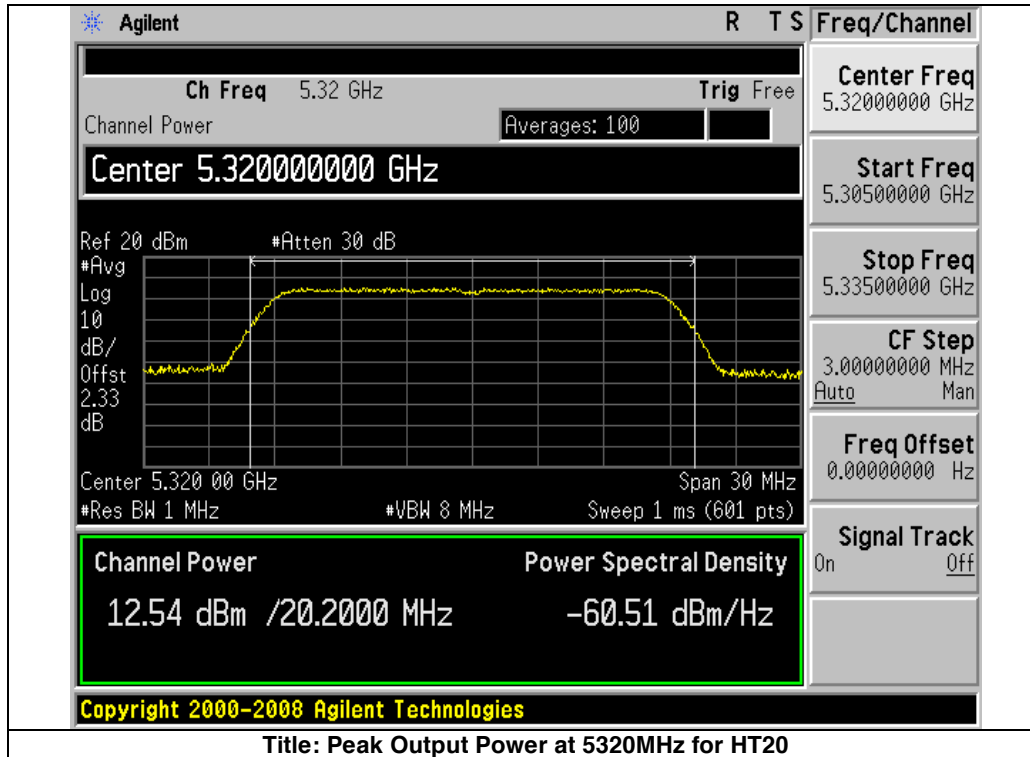
Frequency (MHz)	Data Rate (Mbps)	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
5260	M0	12.59	24	-11.41
5280	M0	12.13	24	-11.87
5300	M0	12.68	24	-11.32
5320	M0	12.54	24	-11.46



Title: Peak Output Power at 5260MHz for HT20



Title: Peak Output Power at 5300MHz for HT20



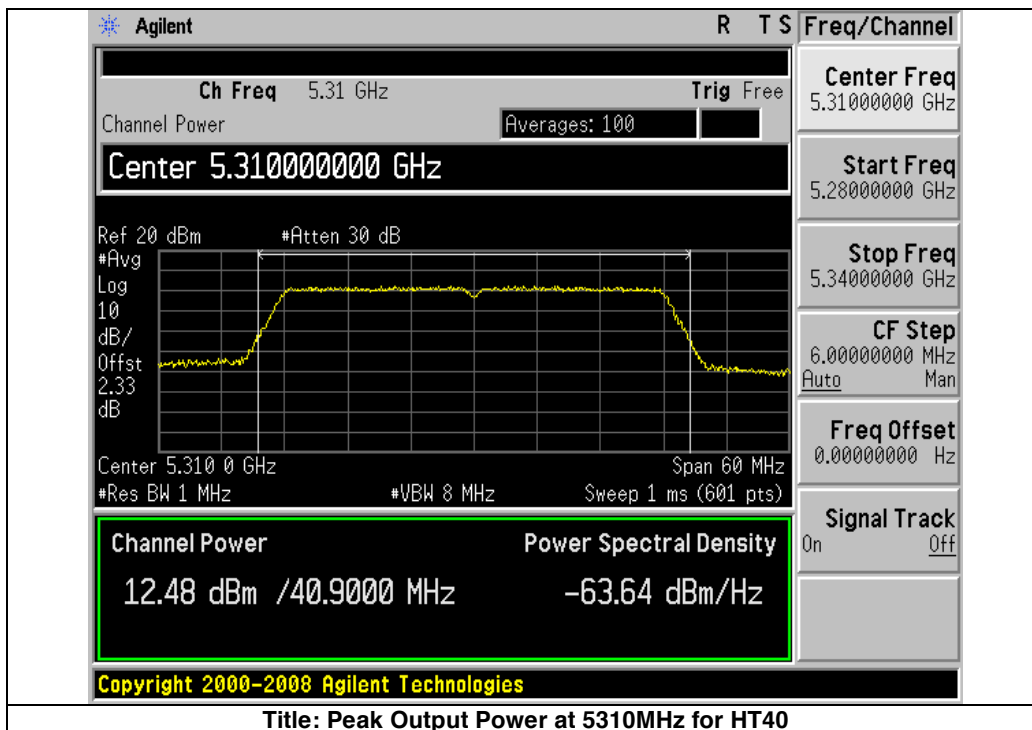
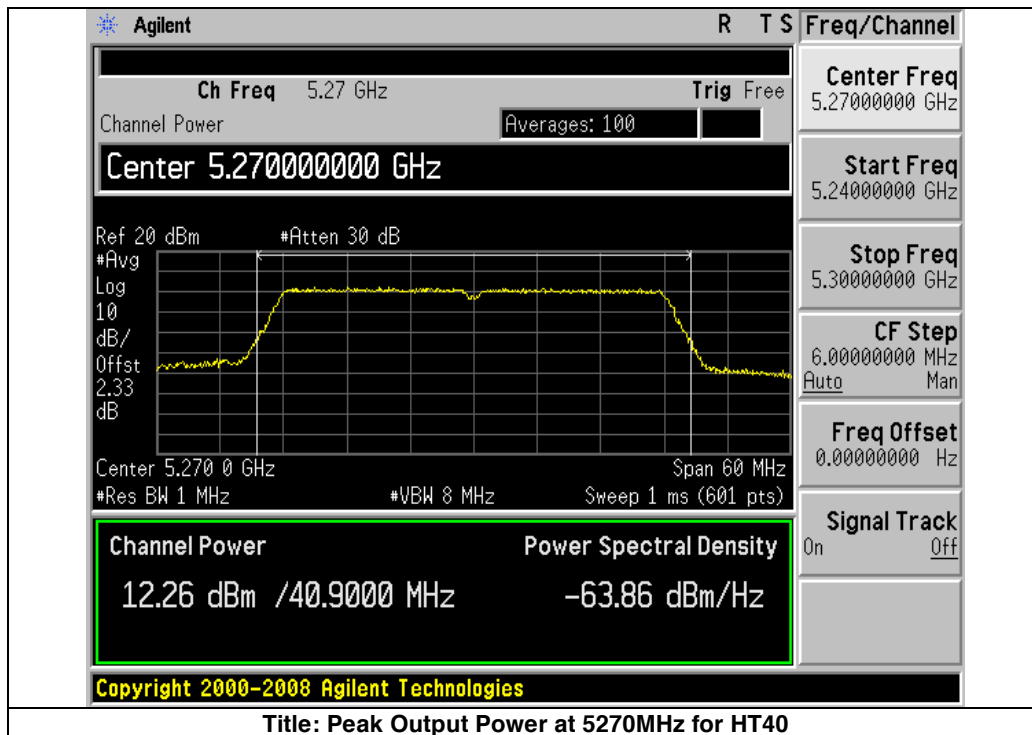
Peak Output Power for HT40:

15.407 & RSS-210(A9.2):

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The smallest 26dB bandwidth for all channels is 40.853MHz. The maximum conducted output power is calculated as $11\text{dBm} + 10 \cdot \log(40.853\text{MHz}) = 27.112\text{dBm} = 514.3\text{mW}$. Which is greater than 250mW.

Frequency (MHz)	Data Rate (Mbps)	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
5270	M0	12.26	24	-11.74
5310	M0	12.48	24	-11.52



Power Spectral Density

15.407: For the bands 5.25-5.35 and 5.47-5.725 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, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum supported antenna gain in the range 5250-530MHz is 4dBi.

Method SA-1 from KDB 789033

Connect the antenna port(s) to the spectrum analyzer input. Place the radio in continuous transmit mode. Configure the spectrum analyzer as shown below.

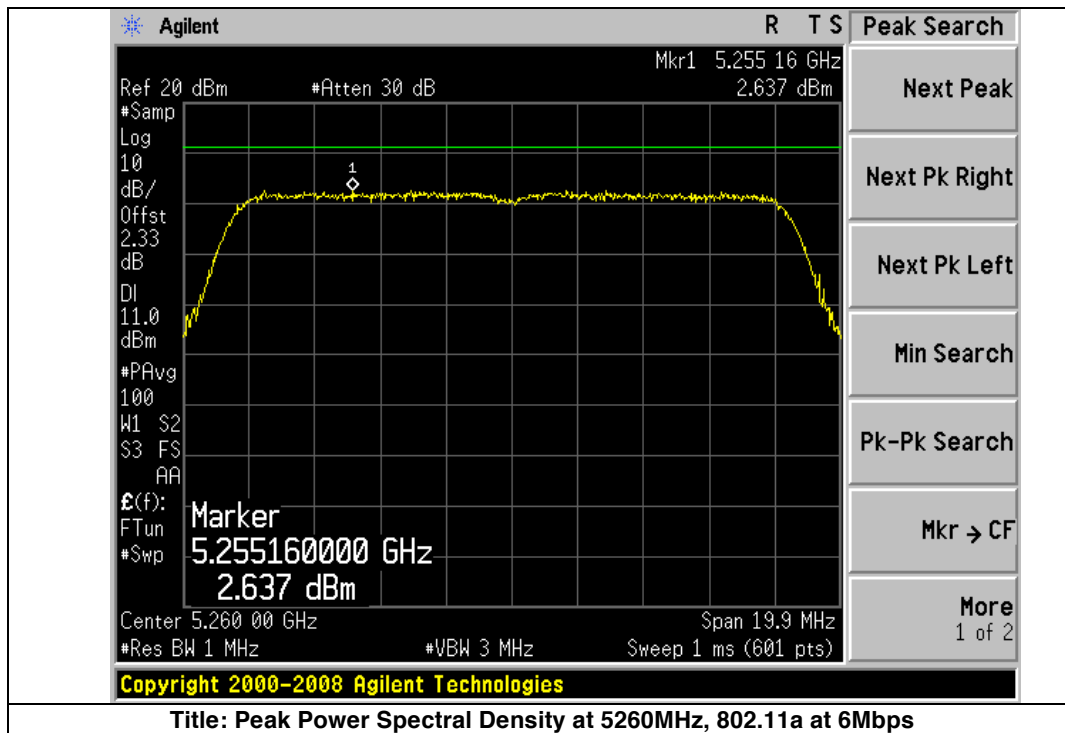
Enable "Channel Power" function of analyzer	
Center Frequency:	Frequency from table below
Span:	20 MHz (must be greater than 26dB bandwidth, adjust as necessary)
Ref Level Offset:	Correct for attenuator and cable loss.
Reference Level:	20 dBm
Attenuation:	20 dB
Sweep Time:	Auto
Resolution Bandwidth:	1 MHz
Video Bandwidth:	3 MHz
Detector:	Sample
Trace:	Trace Average 100 traces in Power Averaging Mode
Integration BW:	=99% BW from 99% Bandwidth Data

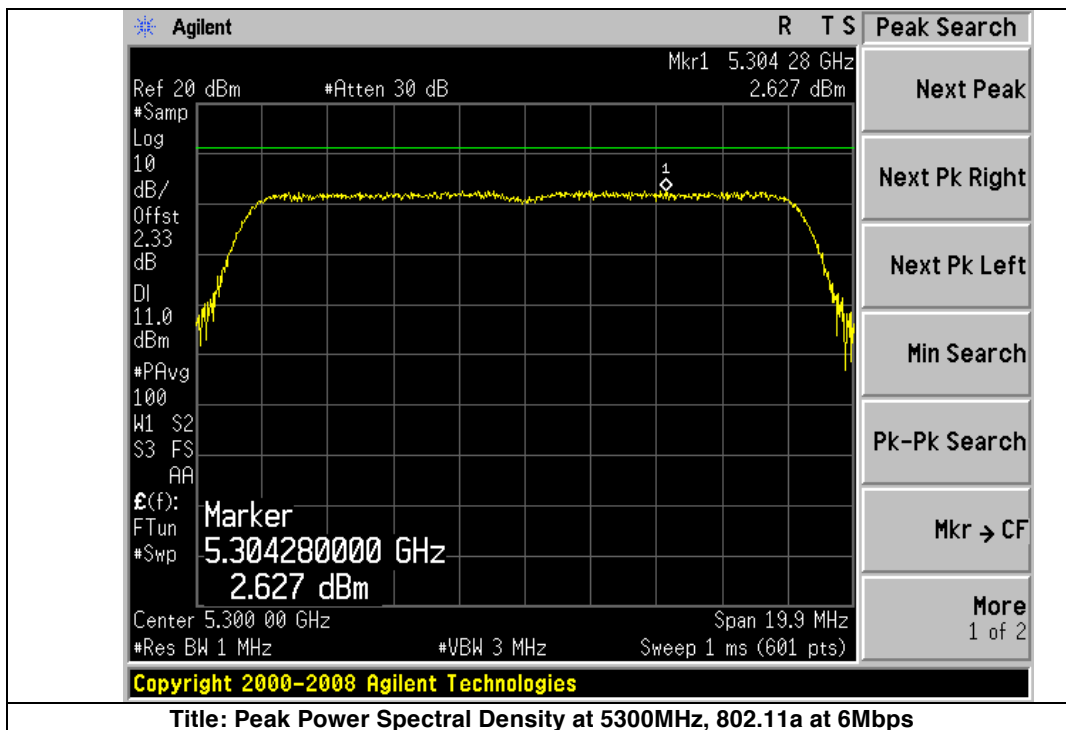
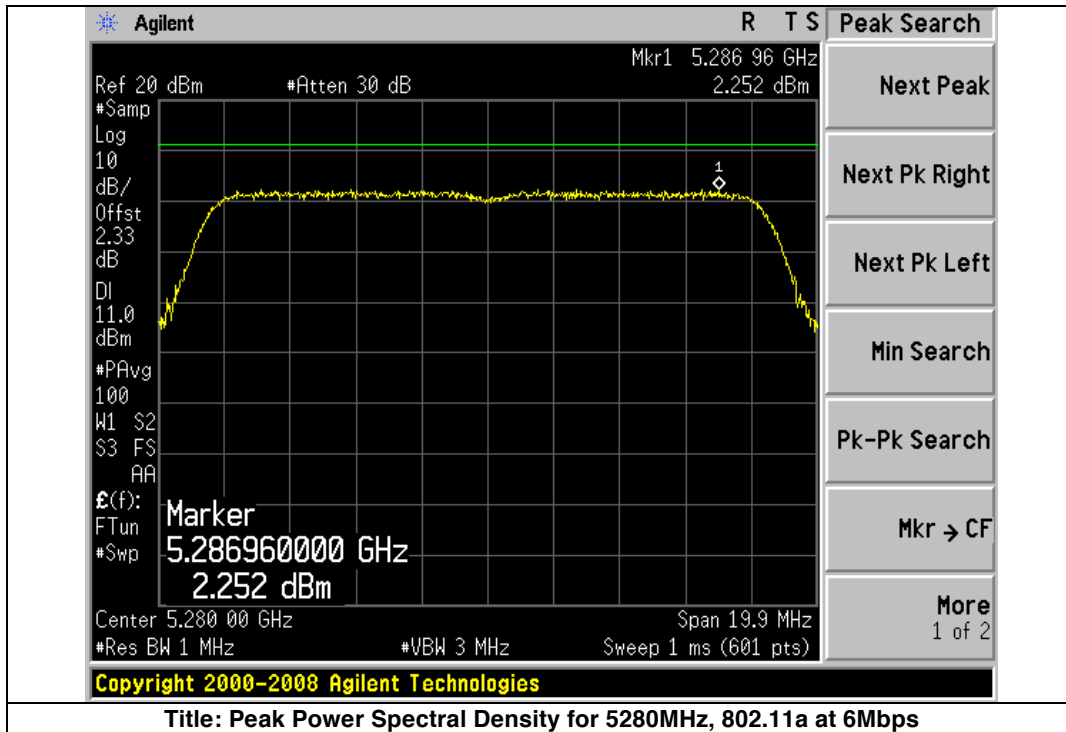
After averaging 100 traces of the transmitter waveform on the spectrum analyzer, record the spectrum analyzer Channel Power. Perform a Marker Peak Search function, and record this value as the Power Spectral Density.

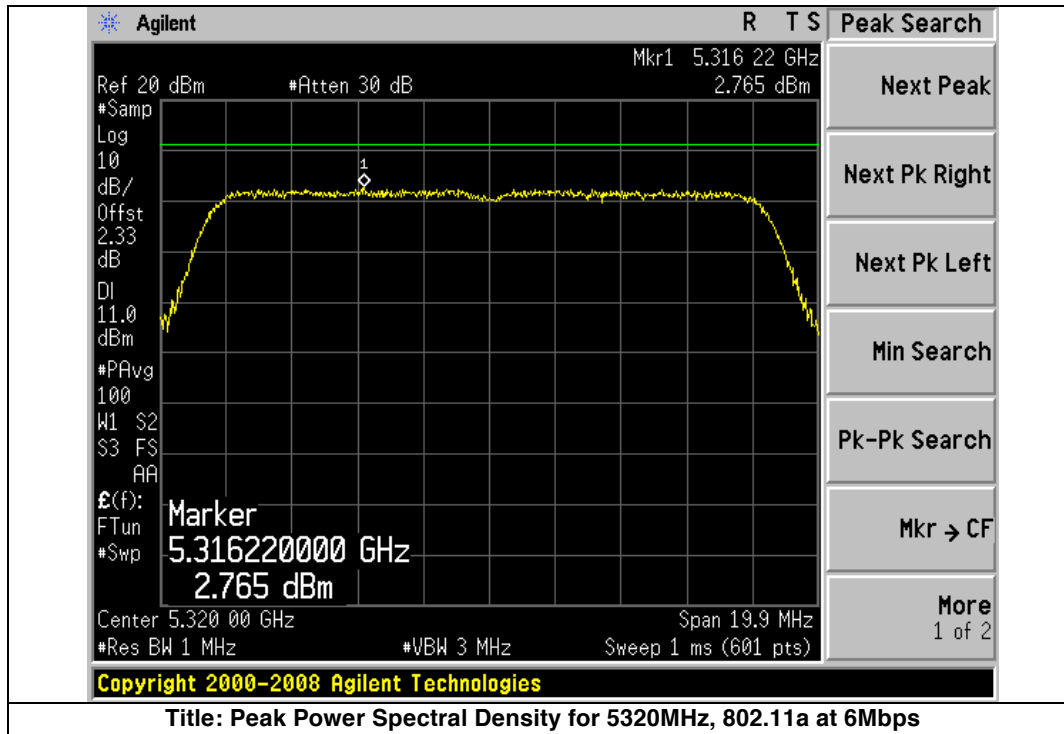
Power Spectral Density for 802.11a

Frequency (MHz)	Data Rate (Mbps)	Power Spectral Density (dBm/MHz)	Limit (dBm)	Margin (dB)
5260	6	2.637	11	-8.363
5280	6	2.252	11	-8.748
5300	6	2.627	11	-8.373
5320	6	2.765	11	-8.235

Graphical Test Results for 802.11a:







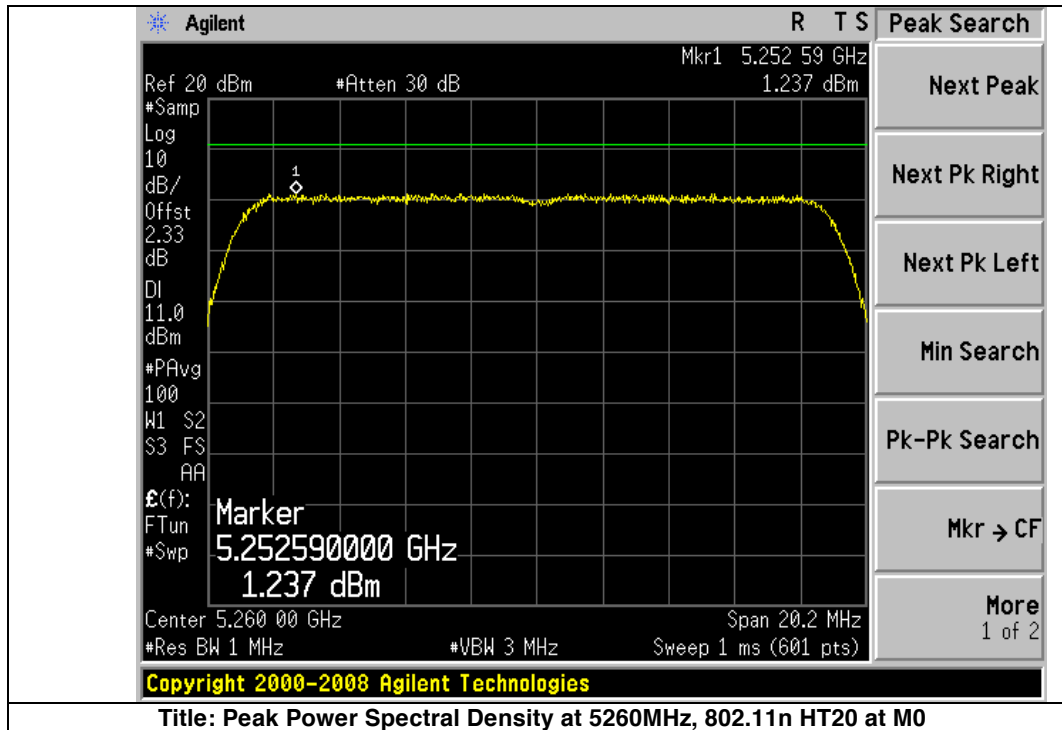
Power Spectral Density for 802.11n HT20:

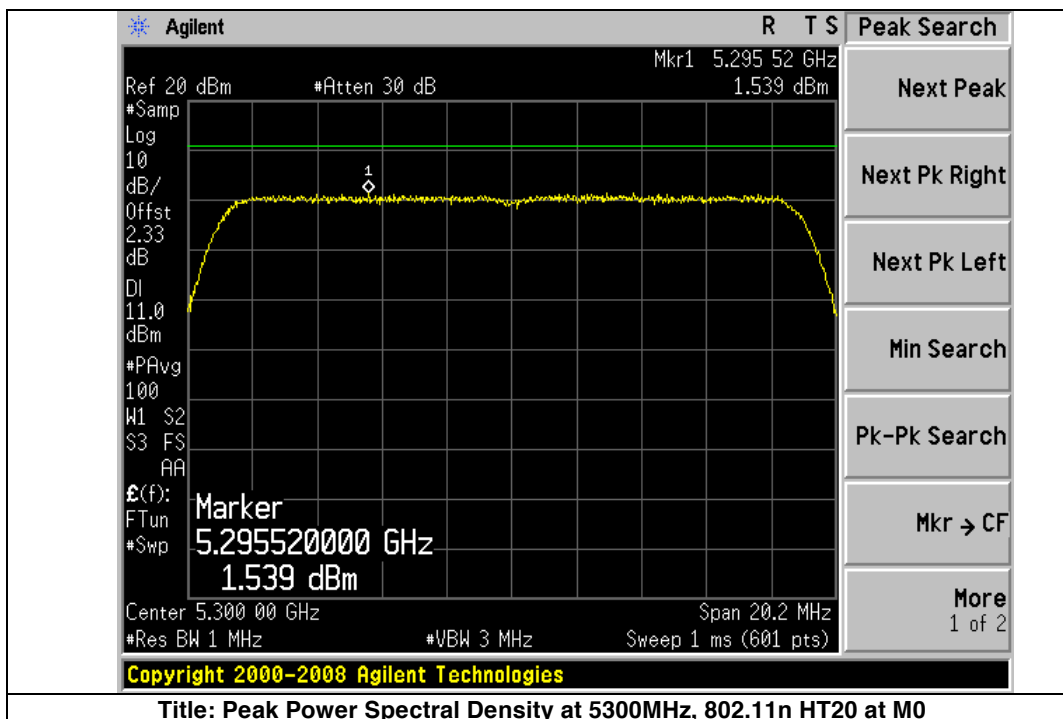
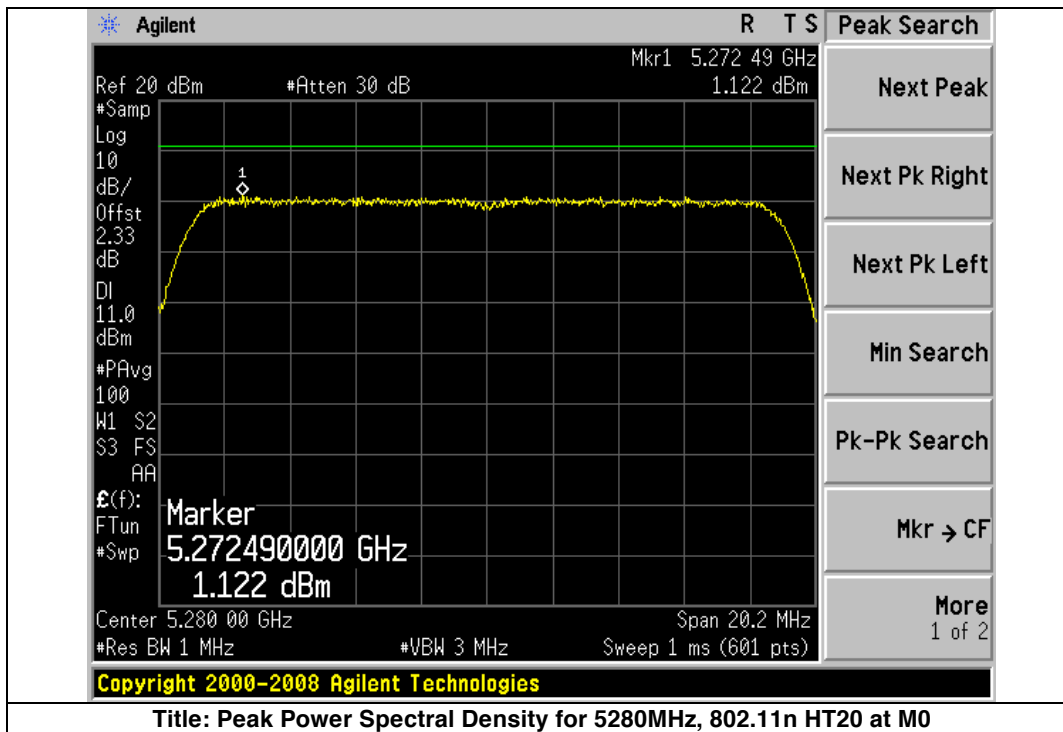
15.407 & RSS-210(A9.2):

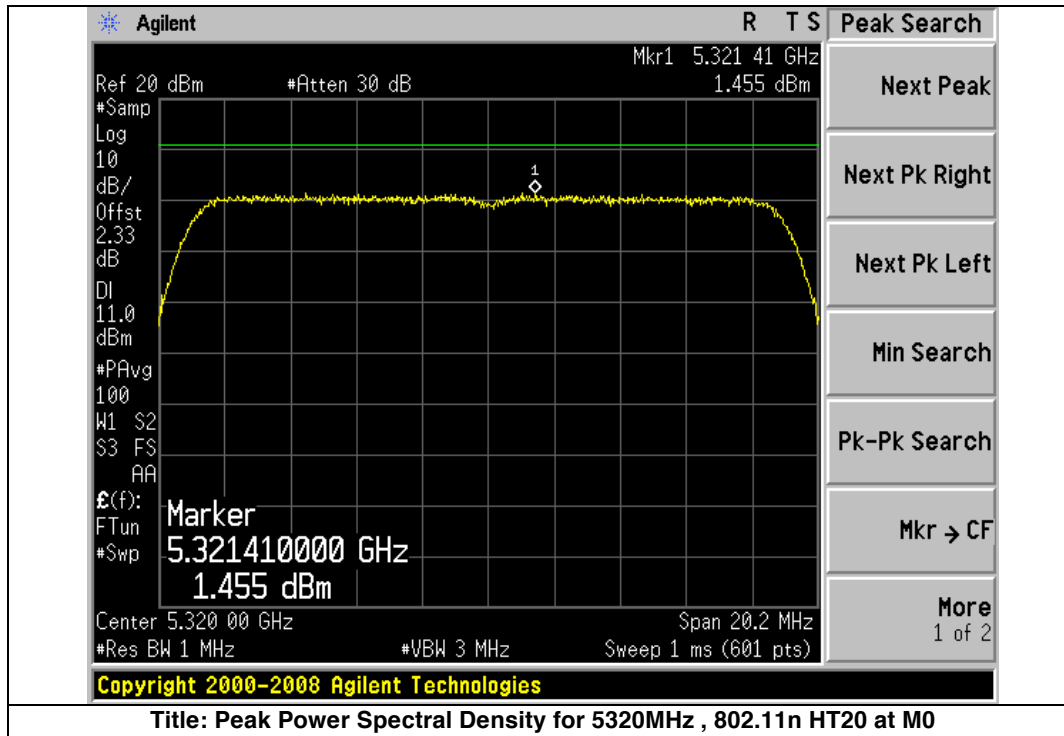
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Frequency (MHz)	Data Rate (Mbps)	Power Spectral Density (dBm/MHz)	Limit (dBm)	Margin (dB)
5260	M0	1.237	11	-9.763
5280	M0	1.122	11	-9.878
5300	M0	1.539	11	-9.461
5320	M0	1.455	11	-9.545

Graphical Test Results for 802.11n (HT20):





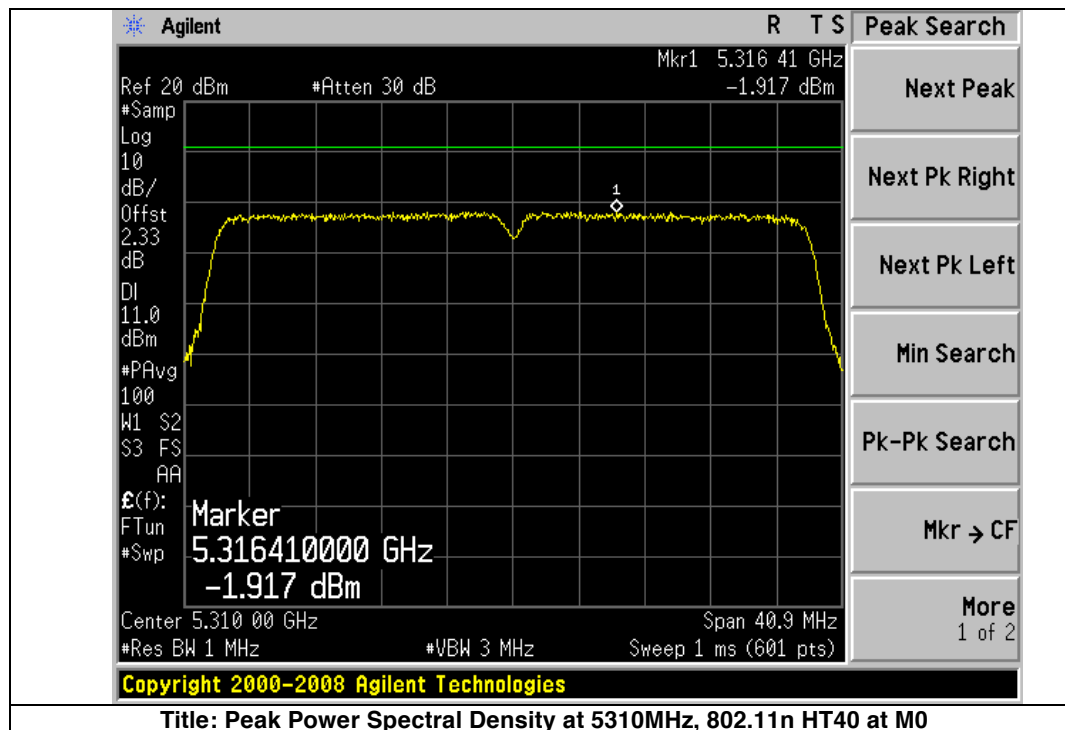
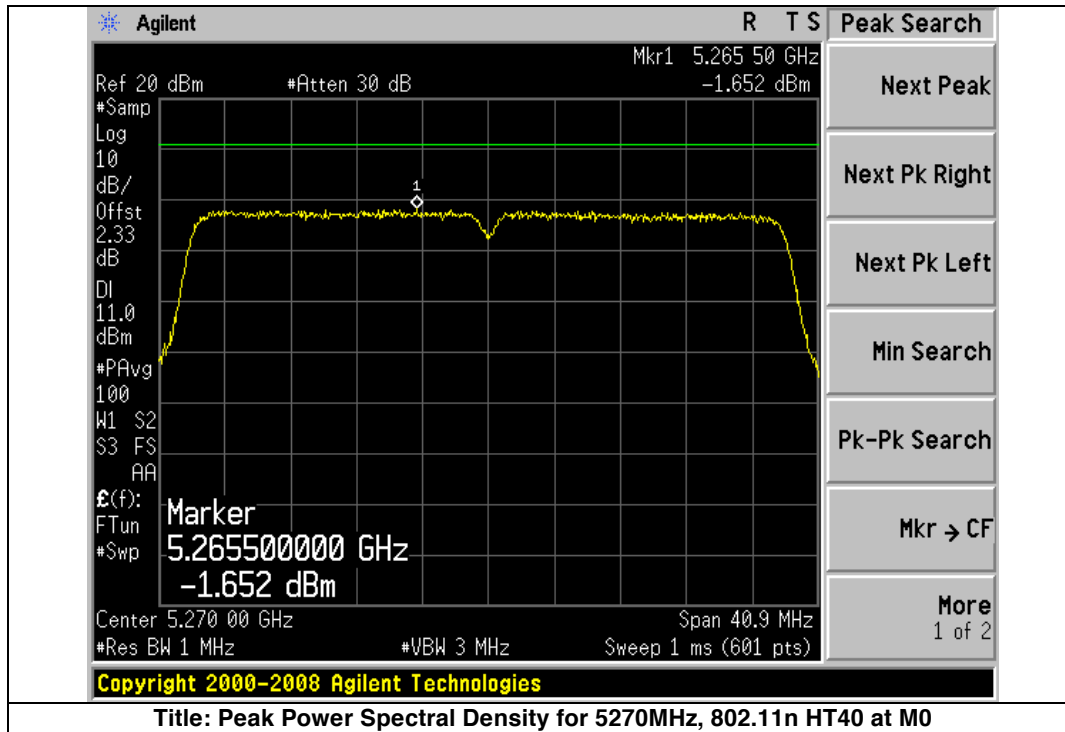


Power Spectral Density for HT40:

15.407 & RSS-210(A9.2):

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Frequency (MHz)	Data Rate (Mbps)	Power Spectral Density (dBm/MHz)	Limit (dBm)	Margin (dB)
5270	M0	-1.652	11	-12.652
5310	M0	-1.917	11	-12.917



Peak Excursion

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

Set the spectrum analyzer span to view the entire emission bandwidth. The largest difference between the following two traces must be ≤ 13 dB for all frequencies across the emission bandwidth.

Set the spectrum analyzer span to view the entire emission bandwidth. The largest difference between the following two traces must be ≤ 13 dB for all frequencies across the emission bandwidth.

1st Trace: (Peak)

Set Span to encompass the entire emission bandwidth of the signal.

RBW = 1 MHz, VBW = 3 MHz

Detector = Peak

Sweep = Auto

Trace 1 = Max-hold

Ref Level Offset = correct for attenuator and cable loss

Ref Level = 20dBm

Atten = 10dBm

2nd Trace: (Average)

Trace 2 = clear right

Detector = Sample

Avg/VBW type = Pwr(RMS)

Average = 100

Sweep = single

Set marker Deltas

Trace 1 & Peak search

Marker Delta

Trace 2 & Peak search

Record the difference between the Peak and Average Markers

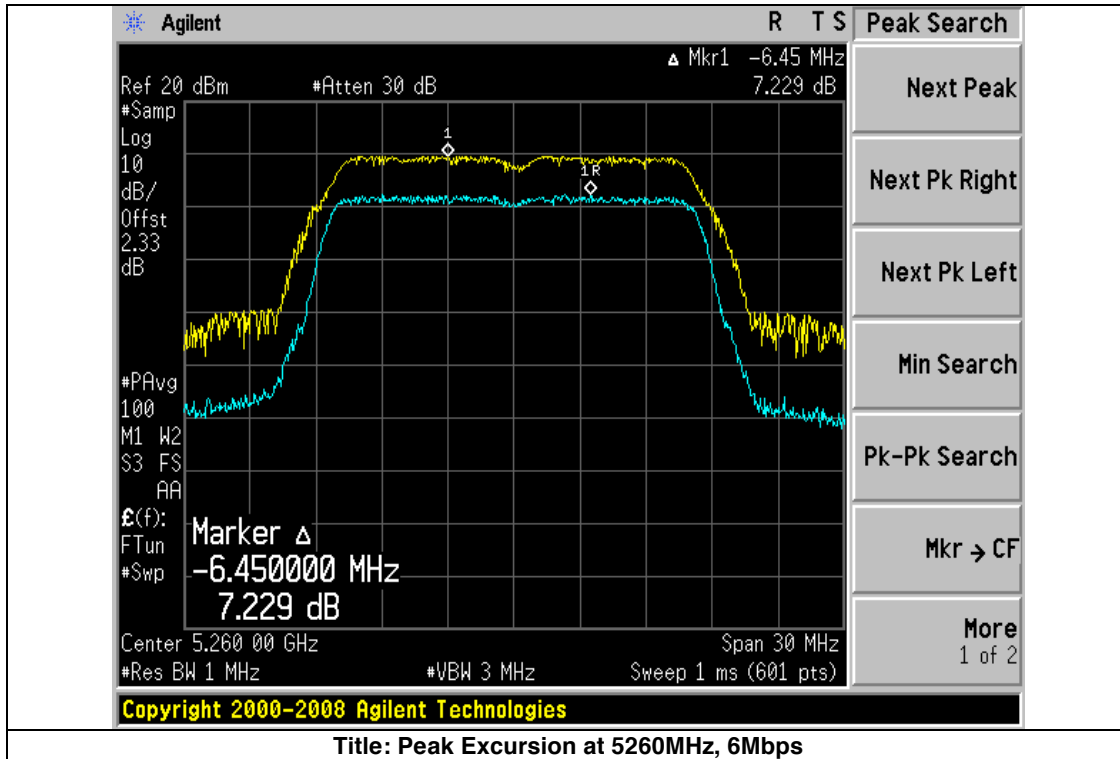
Peak Excursion for 802.11a

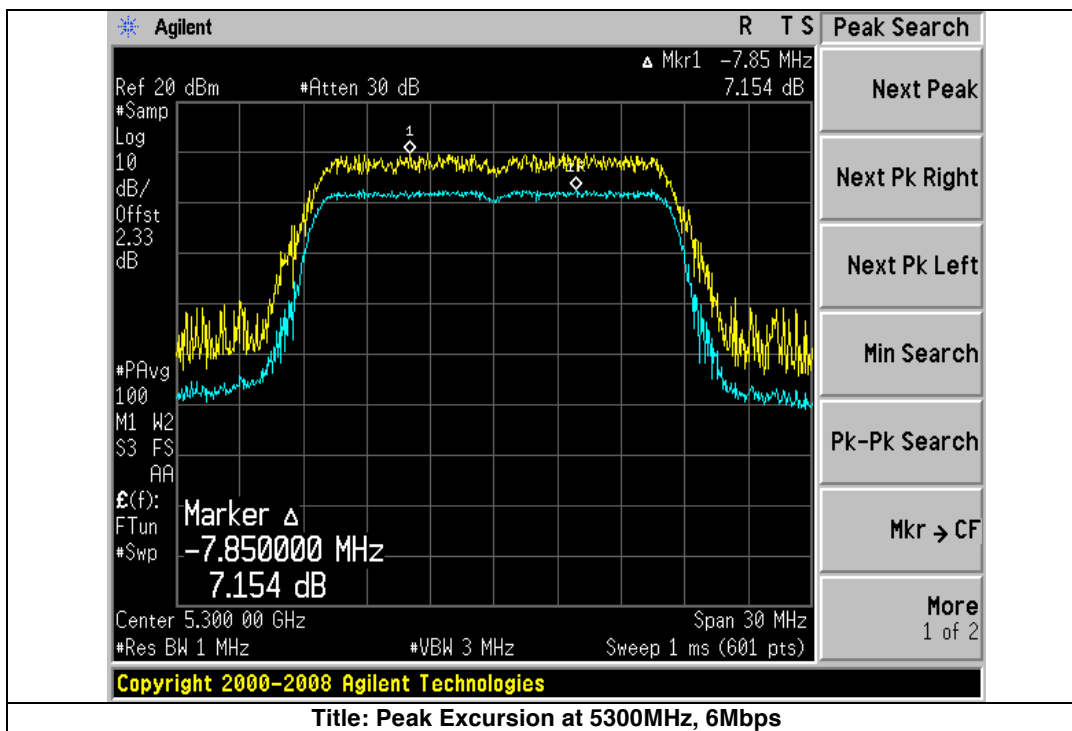
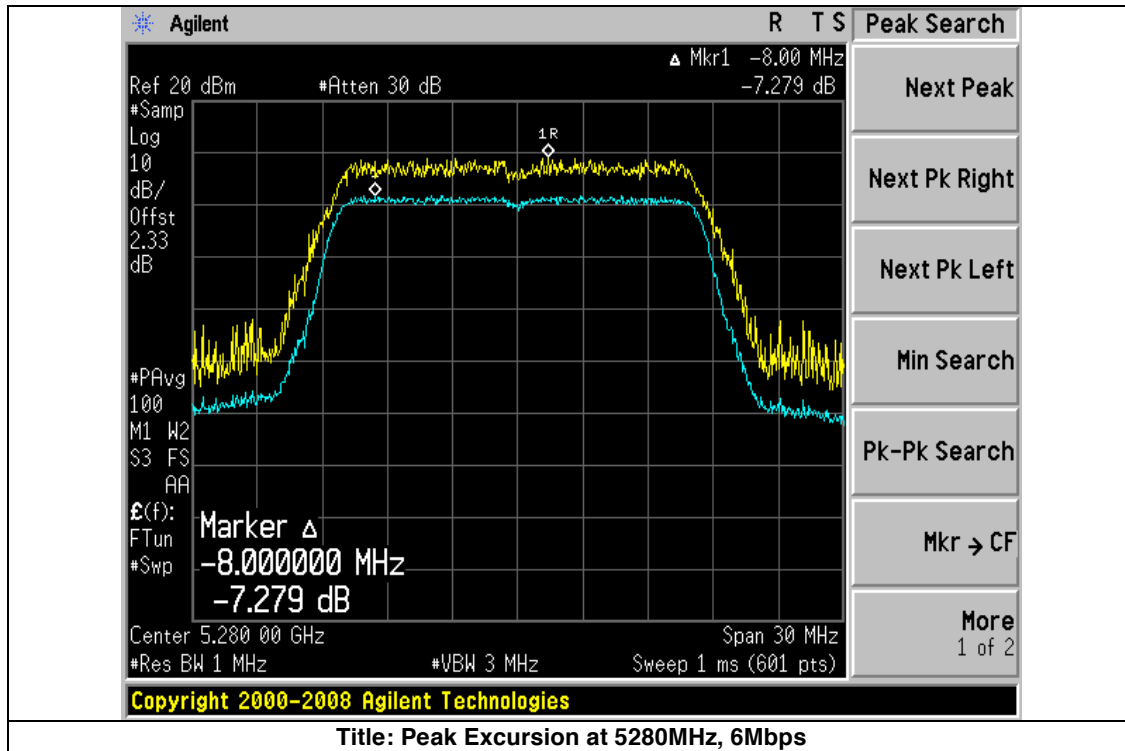
15.407: The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

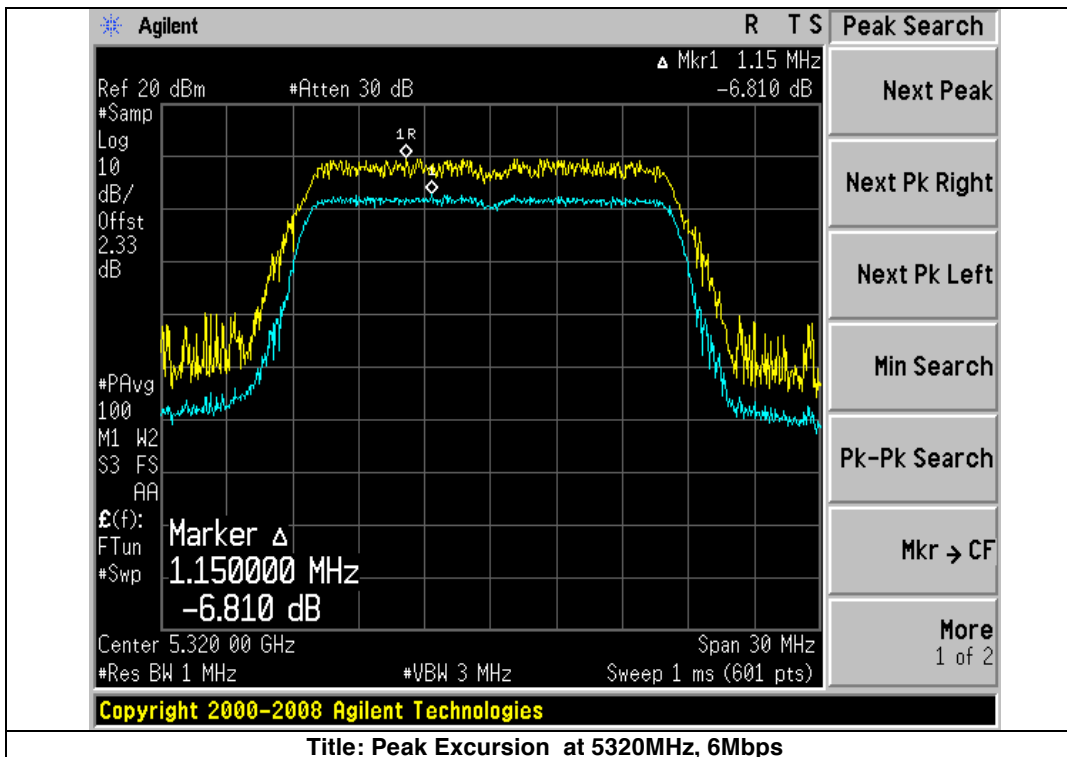
Frequency (MHz)	Data Rate (Mbps)	Peak Excursion (dB)	Limit (dBm)	Margin (dB)
5260	6	7.229	13	-5.771
5280	6	7.279	13	-5.721
5300	6	7.154	13	-5.846

5320	6	6.810	13	-6.190
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Graphical Test Results



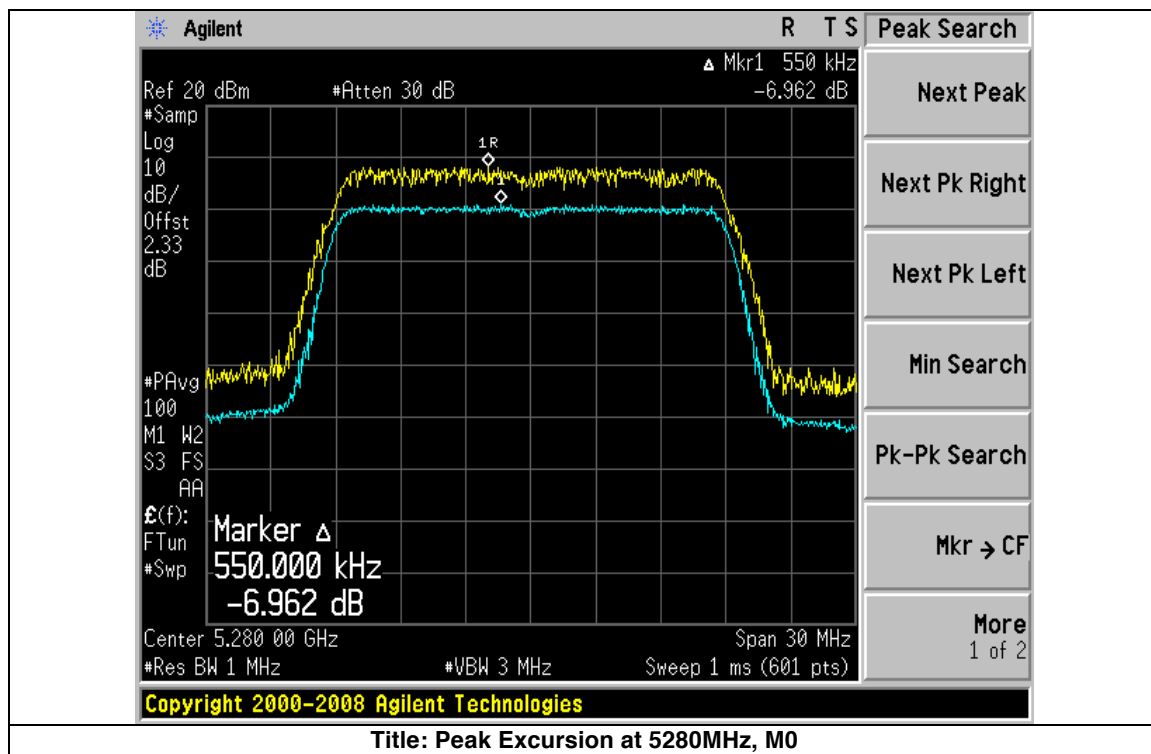
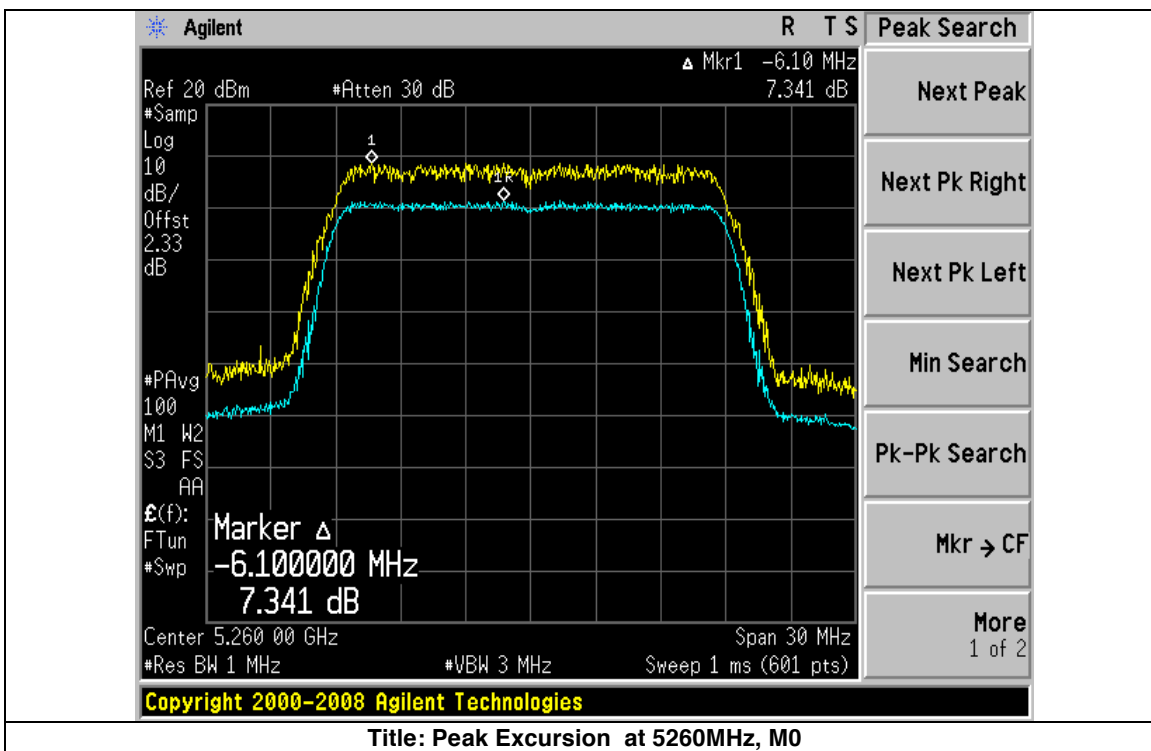


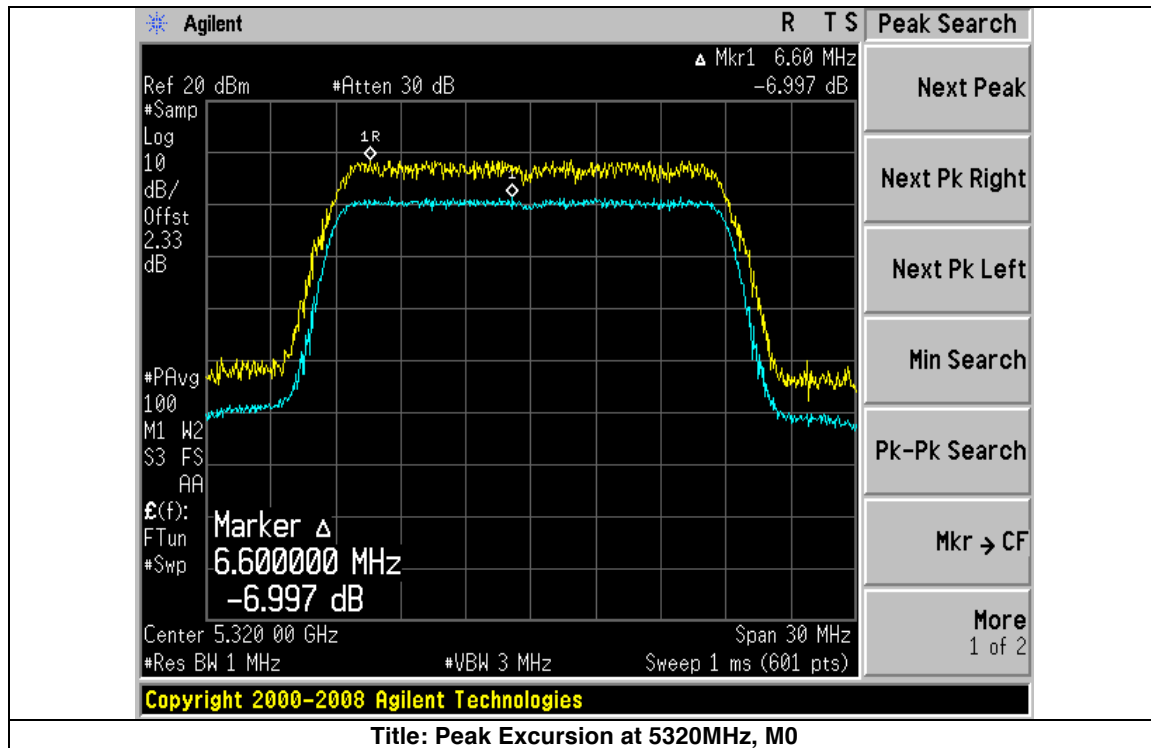
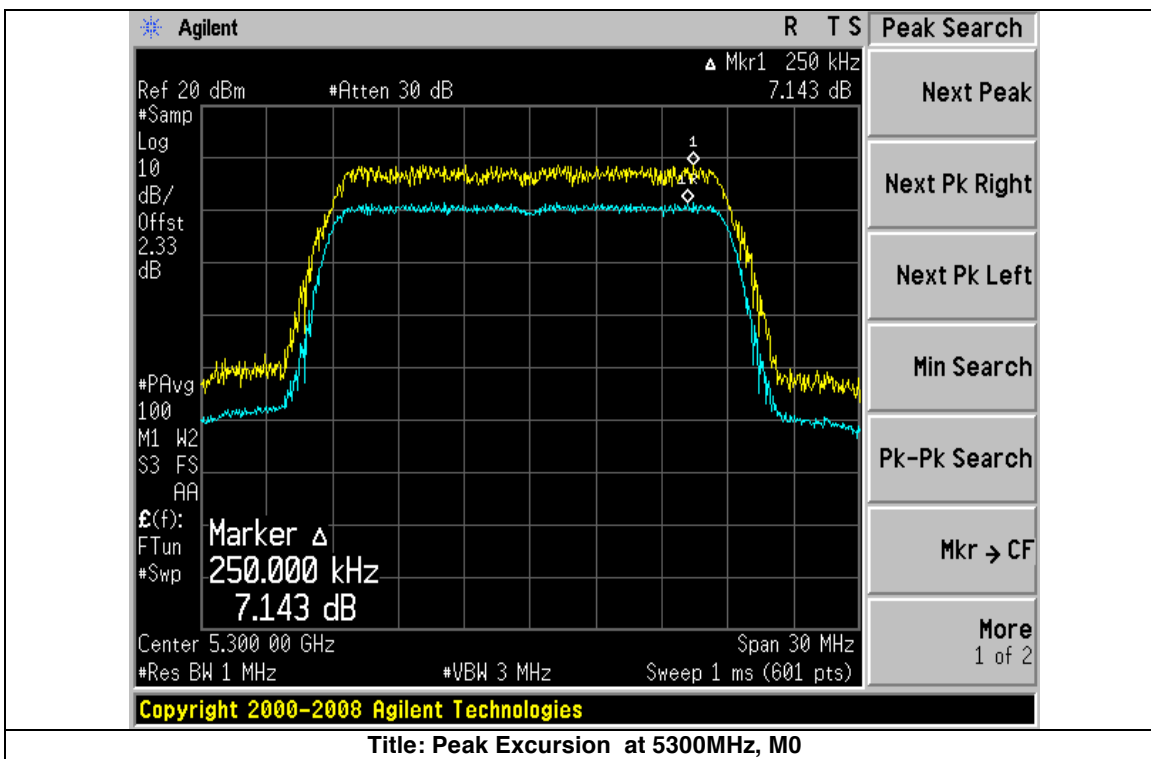


Peak Excursion for 802.11n HT20:

Frequency (MHz)	Data Rate (Mbps)	Peak Excursion (dB)	Limit (dBm)	Margin (dB)
5260	M0	7.341	13	-5.659
5280	M0	6.962	13	-6.038
5300	M0	7.143	13	-5.857
5320	M0	6.997	13	-6.003

Graphical Test Results

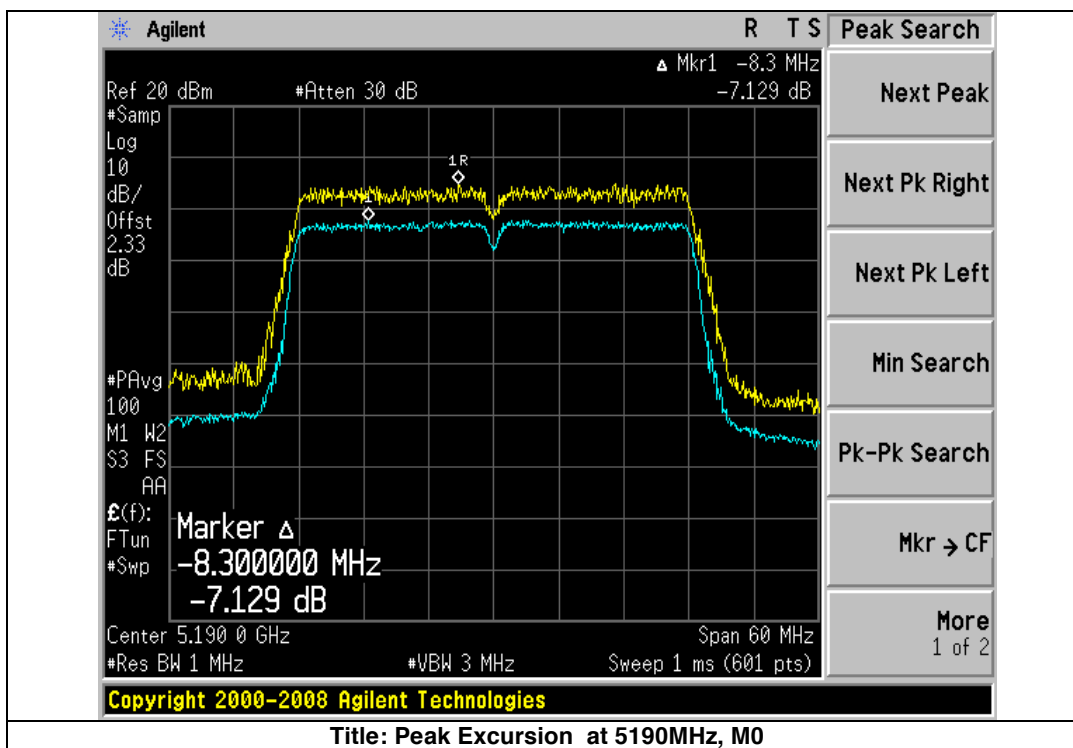


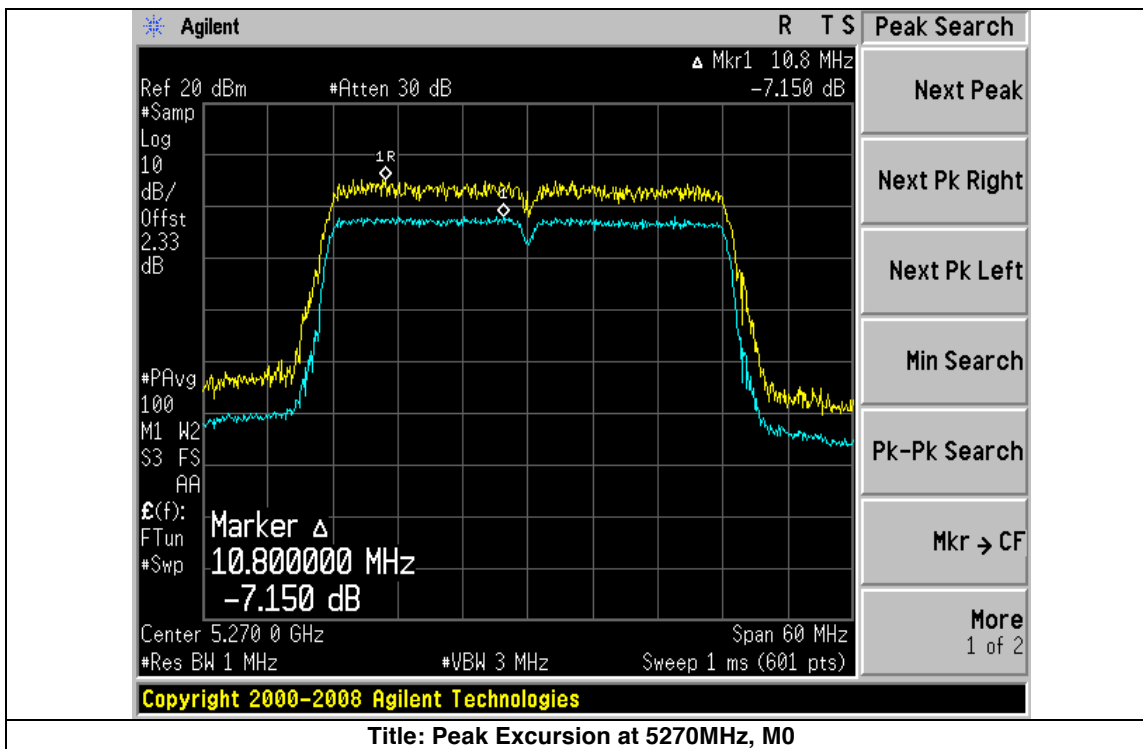
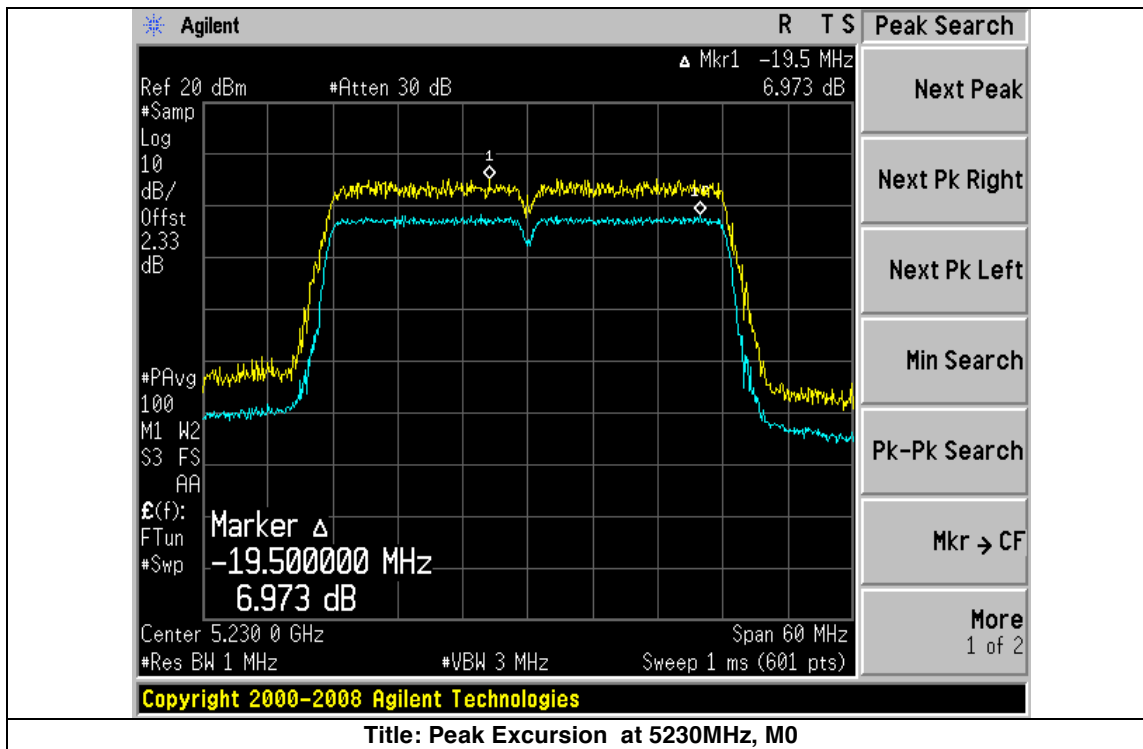


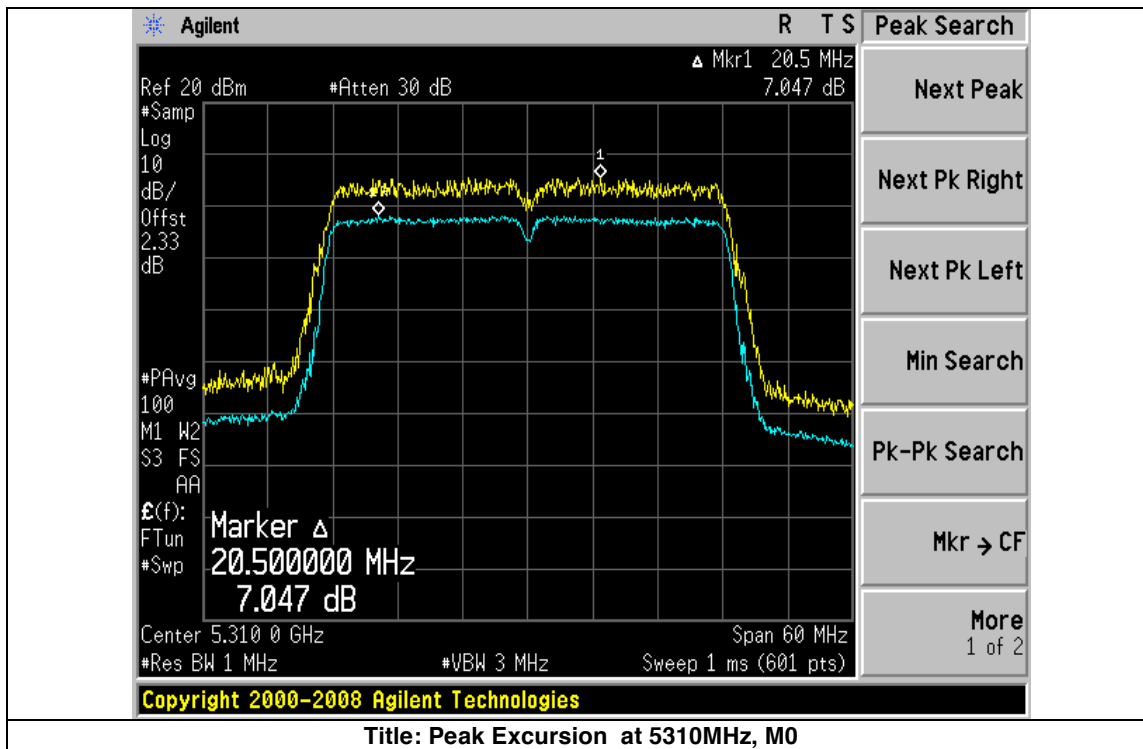
Peak Excursion for 802.11n HT40:

Frequency (MHz)	Data Rate (Mbps)	Peak Excursion (dB)	Limit (dBm)	Margin (dB)
5270	M0	7.150	13	-5.850
5310	M0	7.047	13	-5.953

Graphical Test Results









Conducted Spurious Emissions

15.407: For transmitters operating in the 5.25-5.35 and 5.47-5.725 GHz band: all emissions outside of the 5.25-5.35 and 5.47-5.725 GHz bands shall not exceed an EIRP of -27dBm/MHz.

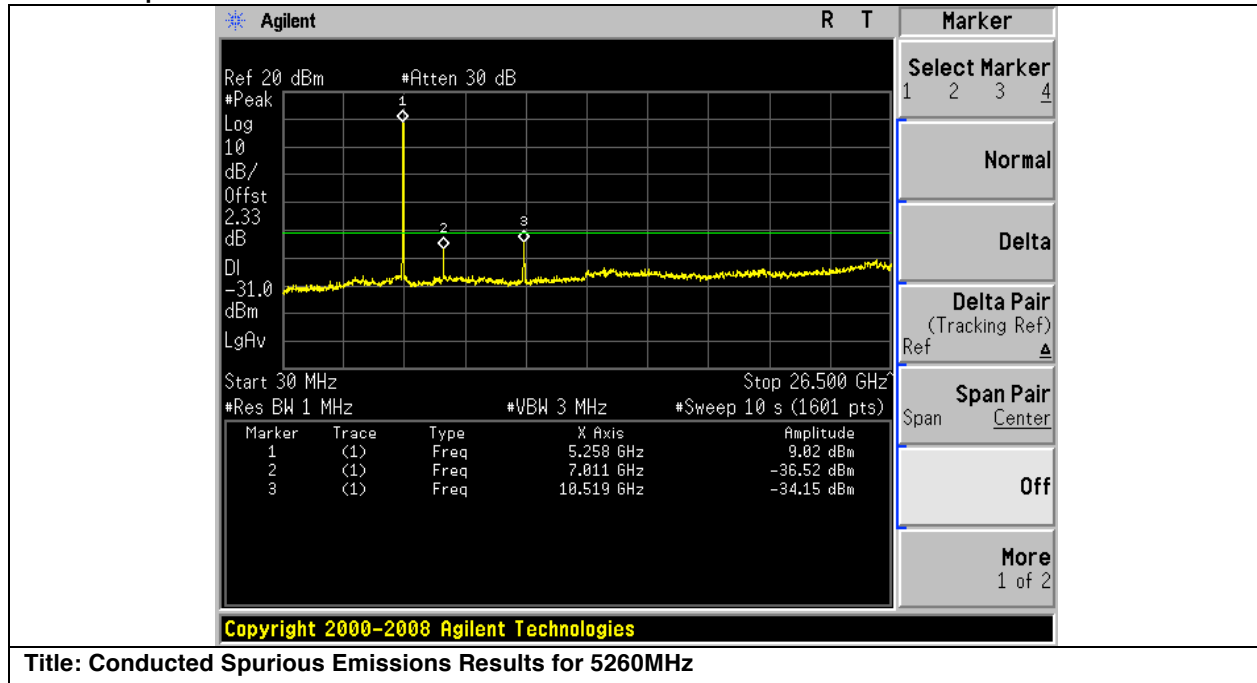
Connect the antenna port(s) to the spectrum analyzer input. Place the radio in continuous transmit mode. Configure the spectrum analyzer as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer).

Span:	30 MHz-40 GHz
Reference Level:	20 dBm
Attenuation:	10 dB
Sweep Time:	10 s
Resolution Bandwidth:	1 MHz
Video Bandwidth:	3 MHz
Detector:	Peak
Trace:	Single
Marker:	Peak

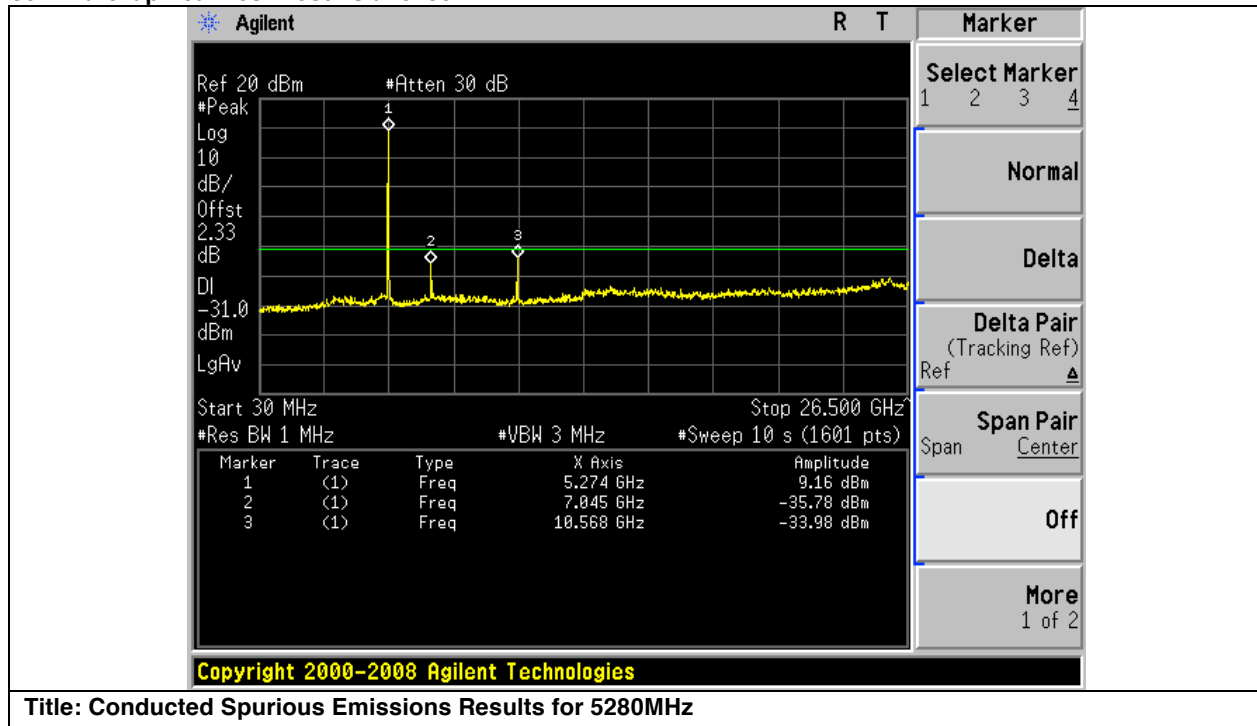
Record the marker waveform peak to spur difference

Note: Worse Case data rate was set during all measurements.

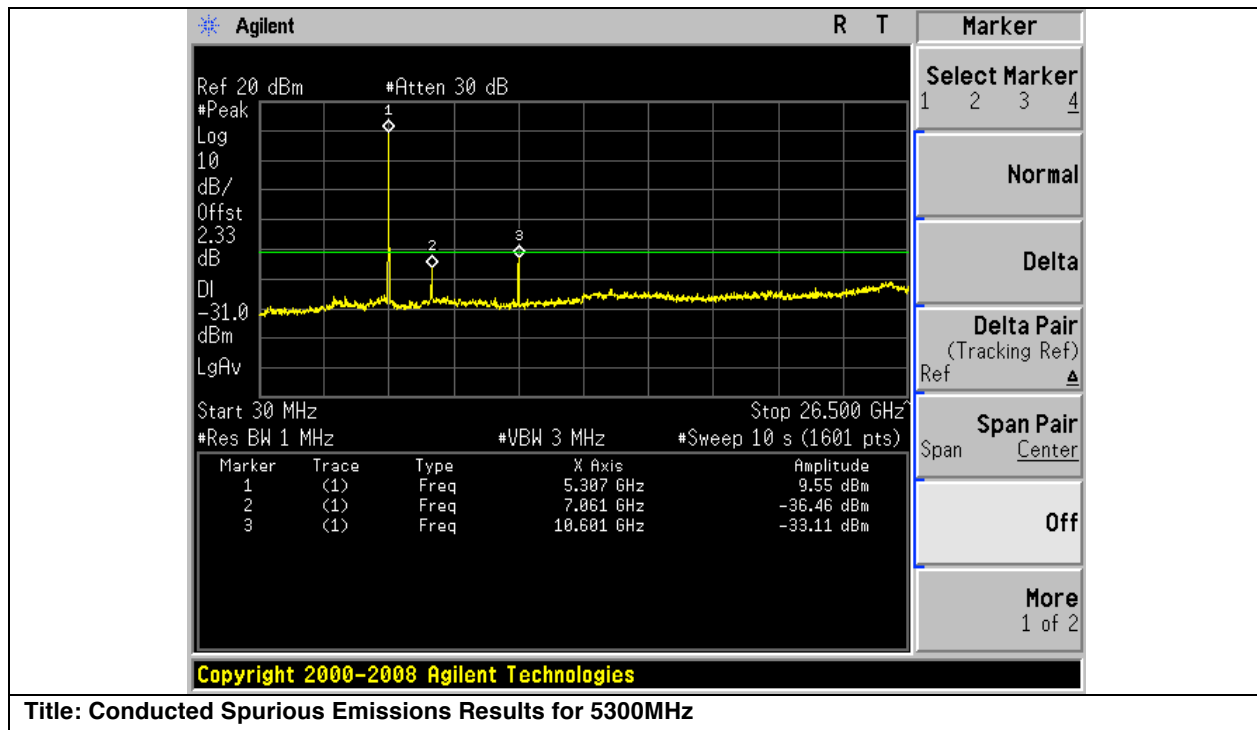
802.11a Graphical Test Results at 5260MHz:



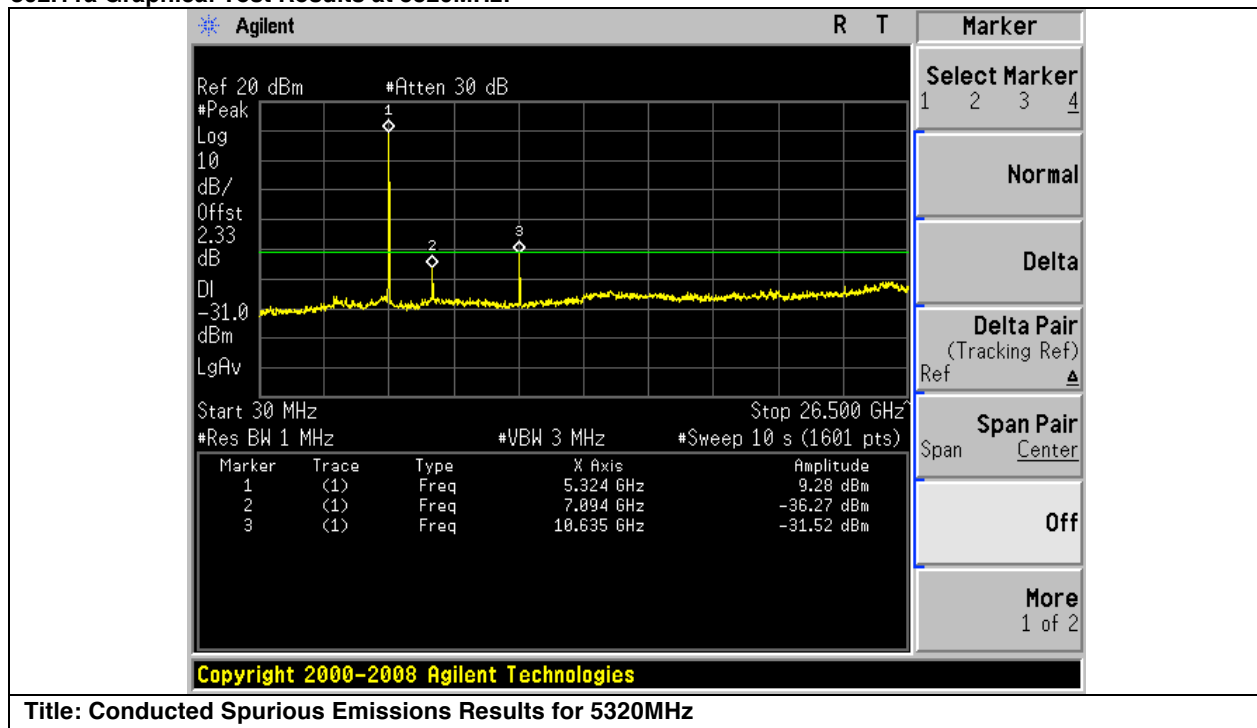
802.11a Graphical Test Results at 5280MHz:



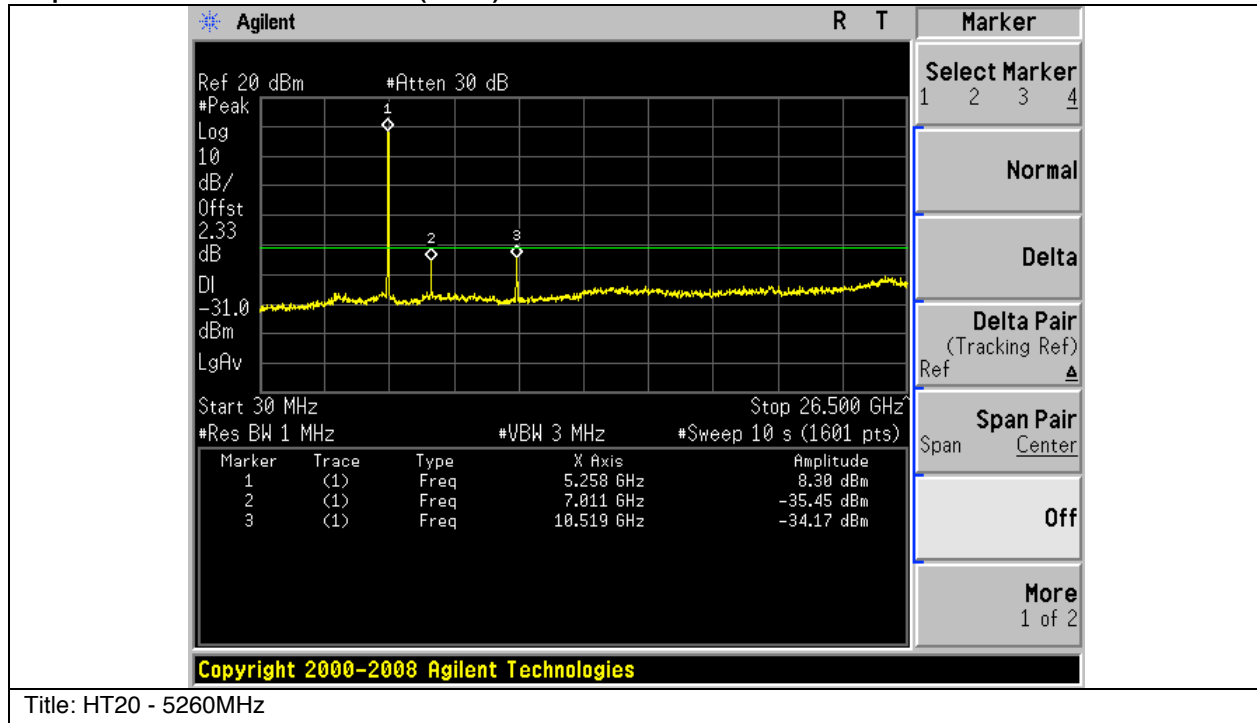
802.11a Graphical Test Results at 5300MHz:



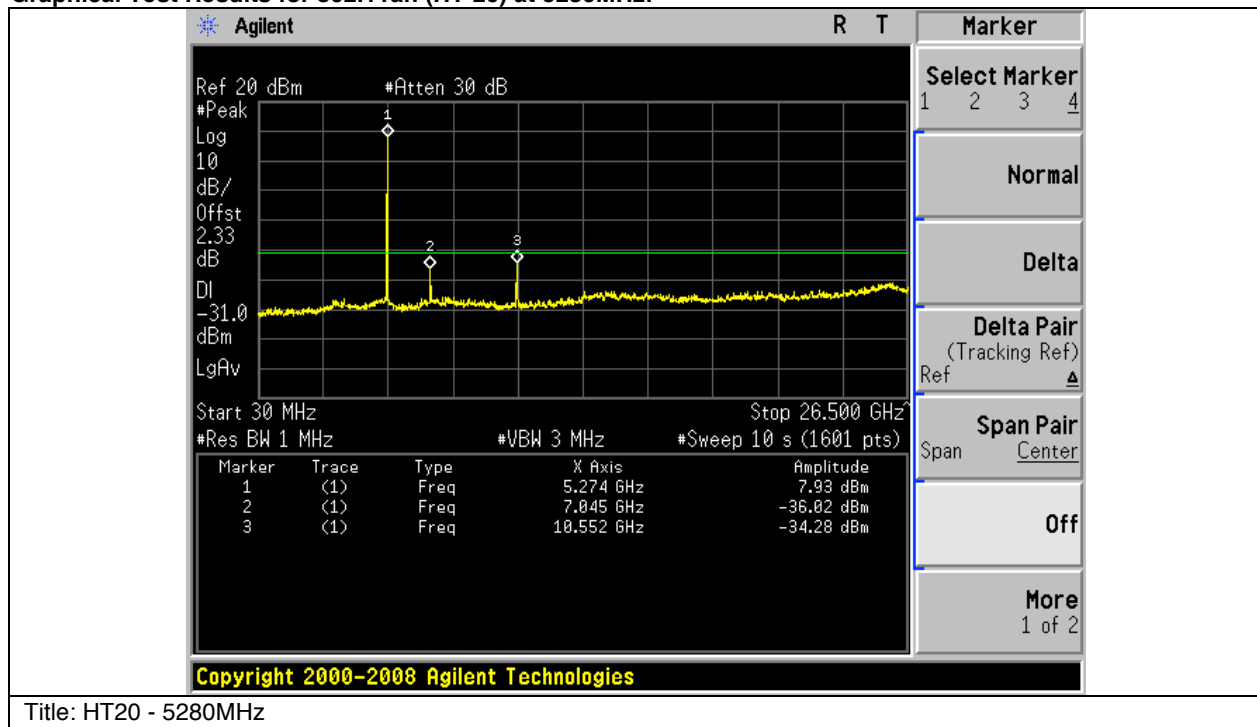
802.11a Graphical Test Results at 5320MHz:



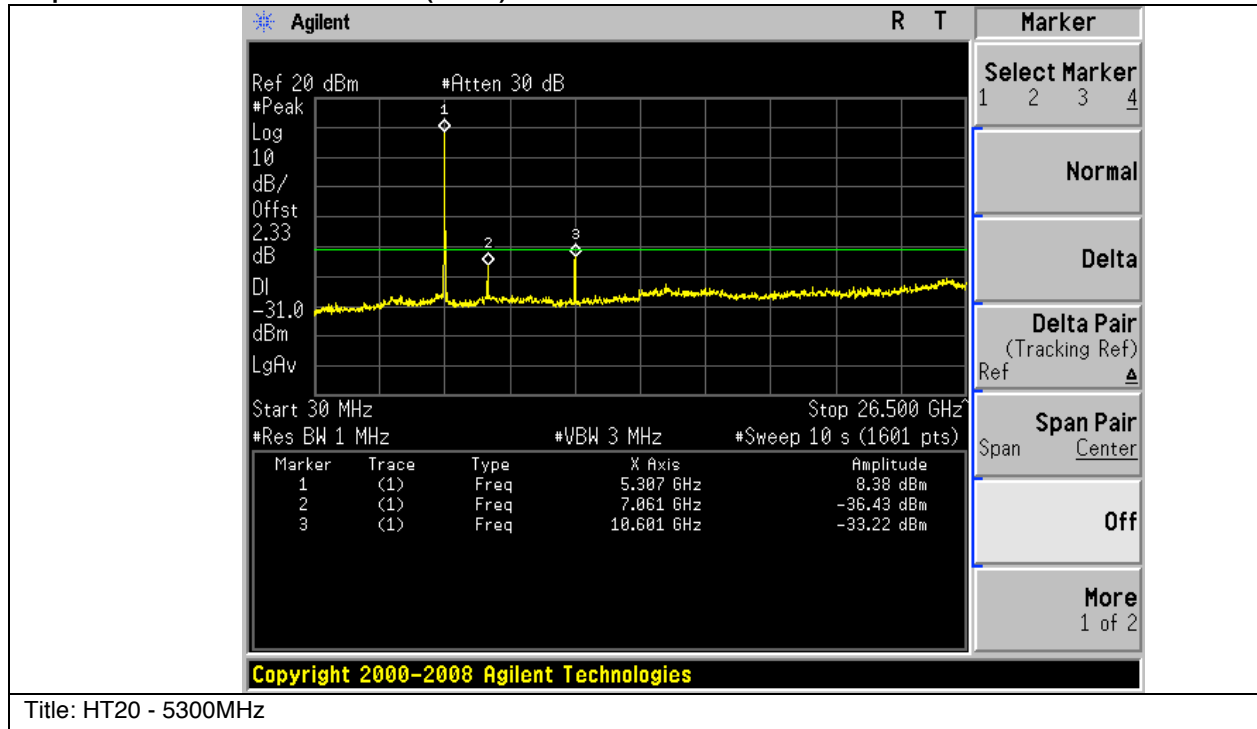
Graphical Test Results for 802.11an (HT-20) at 5260MHz:



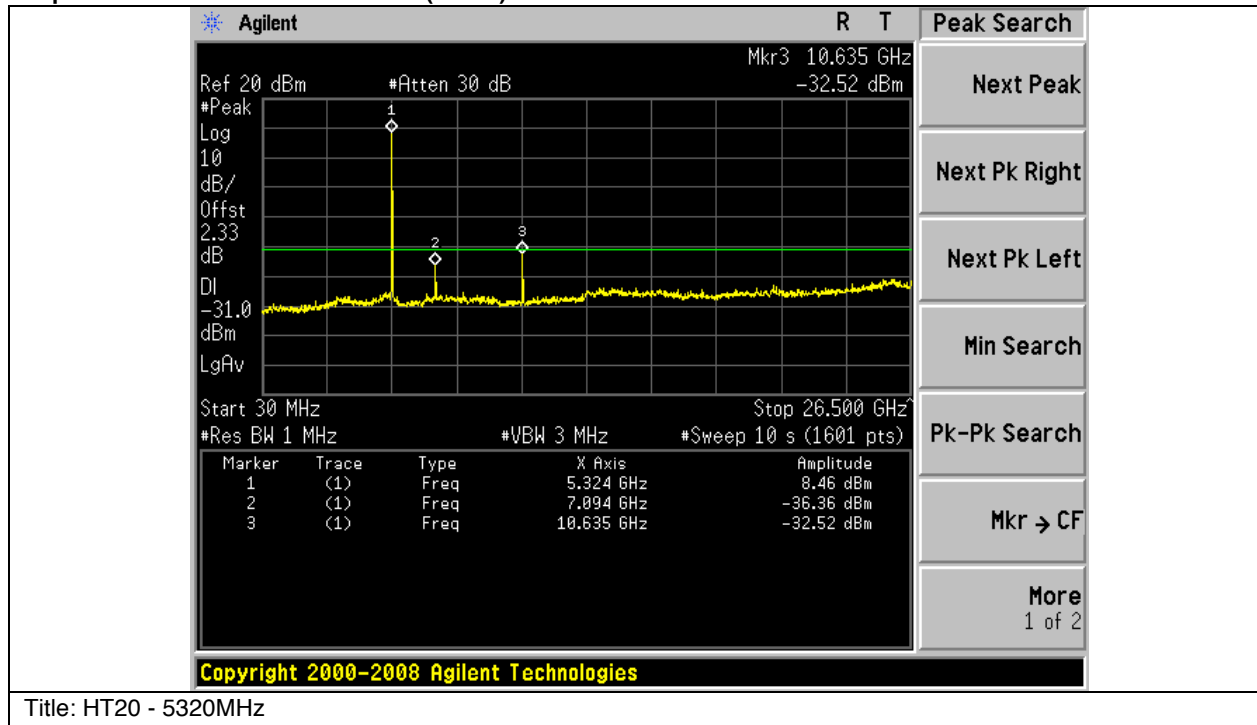
Graphical Test Results for 802.11an (HT-20) at 5280MHz:



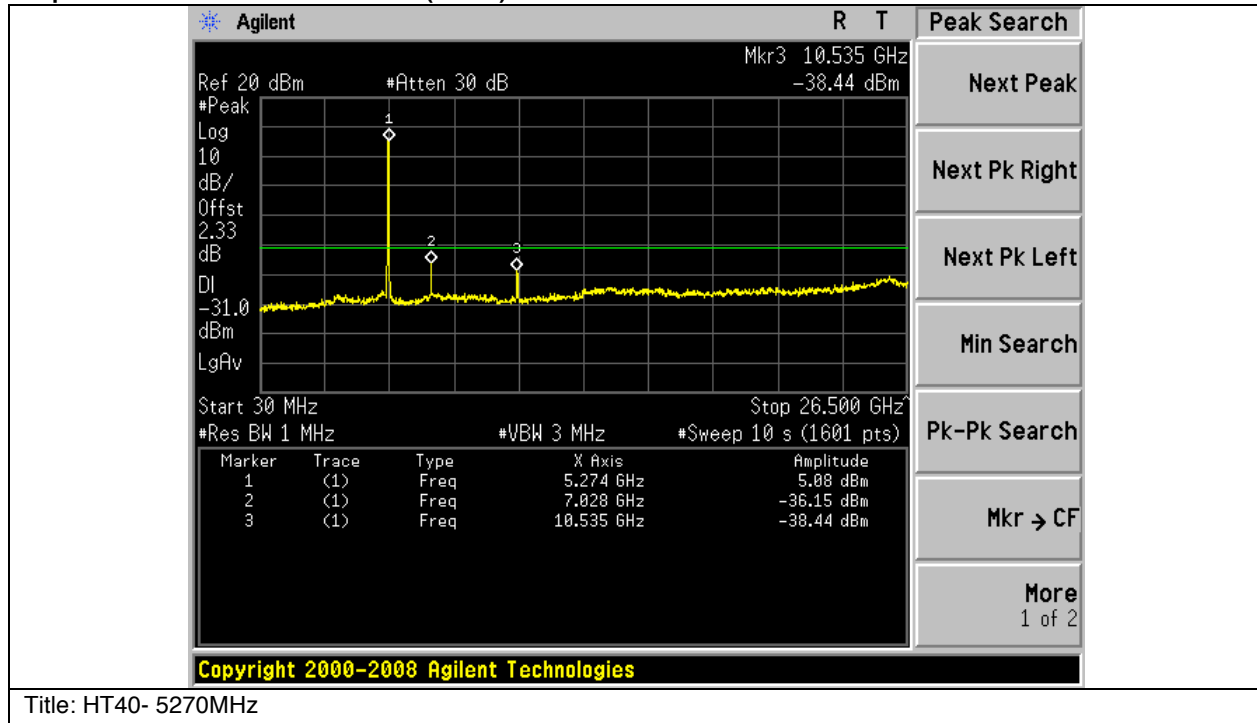
Graphical Test Results for 802.11an (HT-20) at 5300MHz:



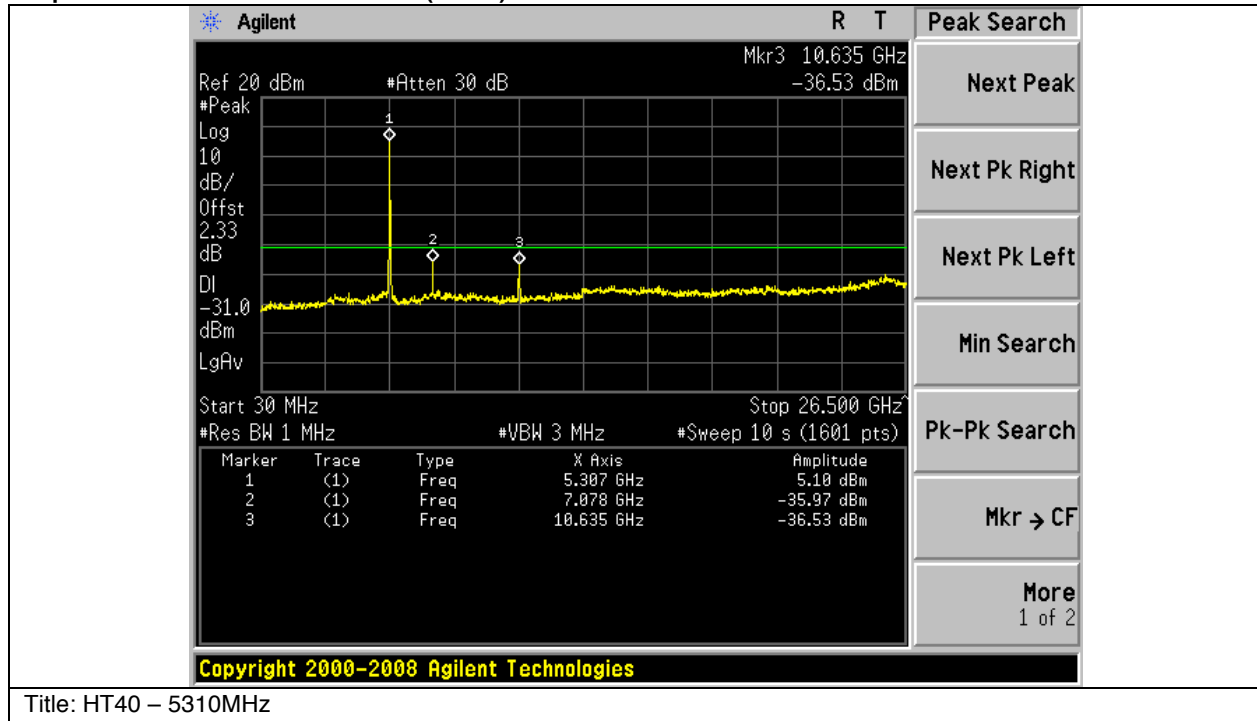
Graphical Test Results for 802.11an (HT-20) at 5320MHz:

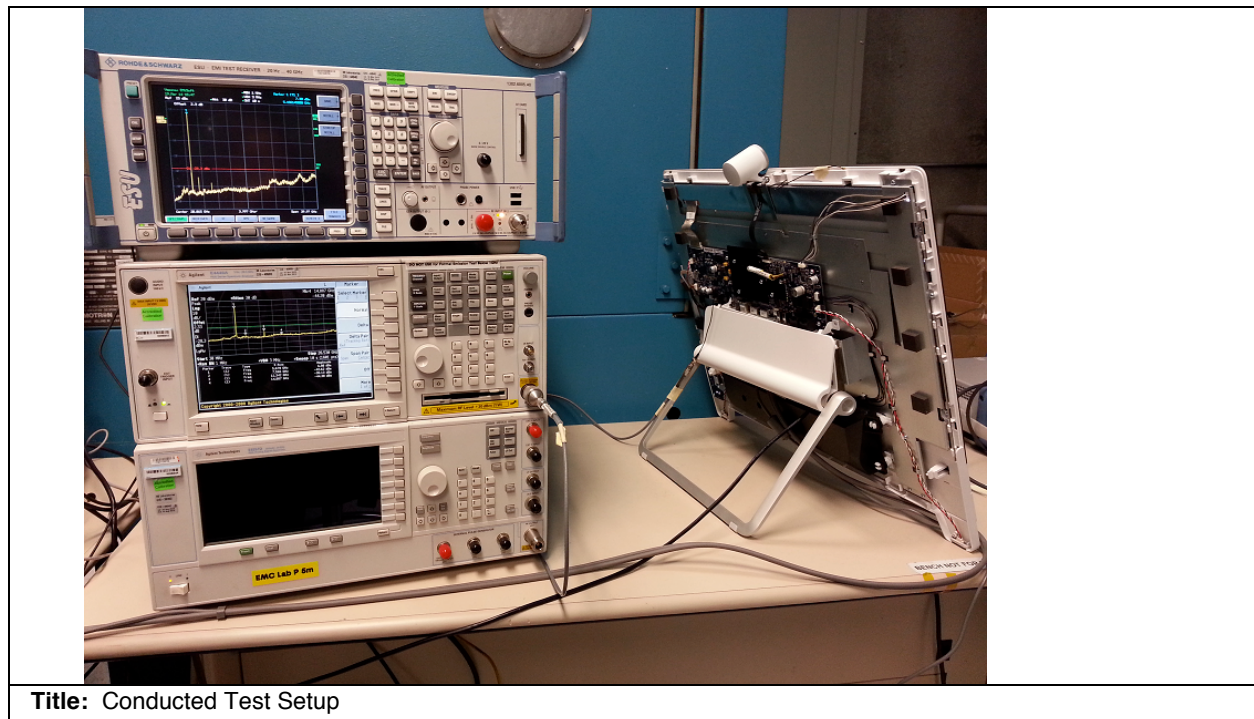


Graphical Test Results for 802.11an (HT-40) at 5270MHz:



Graphical Test Results for 802.11an (HT-40) at 5310MHz:





Conducted Band Edge

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Connect the antenna port(s) to the spectrum analyzer input. Place the radio in continuous transmit mode. Be sure to enter all losses between the transmitter output and the spectrum analyzer.

Reference Level: 10 dBm
Attenuation: 4 dB
Sweep Time: Coupled
Resolution Bandwidth: 1MHz
Video Bandwidth: 1 MHz for peak, 100 Hz for average
Detector: Peak

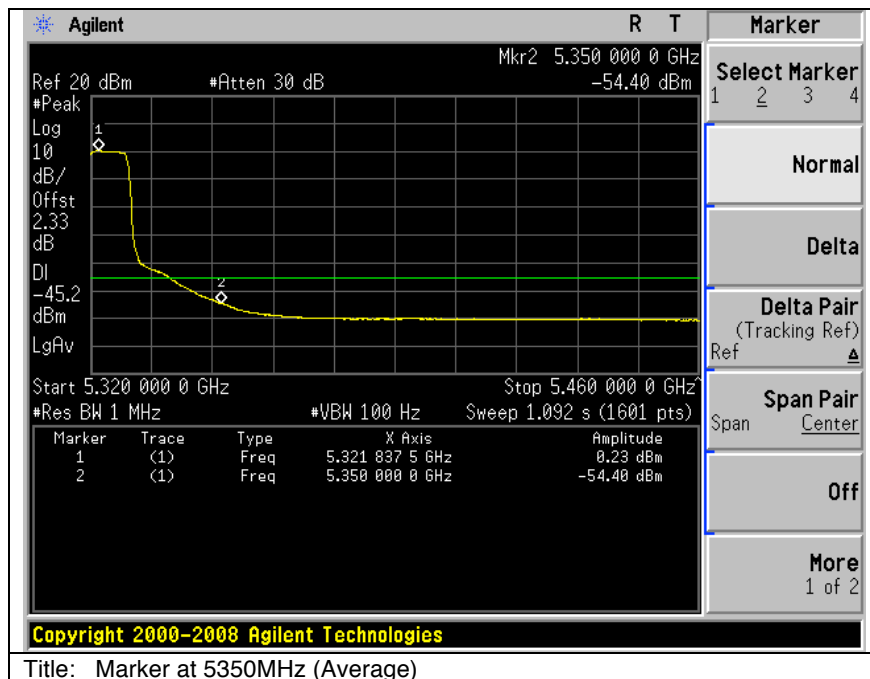
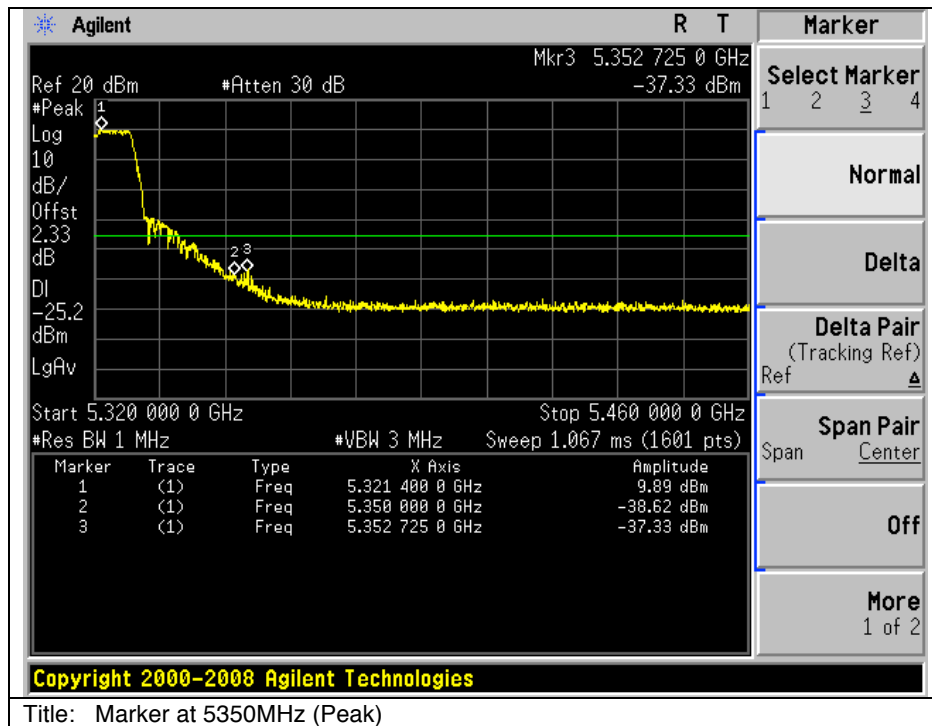
Save 2 plots: 1) Average Plot (Vertical and Horizontal), Limit= -41.25 dBm eirp (54dBuV @3m)
2) Peak plot (Vertical and Horizontal), Limit = -21.25 dBm eirp (74dBuV @3m)

Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands.

802.11a Band edge Test Results:

Mode	Transmit Frequency (MHz)	Measurement Type	Data Rate (Mbps)	Marker (MHz)	Band Edge Level (dBm)	Limit (dBm)	Limit adjusted for antenna gain (dBm)	Margin (dB)
802.11a	5320	Peak	6	5350	-38.62	-21.25	-25.2	-13.42
	5320	Average	6	5350	-54.4	-41.25	-45.2	-9.2

Graphical Test Results for 802.11a:

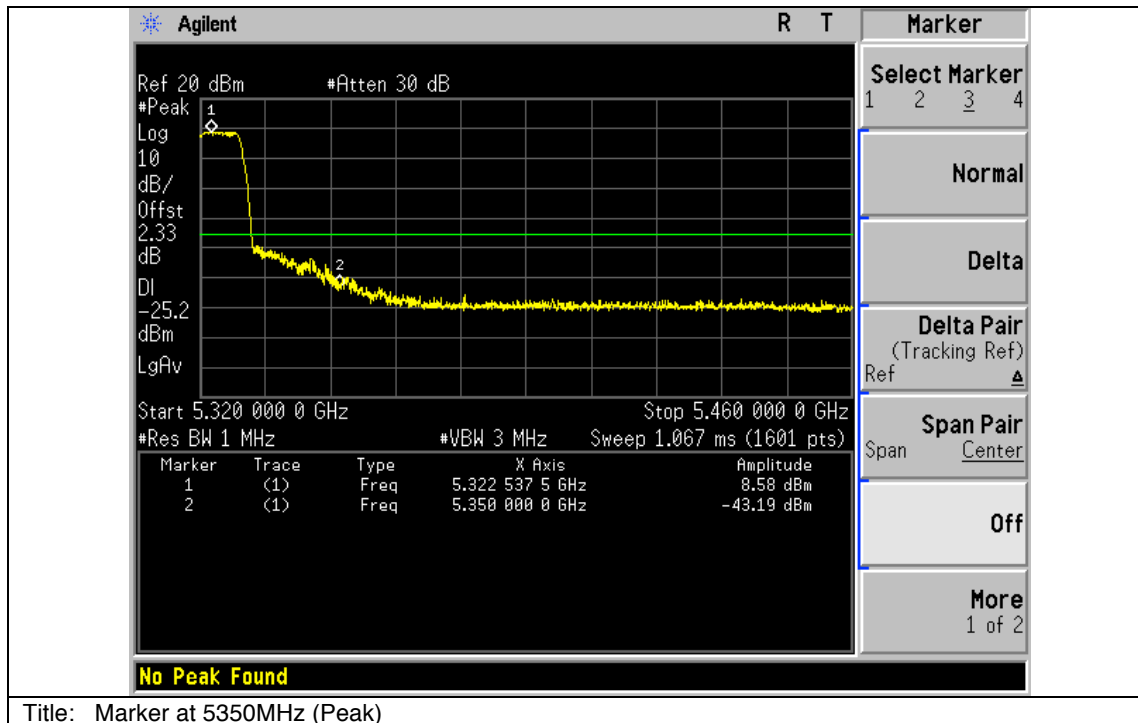


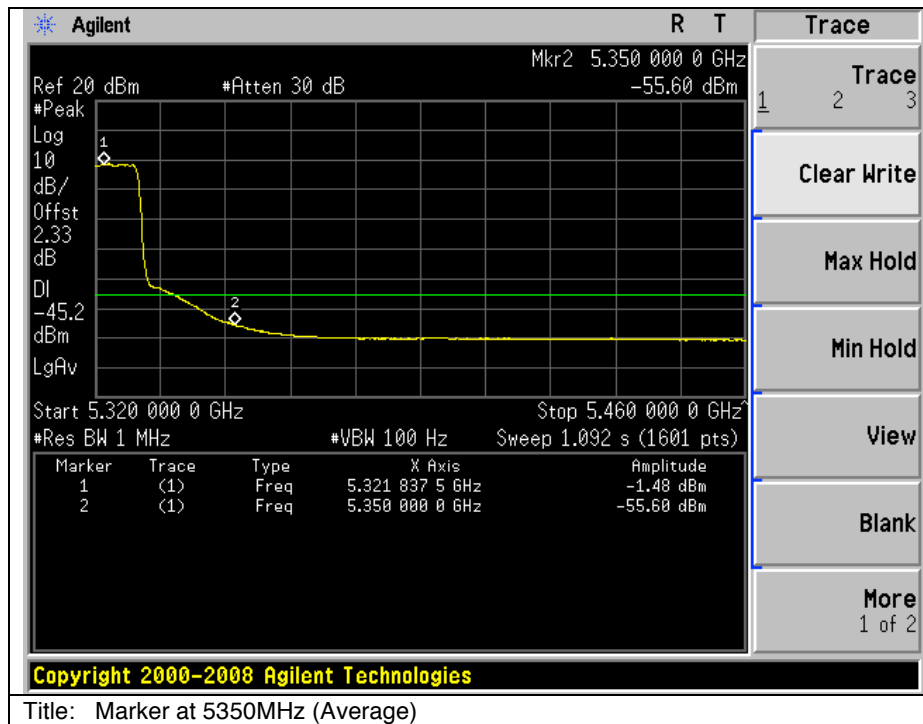


802.11n (HT-20) Band edge Test Results:

Mode	Transmit Frequency (MHz)	Measurement Type	Data Rate (Mbps)	Marker (MHz)	Band Edge Level (dBm)	Limit (dBm)	Limit adjusted for antenna gain (dBm)	Margin (dB)
802.11n HT20	5320	Peak	M0	5350	-43.19	-21.25	-25.2	-17.99
	5320	Average	M0	5350	-55.6	-41.25	-45.2	-10.4

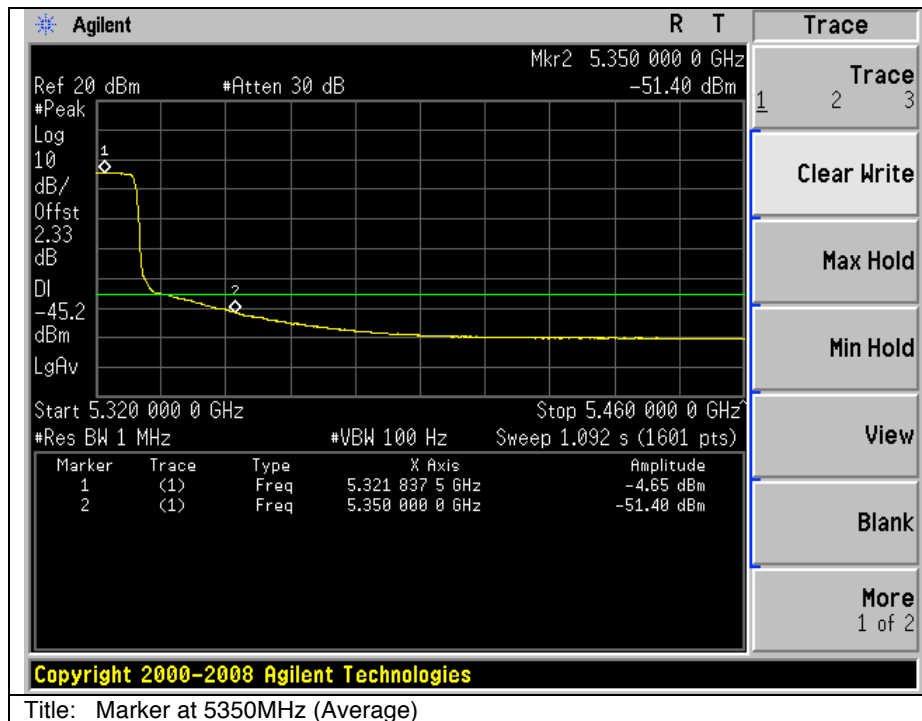
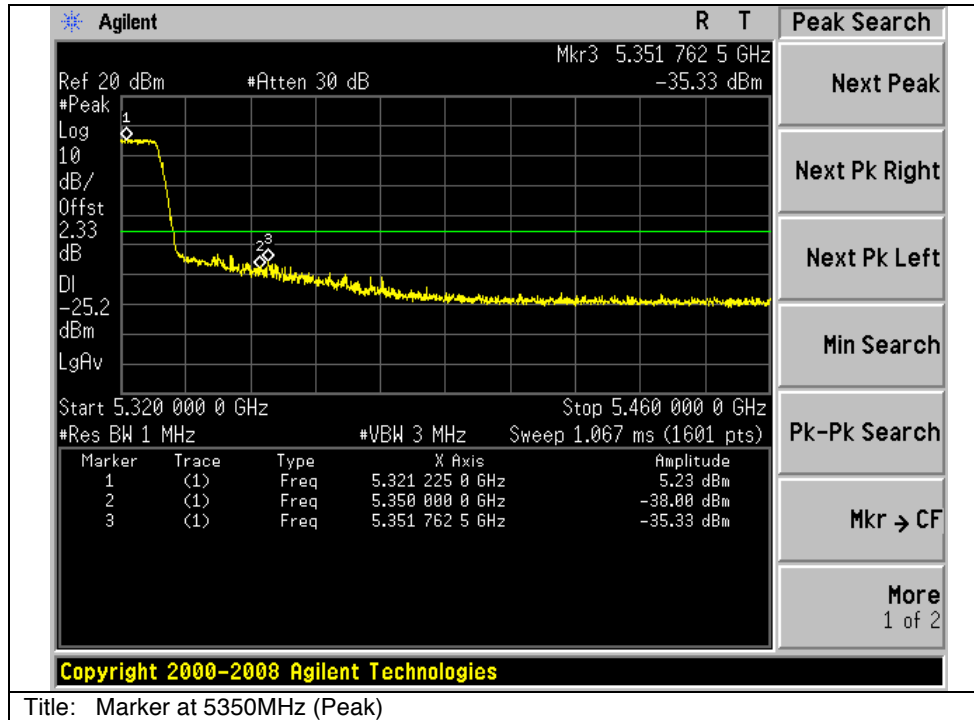
Graphical Test Results for 802.11n – HT20 Mode:





802.11n (HT-40) Band edge Test Results:

Mode	Transmit Frequency (MHz)	Measurement Type	Data Rate (Mbps)	Marker (MHz)	Band Edge Level (dBm)	Limit (dBm)	Limit adjusted for antenna gain (dBm)	Margin (dB)
802.11n HT40	5310	Peak	M0	5350	-48.19	-21.25	-25.2	-22.99
	5310	Average	M0	5350	-35.82	-41.25	-45.2	-3.95





Appendix B: Emission Test Results

Testing Laboratory: Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134, USA

Radiated Spurious Emissions

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Using Vasona, configure the spectrum analyzer as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer). Place the radio in continuous transmit mode.

Span:	1GHz – 18 GHz
Reference Level:	80 dBuV
Attenuation:	10 dB
Sweep Time:	Coupled
Resolution Bandwidth:	1MHz
Video Bandwidth:	1 MHz for peak, 10 Hz for average
Detector:	Peak

Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

Save 2 plots: 1) Average Plot (Vertical and Horizontal), Limit= 54dBuV @3m
 2) Peak plot (Vertical and Horizontal), Limit = 74dBuV @3m

Place a marker at the end of the restricted band closest to the transmit frequency to show compliance.
Also measure any emissions in the restricted bands.

This report represents the worst case data for all supported operating modes and antennas.
System was evaluated up to 40GHz but there were no measurable emissions above 18 GHz.

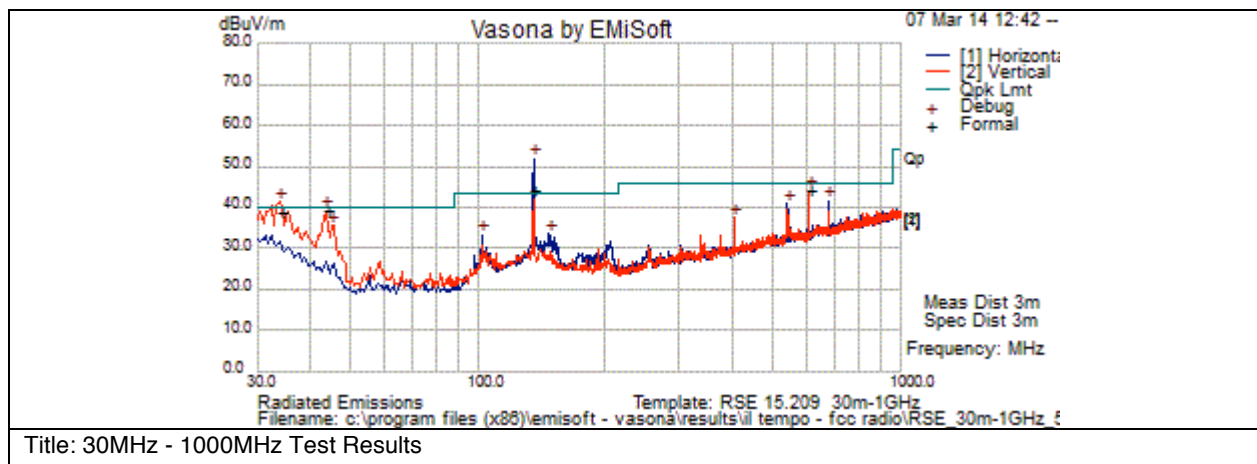
Note: A Notch Filter was used during formal testing from 1 - 18GHz to help prevent the front end of the analyzer from over loading. The Notch filters used are designed to suppress Tx fundamental frequency but do not effect harmonics of the fundamental frequency from being measured



Note: Emission at 135MHz will be evaluated during EMC testing and assessed against the applicable limits. The emission at 135MHz was not caused by the radio. A scan was performed with the radio transmitting. Another scan was performed with the radio transmitter turned off. The emission at 135MHz was present in both cases, which proves it was an EMC issue. The source of the emission was determined. There is a cable that is held in place with a piece of foam with a sticky side. The sticky foam had separated from the metal it was originally placed on. For comparison, a measurement was performed with the foam pressed back down. The result was passing (See Graphical Test Results 30MHz – 1000MHz (Transmitter Off) result with -1.6dB margin below).

Graphical Test Results: 30MHz – 1000MHz (Transmitter On)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



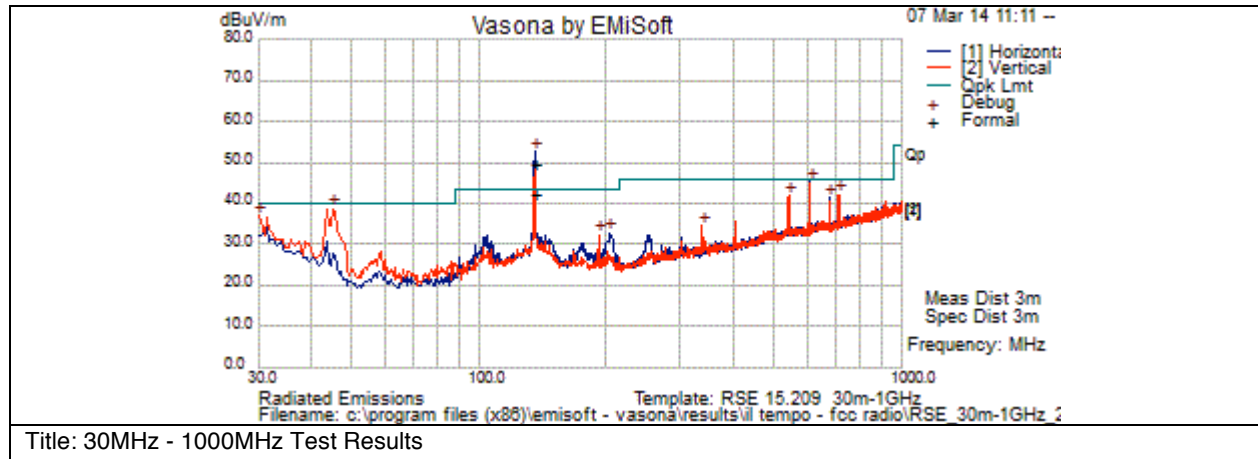
Test Results Table

Formal Data													
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	34.05	20.6	0.5	17.6	38.7	Quasi Peak	V	102	126	40	-1.3	Pass	Digital Emission
2	43.8	27.5	0.6	11.1	39.2	Peak [Scan]	V	100	89	40	-0.8	Pass	Digital Emission
3	608.12	23	2.3	18.8	44	Peak [Scan]	H	300	119	46	-2	Pass	
4	135.168	29.4	1.1	13.6	44.1	Quasi Peak	H	200	0	43.5	0.6	NA	Digital Emission



Graphical Test Results: 30MHz – 1000MHz (Transmitter Off)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Test Results Table

Formal Data													
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	135.168	34.7	1.1	13.6	49.4	Quasi Peak	H	200	0	43.5	5.9	NA	Digital Emission
2	135.168	27.3	1.1	13.6	41.9	Quasi Peak	H	200	0	43.5	-1.6	Pass	