

# RF TEST REPORT

Test item : Cellular/PCS GSM/GPRS/EDGE and Cellular WCDMA/HSPA  
Phone with Bluetooth and WLAN  
Model No. : LG-P768f, LG-P768F, LGP768f, LGP768F, P769f, P769F  
Order No. : DEMC1207-01175  
Date of receipt : 2012-07-13  
Test duration : 2012-07-27 ~ 2012-08-24  
Date of issue : 2012-09-11  
Use of report : FCC Original Grant

Applicant : LG Electronics MobileComm U.S.A., Inc.  
1000 Sylvan Avenue, Englewood Cliffs NJ 07632

Test laboratory : Digital EMC Co., Ltd.  
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, 449-080, Korea

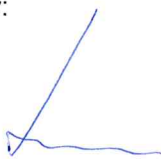
Test specification : FCC Part 15.407 Subpart E  
ANSI C63.4-2003, KDB 789033

Test environment : See appended test report

Test result :  Pass  Fail

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of Digital EMC Co., Ltd.

Tested by:



Engineer  
S.K. Ryu

Witnessed by:

N/A

Reviewed by:



Technical Director  
Harvey sung

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# 1. EUT information

## 1.1 EUT description

<b>FCC Equipment Class</b>	Unlicensed National Information Infrastructure (UNII)
<b>Product</b>	Cellular/PCS GSM/GPRS/EDGE and Cellular WCDMA/HSPA Phone with Bluetooth and WLAN
<b>Model Name</b>	LG-P768f
<b>Add Model Name</b>	LG-P768F, LGP768f, LGP768F, P769f, P769F
<b>Equipment serial no.</b>	Identical prototype
<b>Frequency Range</b>	802.11a/n(20MHz) : Band I: 5180 ~ 5240MHz Band II: 5260 ~ 5320MHz Band III: 5500 ~ 5700MHz
<b>Channel number</b>	802.11a/n(20MHz): 4 (Band I) / 4 (Band II) / 8 (Band III)
<b>Modulation type</b>	802.11a/n : OFDM
<b>Data rate</b>	802.11a/g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n(20MHz): 6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps
<b>Antenna Specification</b>	Internal Antenna (1TX / 1RX) / Max. peak gain: -0.63dBi
<b>Power Supply</b>	DC 3.8 V

## 1.2 Ancillary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

## 2. Information about test items

### 2.1 Test mode / Channel Information

5GHz Band	Mode	Data Rate
Band I	802.11a	6Mbps
	802.11n(20MHz)	MCS0
	802.11n(40MHz)	-
Band II	802.11a	6Mbps
	802.11n(20MHz)	MCS0
	802.11n(40MHz)	-
Band III	802.11a	6Mbps
	802.11n(20MHz)	MCS0
	802.11n(40MHz)	-

For all test items, the low, middle and high channels of the modes were tested with above worst case data rate.

### 2.2 Tested Channel Information

5GHz Band	802.11a/n(20MHz)		802.11n(40MHz)	
	Channel	Frequency [MHz]	Channel	Frequency [MHz]
Band I	36	5180	-	-
	40	5200	-	-
	48	5240	-	-
Band II	52	5260	-	-
	60	5300	-	-
	64	5320	-	-
Band III	100	5500	-	-
	116	5580	-	-
	140	5700	-	-

### 2.3 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

## 2.4 Tested environment

Temperature	: 24 °C
Relative humidity content	: 47 ~ 54 % R.H.
Details of power supply	: DC 3.8 V

## 2.5 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing  
→ None

### 3. Test Report

#### 3.1 Summary of tests

FCC Part Section(s)	RSS Section(s)	Parameter	Limit	Test Condition	Status Note 1
<b>I. Transmitter Mode (TX)</b>					
15.407(a)	N/A	26 dB Bandwidth for FCC	N/A	Conducted	<b>C</b>
15.407(a)	RSS-210 [A9.2]	Maximum Conducted Output Power	< 4 + 10log <sub>10</sub> (B) dBm (5150-5250) < 11 + 10log <sub>10</sub> (B) dBm (5250-5350) < 11 + 10log <sub>10</sub> (B) dBm (5470-5725)		<b>C</b>
15.407(a)	RSS-210 [A9.2]	Peak Power Spectral Density	< 4 dBm/MHz (5150-5250) < 11 dBm/MHz (5250-5350) < 11 dBm/MHz (5470-5725)		<b>C</b>
15.407(a)	N/A	Peak Excursion	< 13 dB/MHz maximum difference		<b>C</b>
15.407(g)	N/A	Frequency Stability	N/A		<b>C</b>
-	RSS Gen [4.6.1]	Occupied Bandwidth (99%)	N/A		<b>NA</b>
15.407(b)	RSS-210 [A9.2]	Undesirable Emissions	< -27 dBm/MHz EIRP (5150-5725)	Radiated	<b>C</b>
15.205 15.209 15.407(b)	RSS-Gen [7.2.5]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		<b>C</b>
15.407(h)	RSS-210 [A9.3]	Dynamic Frequency Selection	See DFS Test Report		<b>C</b> <sup>Note3</sup>
15.207	RSS-Gen [7.2.4]	AC Conducted Emissions	FCC 15.207	AC Line Conducted	<b>C</b>
15.203	RSS-Gen [7.1.2]	Antenna Requirements	FCC 15.203	-	<b>C</b>
Note 1: <b>C</b> =Comply <b>NC</b> =Not Comply <b>NT</b> =Not Tested <b>NA</b> =Not Applicable Note 2: These test items were performed in each axis and the worst case data was reported. Note 3: Refer to the DFS Test Report.					

### 3.2 Transmitter requirements

#### 3.2.1 26 dB Bandwidth

##### Test Requirements

The bandwidth at 26 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies. The 26dB bandwidth is used to determine the conducted output power limit.

##### ■ TEST CONFIGURATION

Refer to the APPENDIX I.

##### ■ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of **KDB789033**.

1. Set resolution bandwidth (RBW) = approximately 1 % of the EBW.
2. Set the video bandwidth (**VBW**) > **RBW**.
3. Detector = **Peak**.
4. Trace mode = **max hold**.

Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

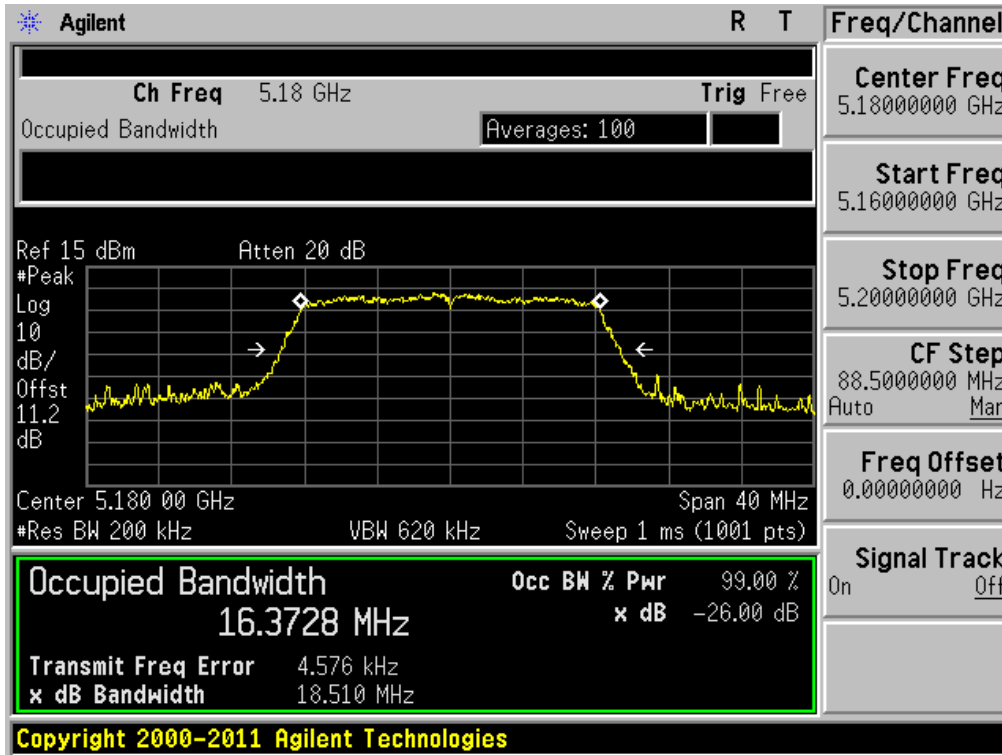
##### ■ TEST RESULTS: **Comply**

Mode	Band	Channel	Frequency [MHz]	Test Result [MHz]
802.11a	Band I	36	5180	18.510
		40	5200	18.553
		48	5240	18.464
	Band II	52	5260	18.425
		60	5300	18.481
		64	5320	18.425
	Band III	100	5500	18.537
		116	5580	18.464
		140	5700	18.592
802.11n (20MHz)	Band I	36	5180	18.953
		40	5200	18.919
		48	5240	18.936
	Band II	52	5260	18.858
		60	5300	18.926
		64	5320	19.027
	Band III	100	5500	18.940
		116	5580	18.912
		140	5700	18.946

RESULT PLOTS

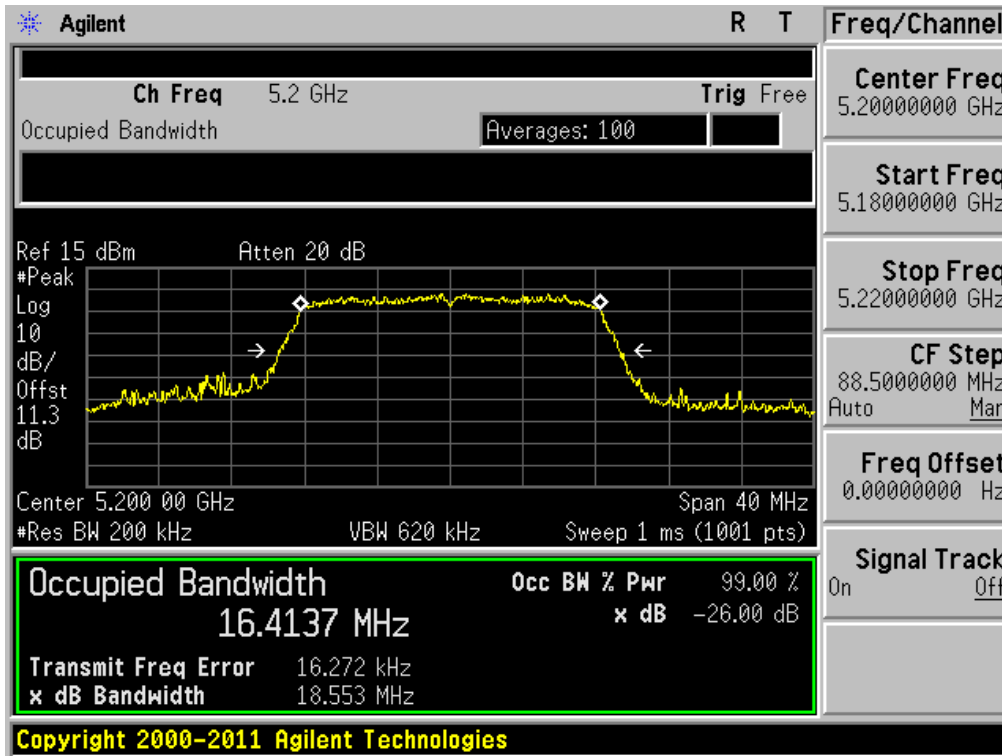
26 dB Bandwidth

Test Mode: 802.11a & Ch.36



26 dB Bandwidth

Test Mode: 802.11a & Ch.40

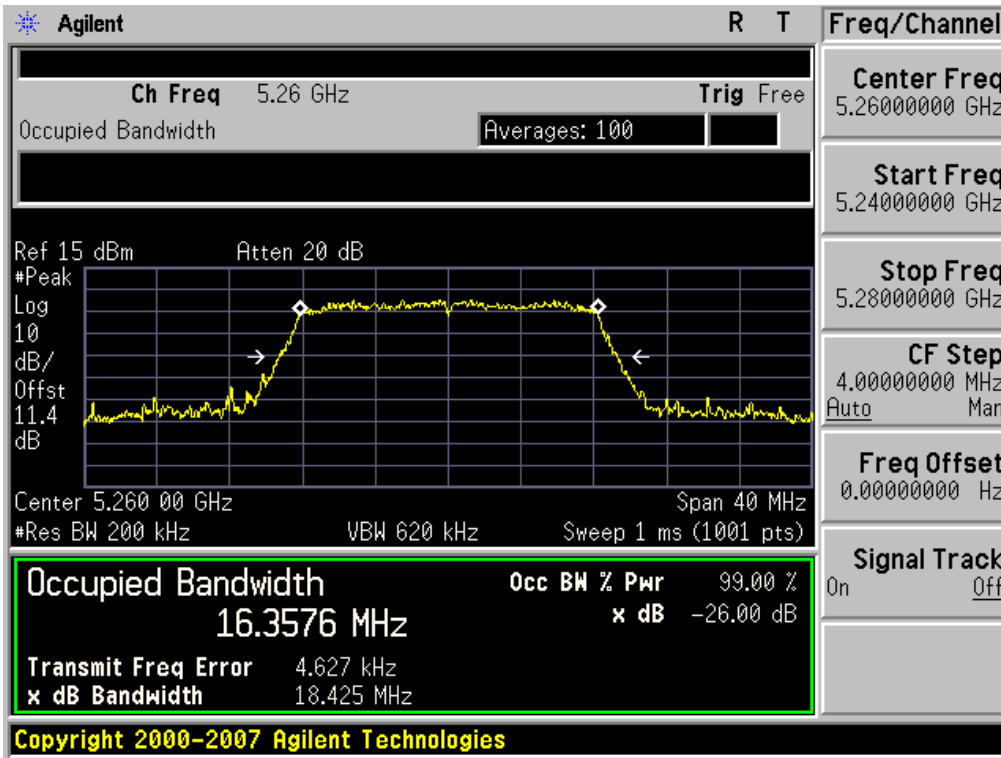






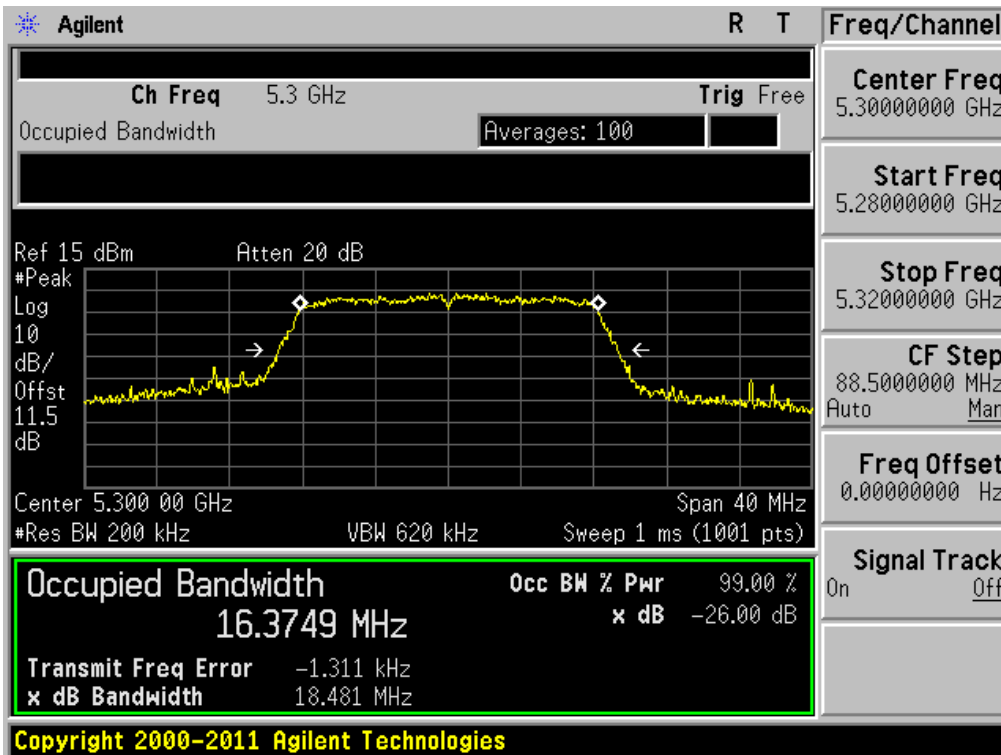
26 dB Bandwidth

Test Mode: 802.11a & Ch.52



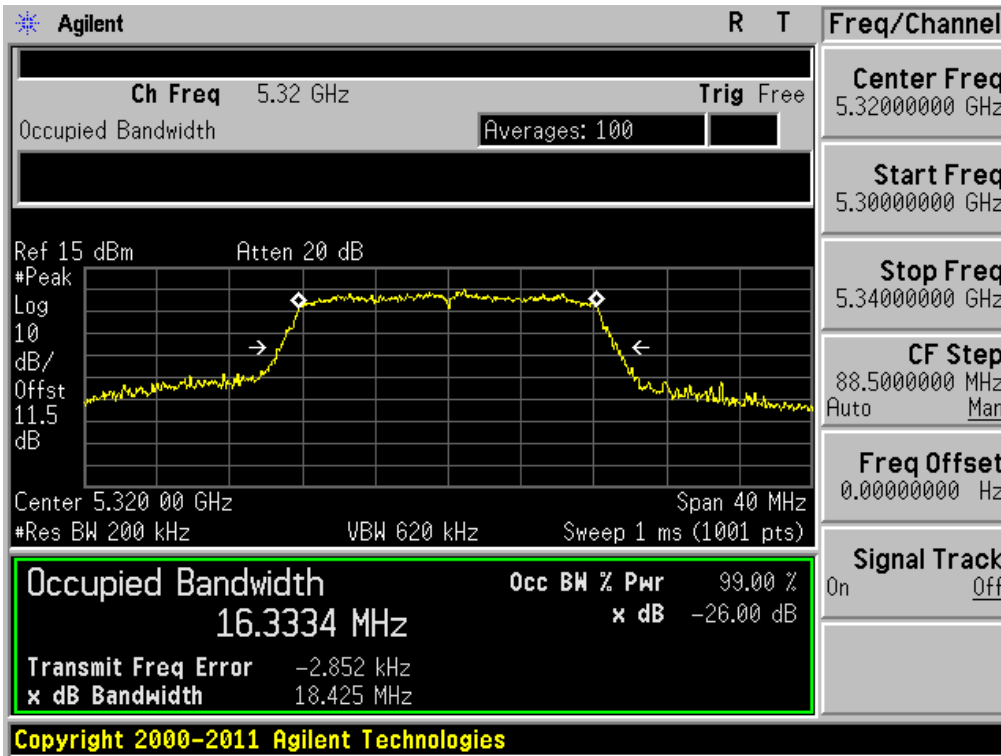
26 dB Bandwidth

Test Mode: 802.11a & Ch.60



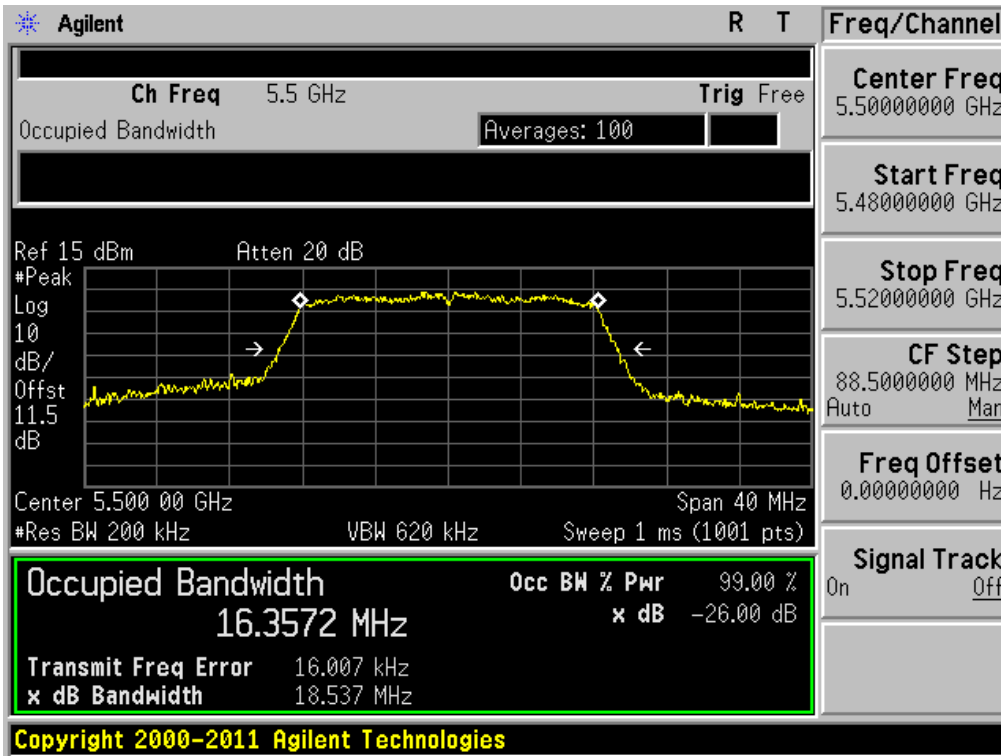
26 dB Bandwidth

Test Mode: 802.11a & Ch.64



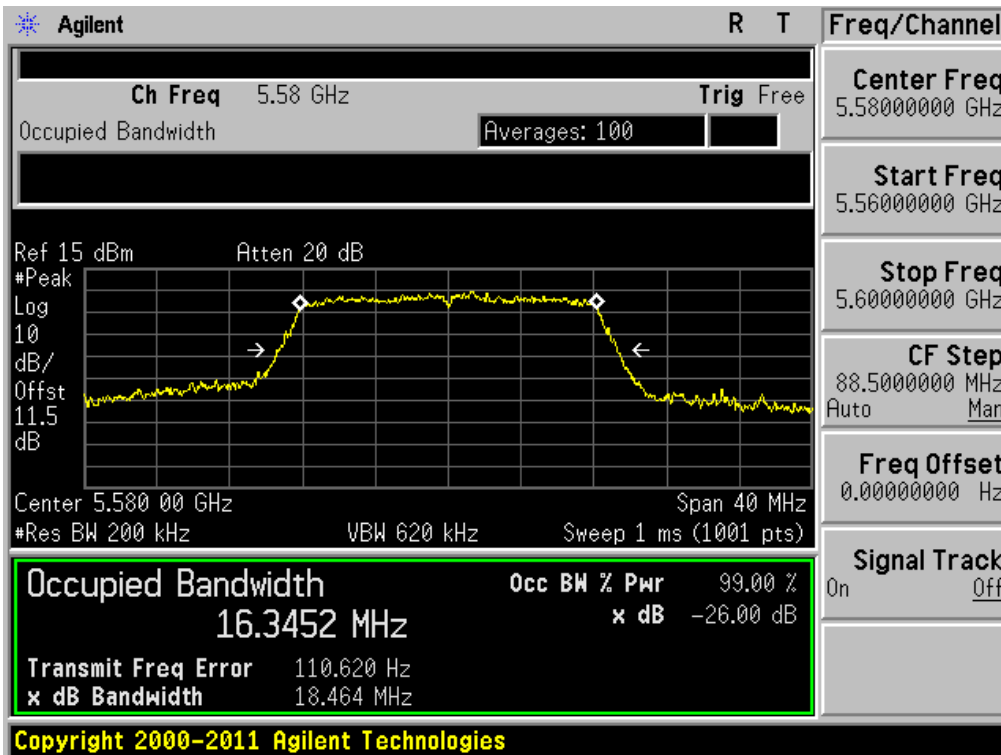
26 dB Bandwidth

Test Mode: 802.11a & Ch.100



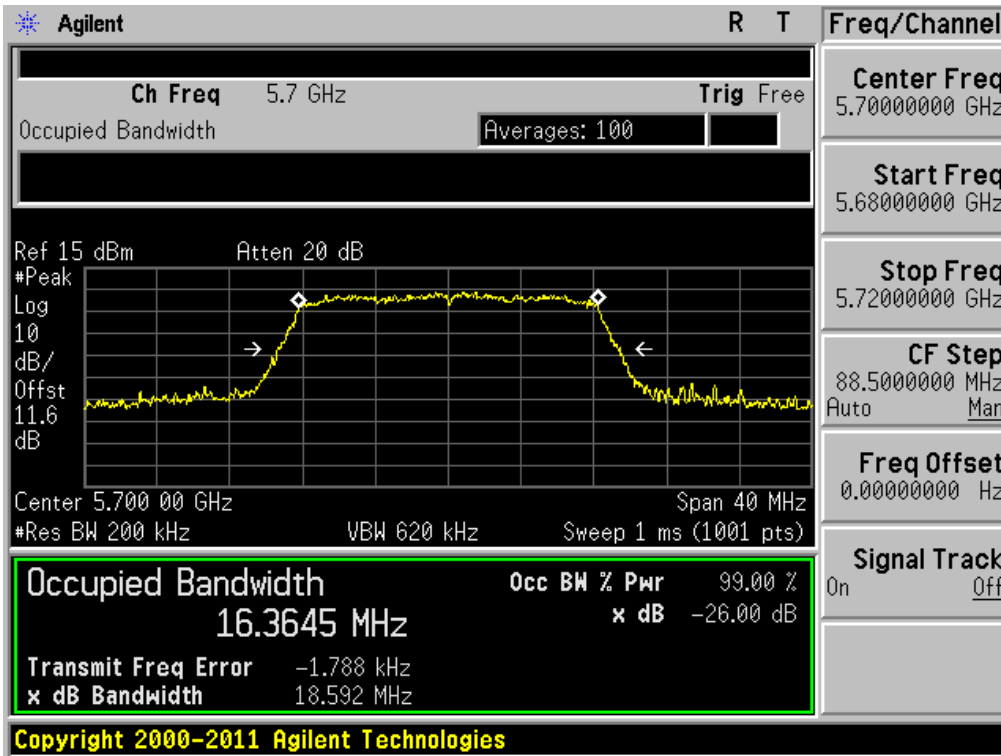
26 dB Bandwidth

Test Mode: 802.11a & Ch.116



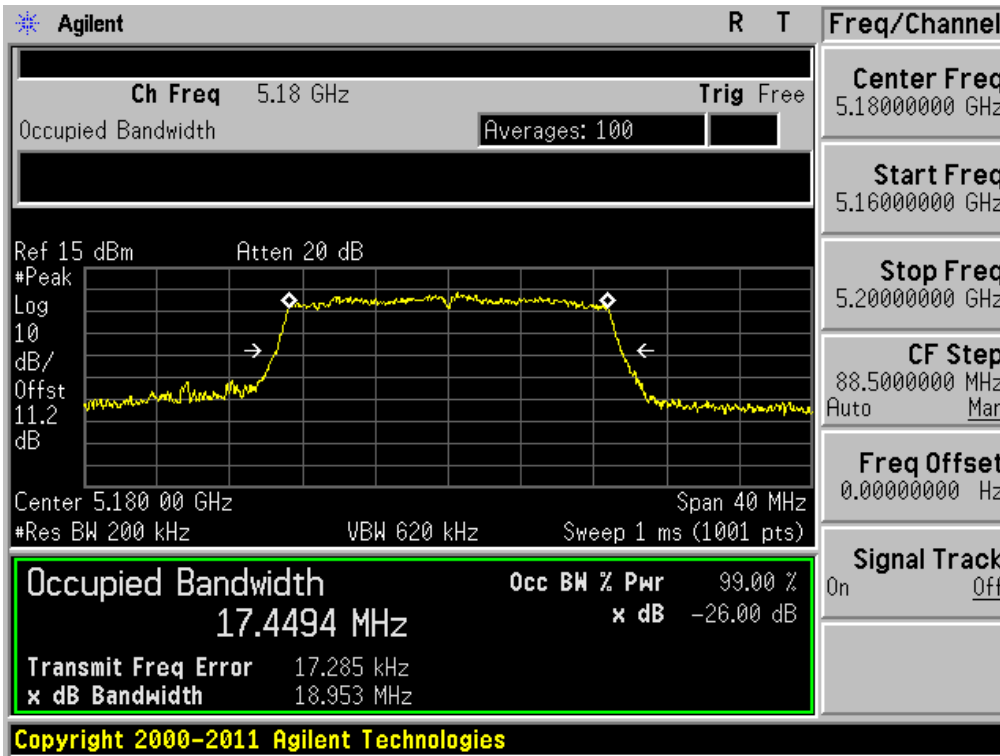
26 dB Bandwidth

Test Mode: 802.11a & Ch.140



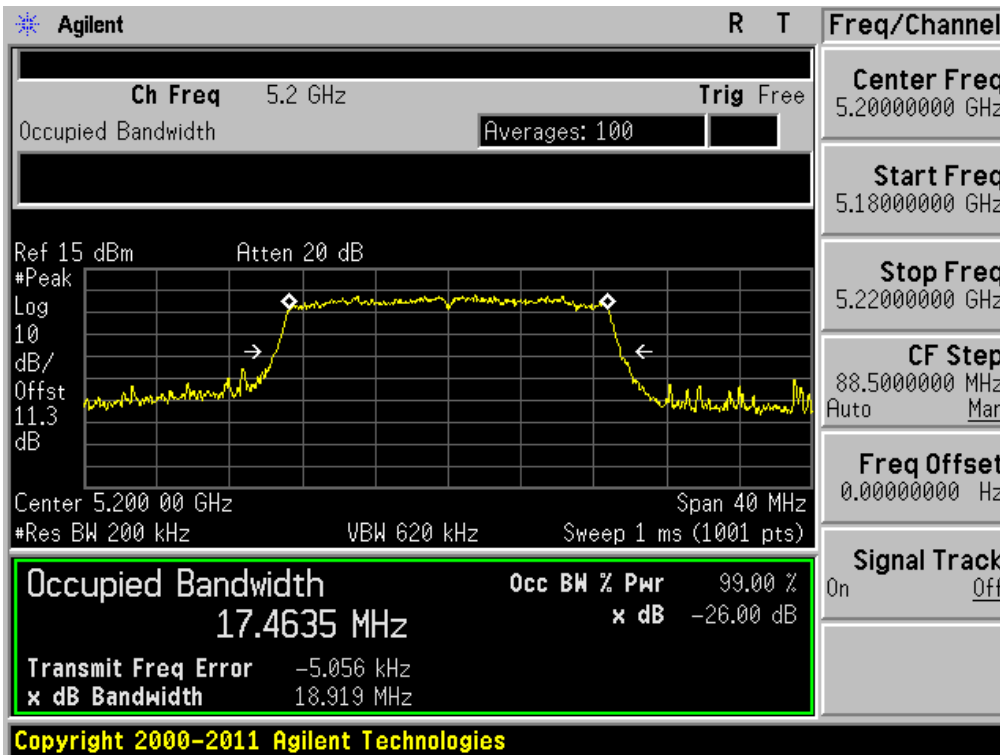
26 dB Bandwidth

Test Mode: 802.11n-HT20 & Ch.36



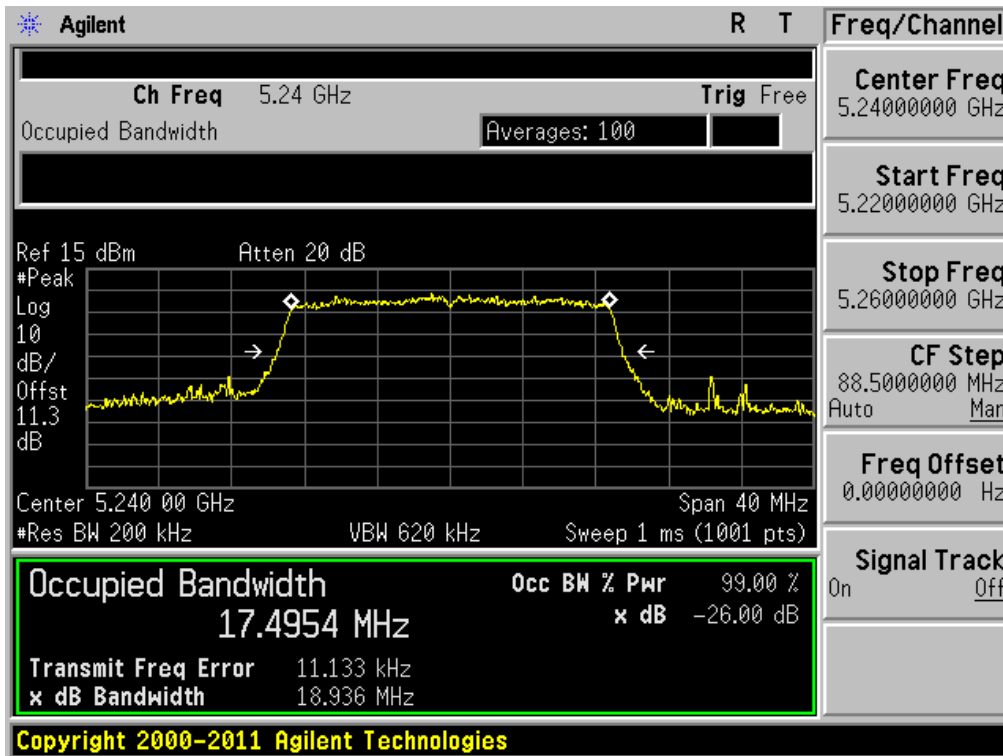
26 dB Bandwidth

Test Mode: 802.11n-HT20 & Ch.40



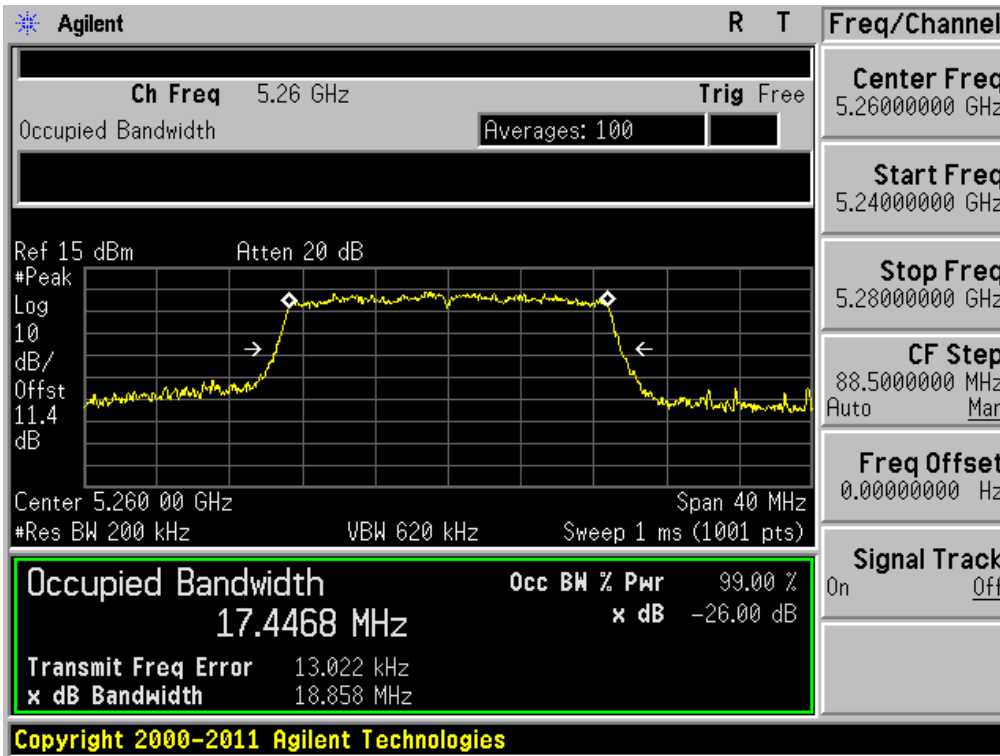
26 dB Bandwidth

Test Mode: 802.11n-HT20 & Ch.48



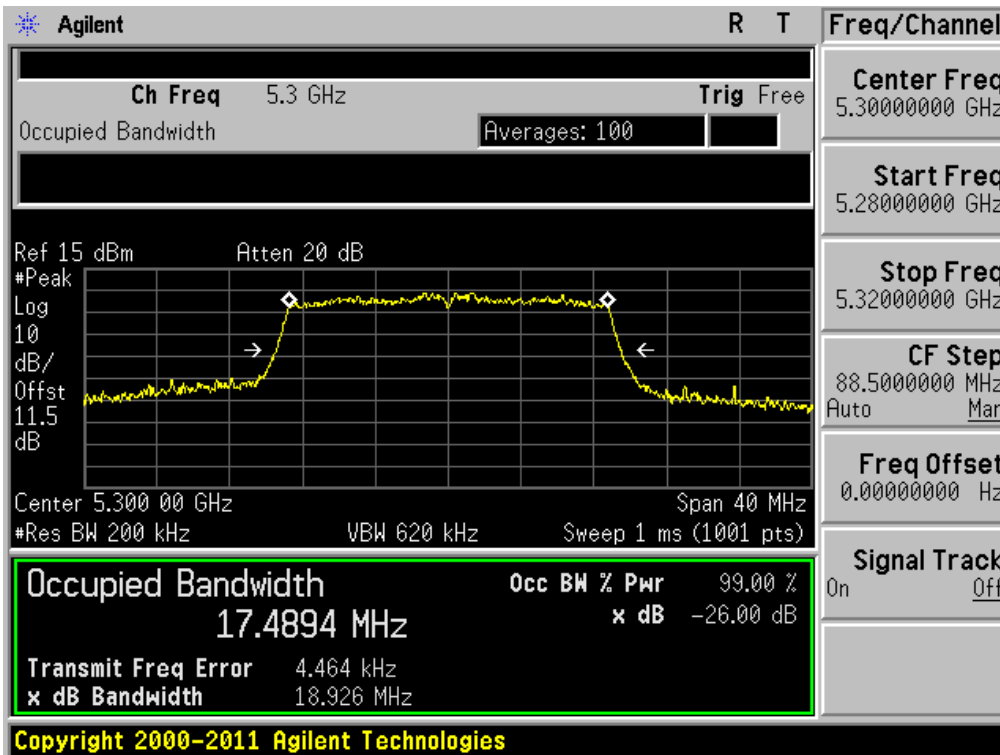
26 dB Bandwidth

Test Mode: 802.11n-HT20 & Ch.52



26 dB Bandwidth

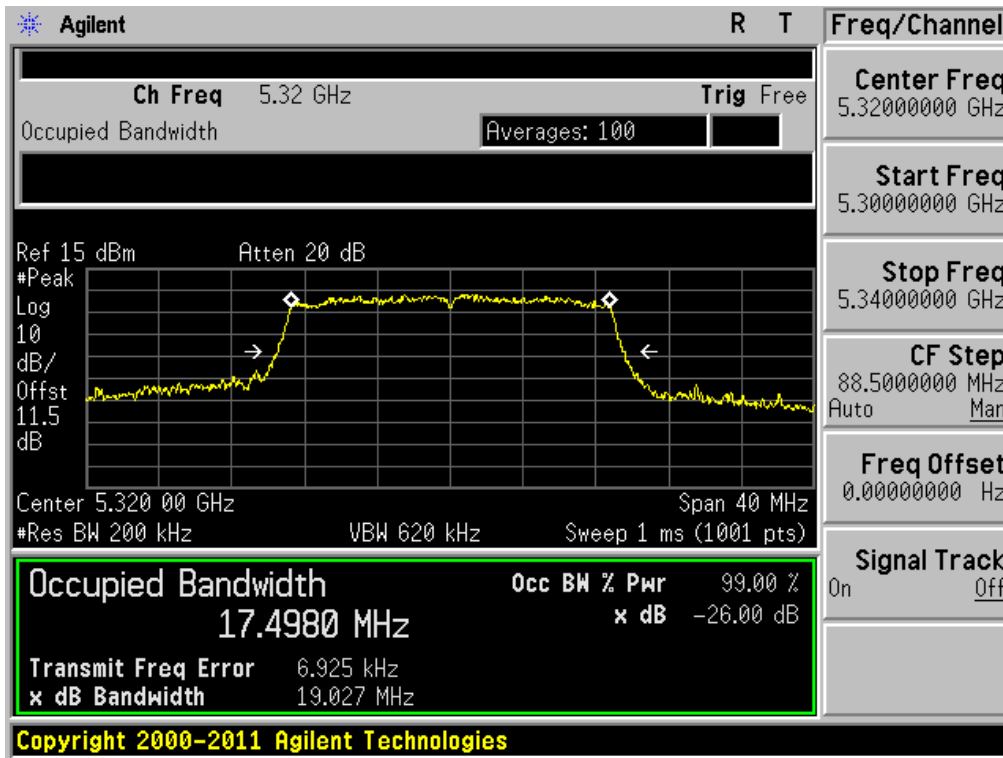
Test Mode: 802.11n-HT20 & Ch.60





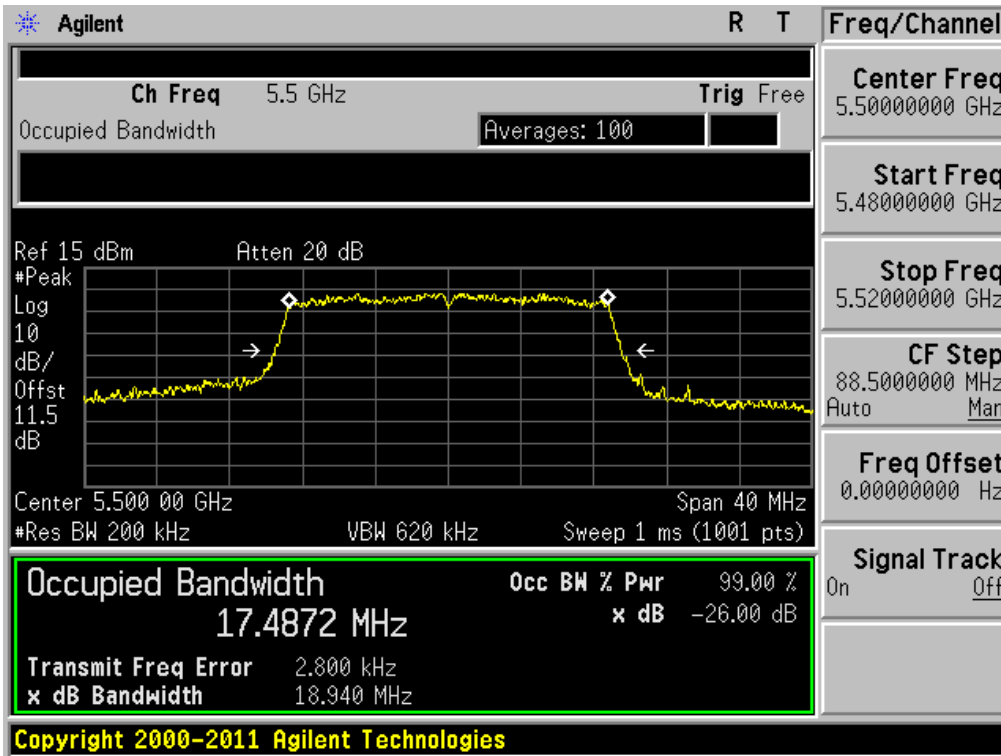
26 dB Bandwidth

Test Mode: 802.11n-HT20 & Ch.64



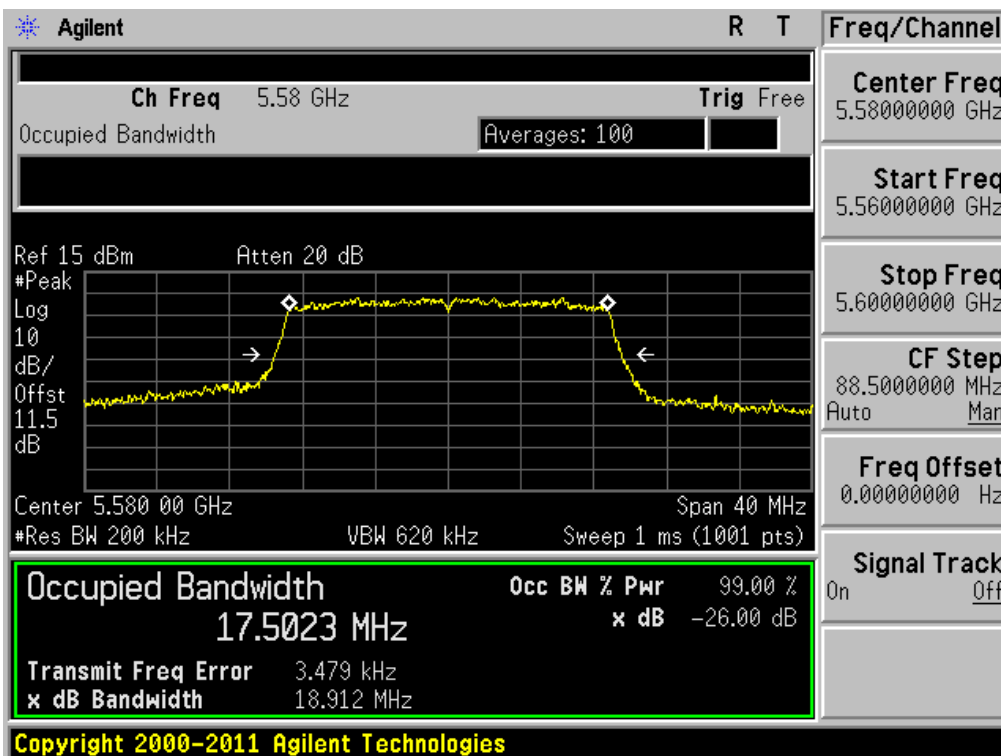
26 dB Bandwidth

Test Mode: 802.11n-HT20 & Ch.100



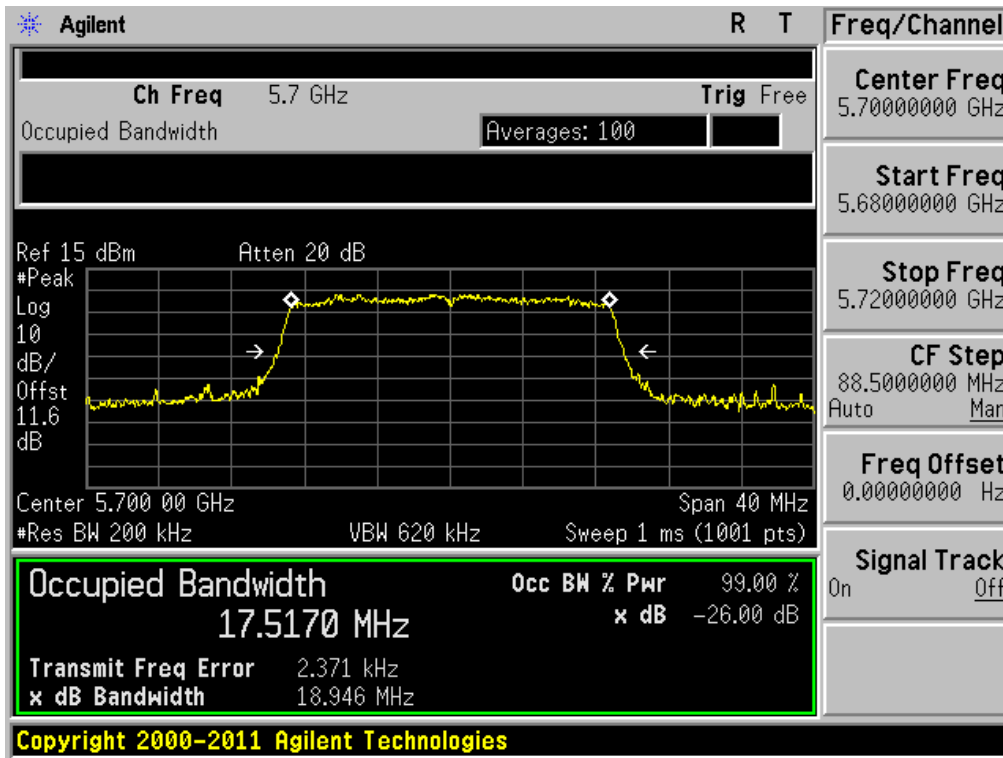
26 dB Bandwidth

Test Mode: 802.11n-HT20 & Ch.116



26 dB Bandwidth

Test Mode: 802.11n-HT20 & Ch.140



### 3.2.2 Output Power

#### Test Requirements

- (1) For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10log 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 maximum conducted output 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.
- (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 + 10log B, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output 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.

#### - Output power Limit Calculation

Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	ANT Gain	Determined Limit [dBm]
		Least 26dBC BW [MHz]			
Band I	802.11a	50	16.98	-0.63	16.66
		18.464	16.66		
	802.11n HT20	50	16.98		16.76
		18.919	16.76		
	802.11n HT40	-	-		-
		-	-		-

Bands	Mode	Power Limit [mW]	Calculation Limit [dBm]	ANT Gain	Determined Limit [dBm]
		Least 26dBC BW [MHz]			
Band II	802.11a	250	23.97	-0.63	23.65
		18.425	23.65		
	802.11n HT20	250	23.97		23.75
		18.858	23.75		
	802.11n HT40	-	-		-
		-	-		-
Band III	802.11a	250	23.97	-0.63	23.66
		18.464	23.66		
	802.11n HT20	250	23.97		23.76
		18.912	23.76		
	802.11n HT40	-	-		-
		-	-		-

#### ■ TEST CONFIGURATION

Refer to the APPENDIX I.

■ **TEST PROCEDURE:**

Maximum Conducted Output Power is measured using Measurement Procedure **Method SA-2 of KDB789033**

1. Set the **RBW = 1 MHz**.
2. Set the **VBW ≥ 3 MHz**.
3. Set **SPAN to encompass the entire EBW** of signal.
4. Detector = **RMS (power averaging)**
5. Sweep time = **auto couple**.
6. **Trace average at least 100 traces in power averaging.**
7. **Compute power by integrating the spectrum across the 26 dB EBW** of the signal using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges.
8. **Add 10 log(1/x), where x is the duty cycle**, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission)

■ **TEST RESULTS : Comply**

Mode	Channel	Frequency [MHz]	Reading [dBm]	Duty Cycle			DCF [dB]	Test Result [dBm]
				On Time[ms]	On+Off Time[ms]	X		
802.11a	36	5180	10.080	2.060	2.160	0.95	0.23	10.310
	40	5200	10.140					10.370
	48	5240	10.160					10.390
	52	5260	10.590	2.060	2.160	0.95	0.23	10.820
	60	5300	10.480					10.710
	64	5320	10.550					10.780
	100	5500	11.730	2.060	2.160	0.95	0.23	11.960
	116	5580	11.680					11.910
	140	5700	11.530					11.760

Mode	Channel	Frequency [MHz]	Reading [dBm]	Duty Cycle			DCF [dB]	Result
				On Time[ms]	On+Off Time[ms]	X		
802.11n (20MHz)	36	5180	9.830	1.92	2.02	0.95	0.23	10.060
	40	5200	10.100					10.330
	48	5240	10.210					10.440
	52	5260	10.490	1.92	2.02	0.95	0.23	10.720
	60	5300	10.370					10.600
	64	5320	10.480					10.710
	100	5500	11.440	1.92	2.02	0.95	0.23	11.670
	116	5580	11.270					11.500
	140	5700	11.390					11.620

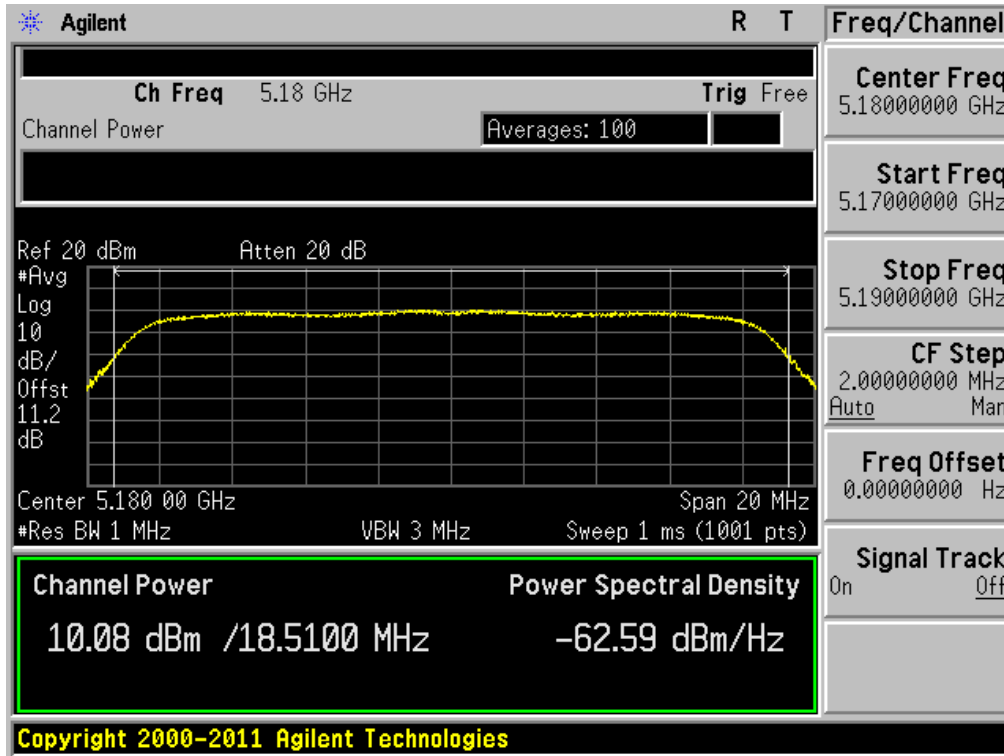
Note 1 : DCF = 10log( 1 / X), X = On Time / (On+Off time)

Note 2 : Test Result = Measurement Data + DCF

Measurement Data PLOTS

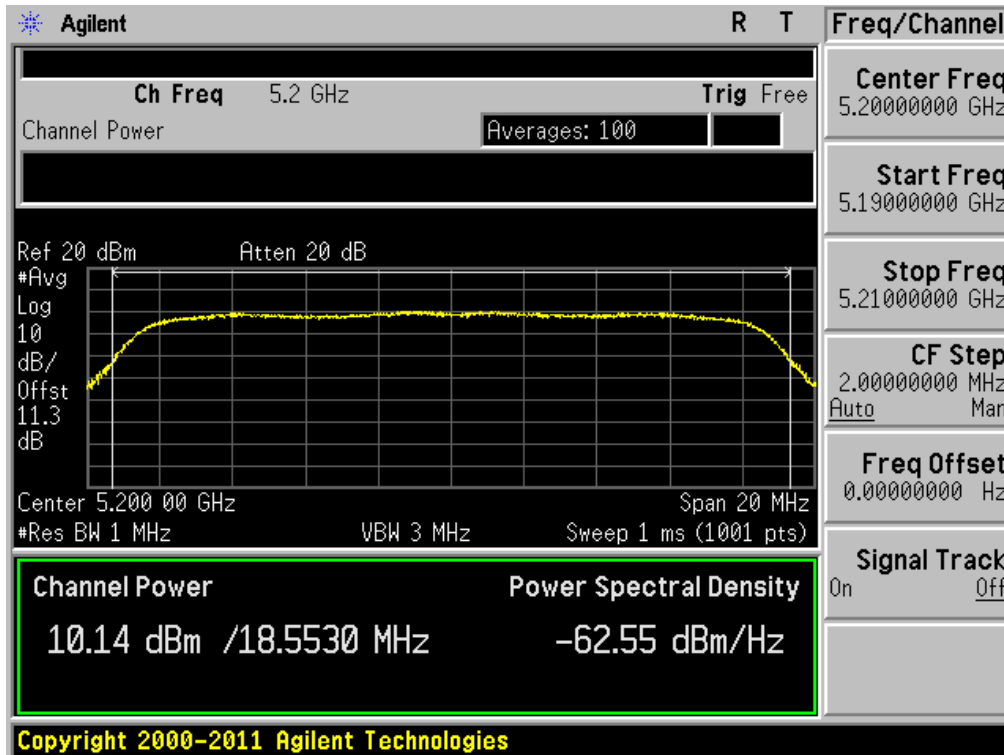
Output Power

Test Mode: 802.11a & Ch.36



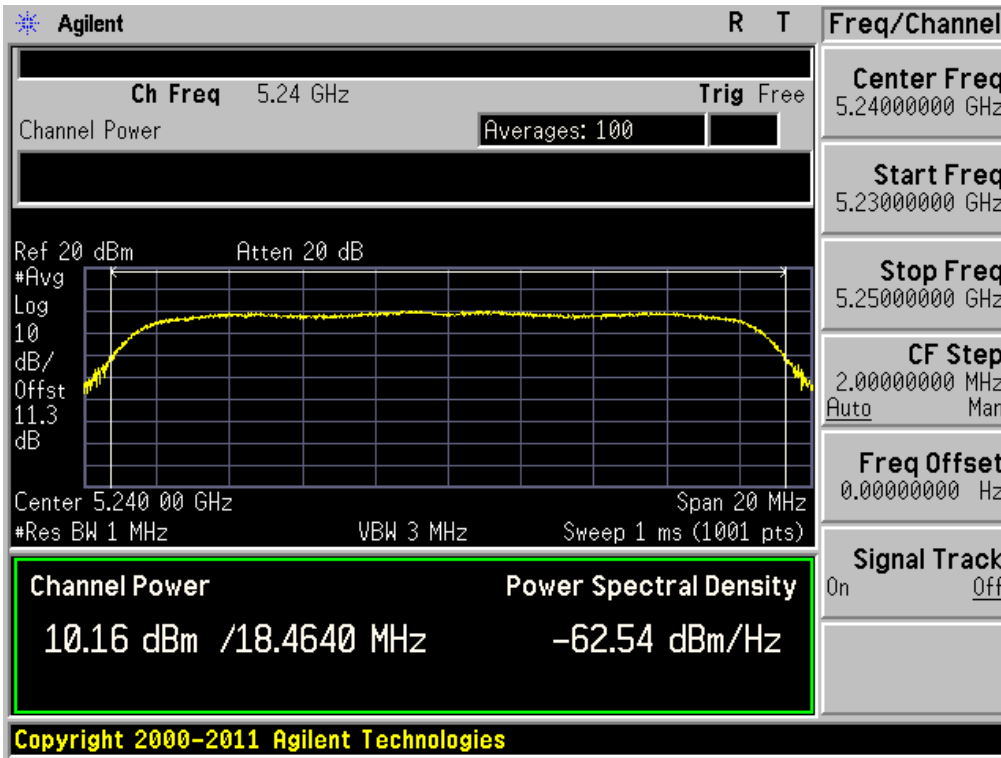
Output Power

Test Mode: 802.11a & Ch.40



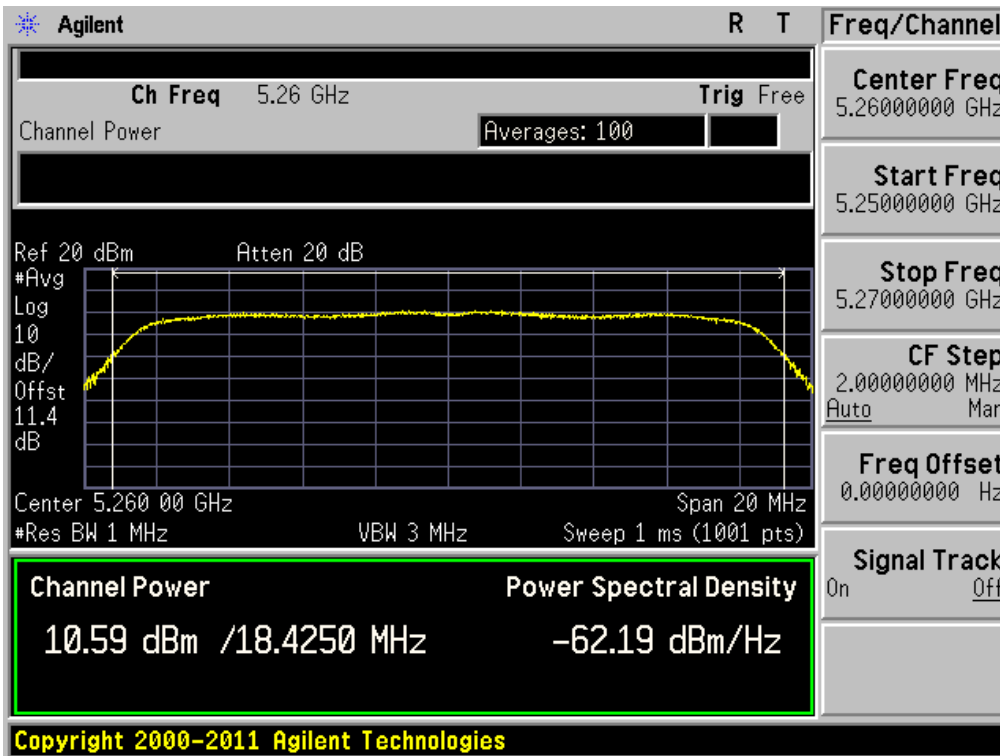
### Output Power

Test Mode: 802.11a & Ch.48



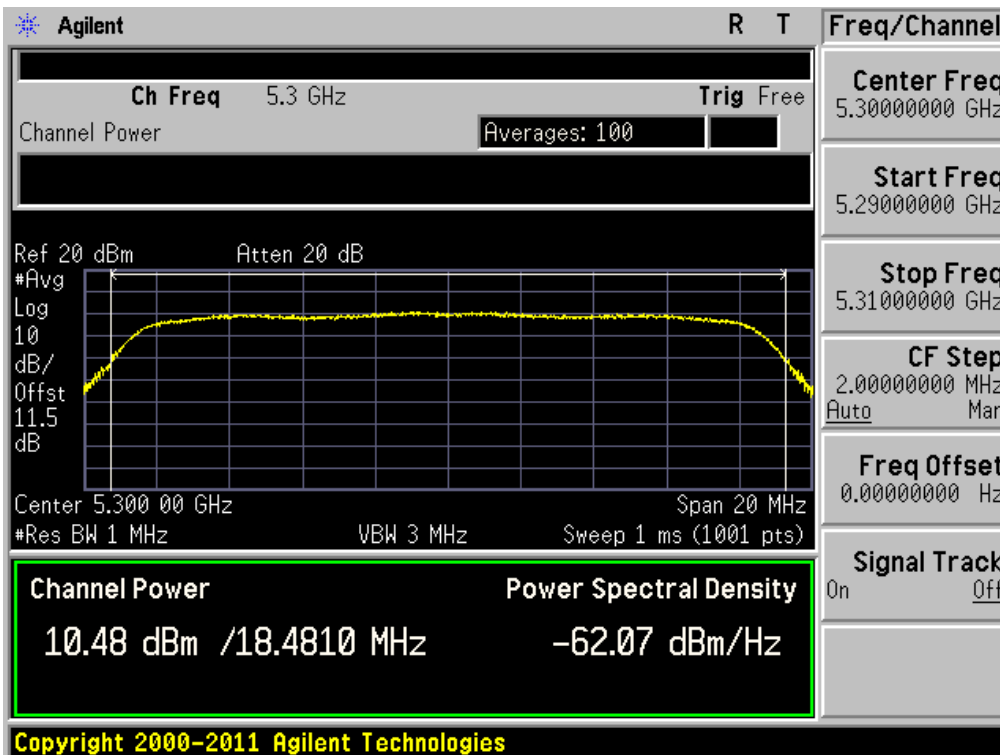
**Output Power**

Test Mode: 802.11a & Ch.52



**Output Power**

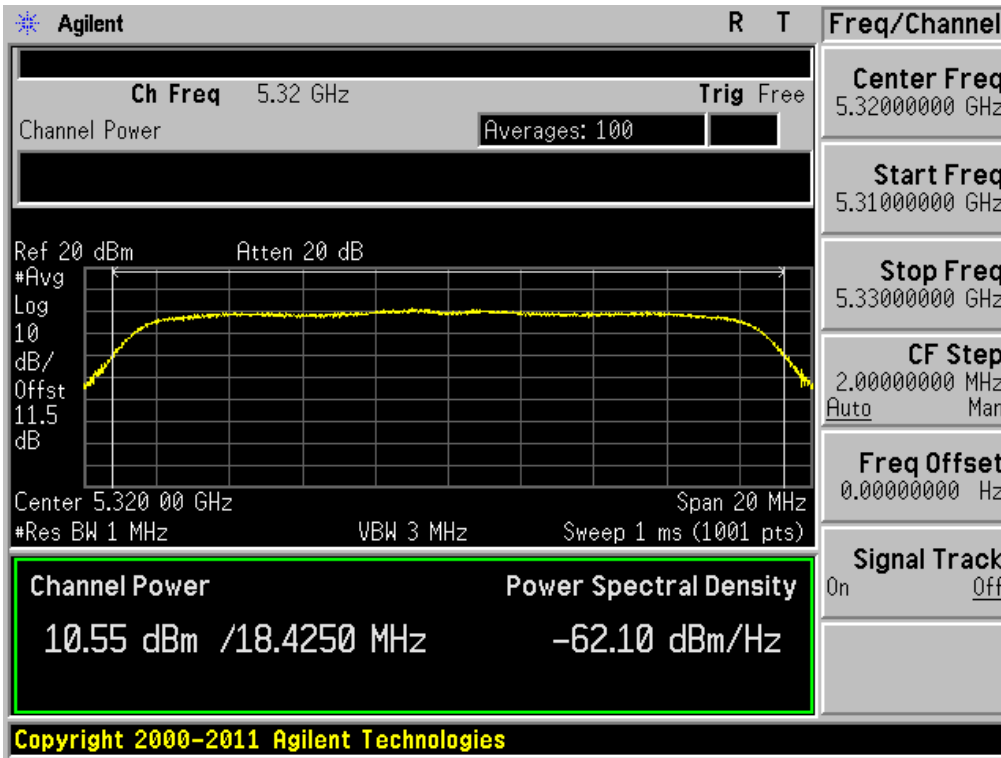
Test Mode: 802.11a & Ch.60





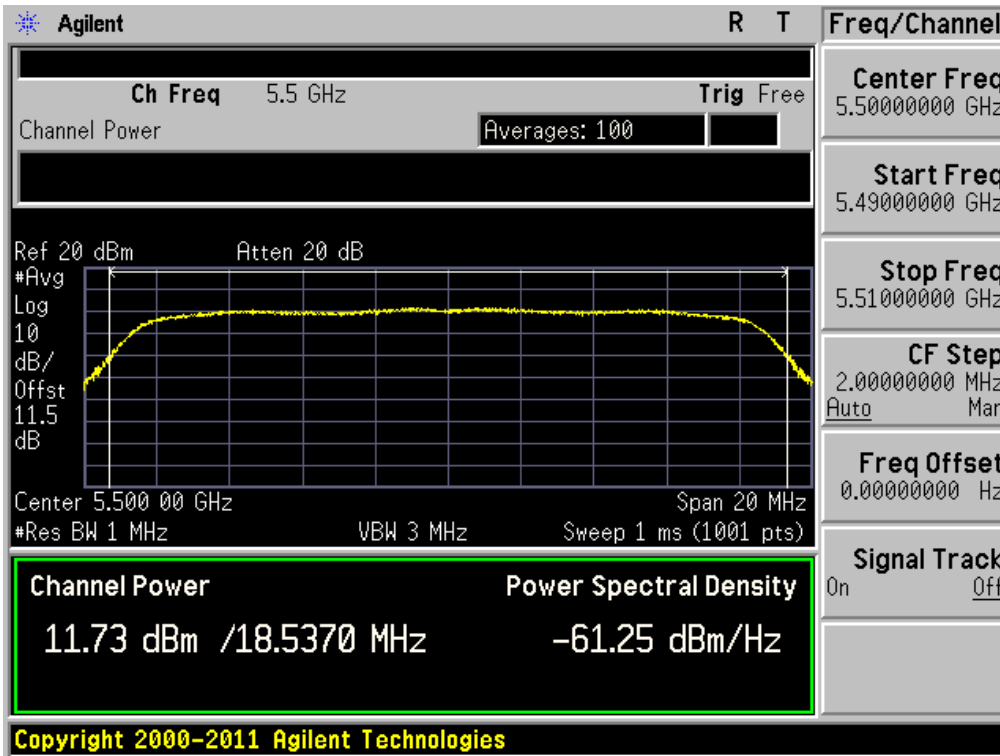
Output Power

Test Mode: 802.11a & Ch.64



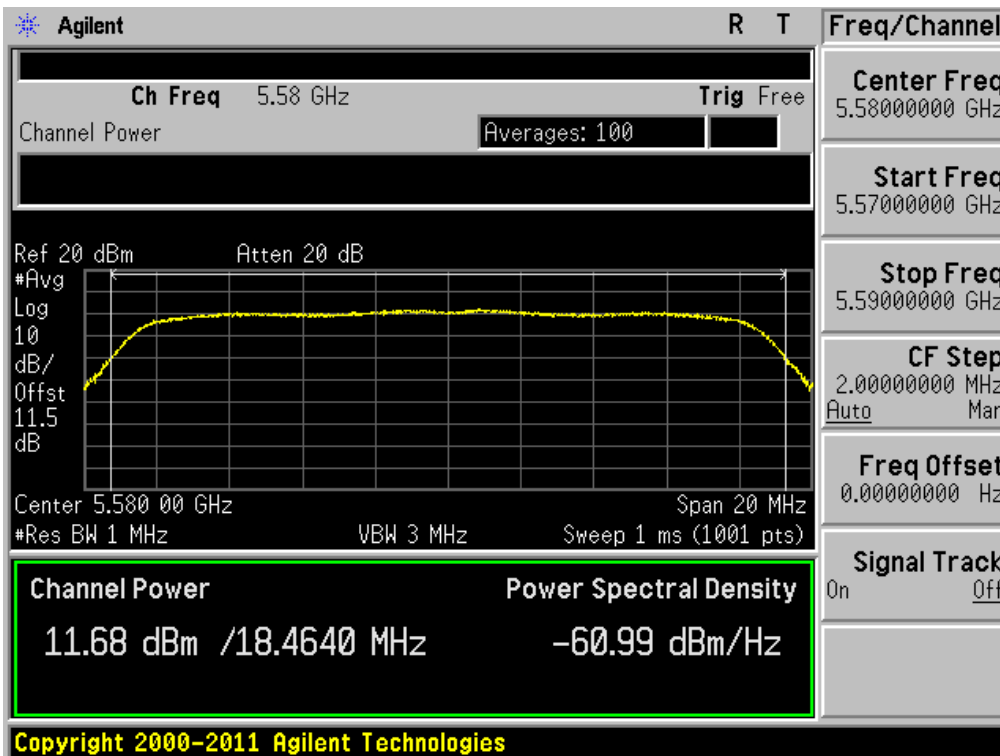
**Output Power**

Test Mode: 802.11a & Ch.100



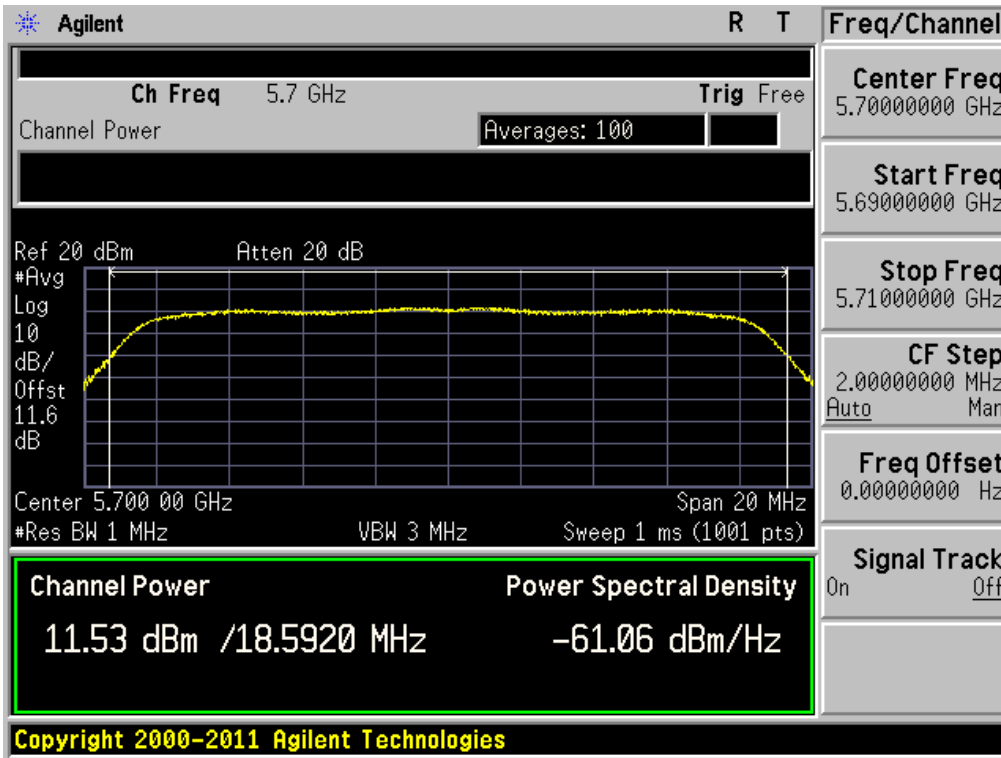
**Output Power**

Test Mode: 802.11a & Ch.116



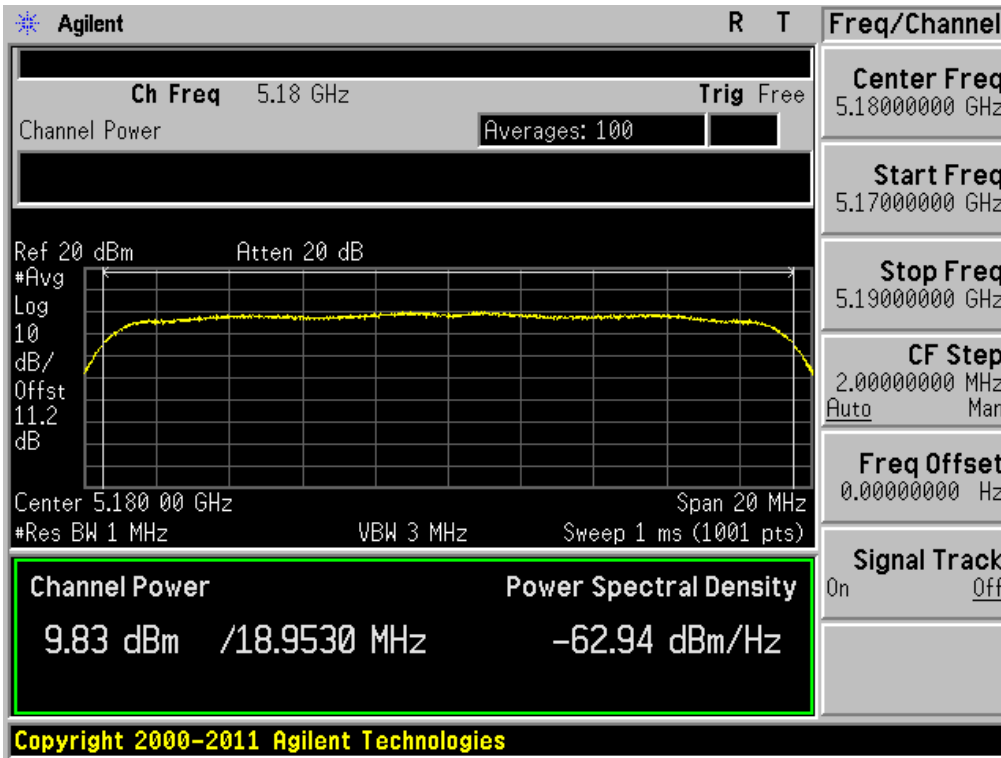
Output Power

Test Mode: 802.11a & Ch.140



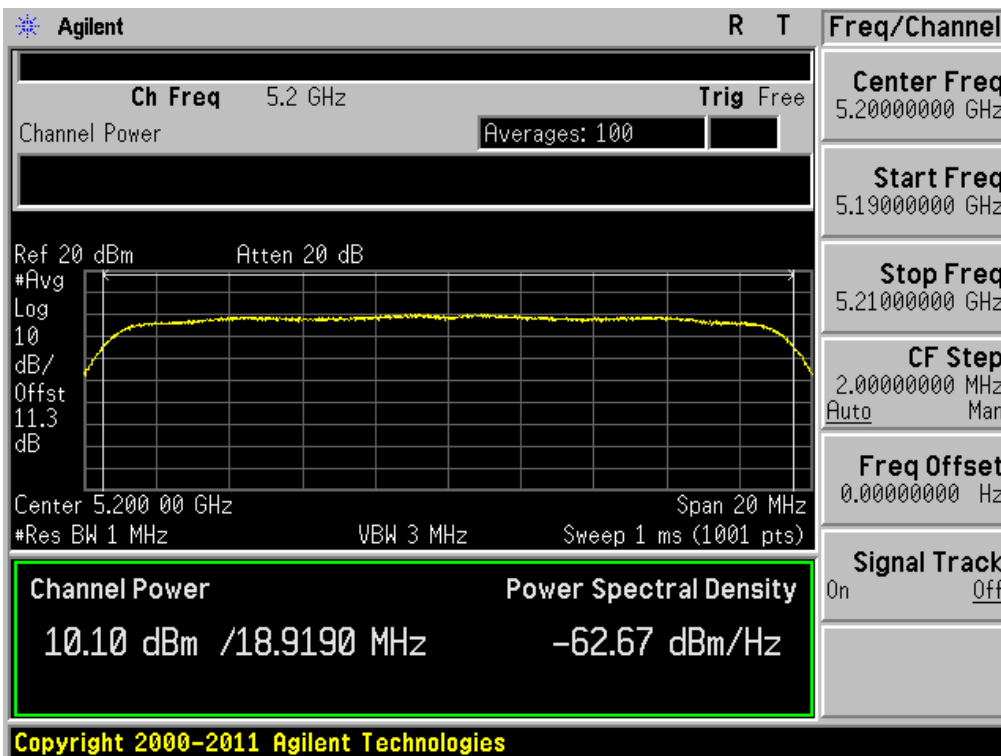
Output Power

Test Mode: 802.11n HT20 & Ch.36



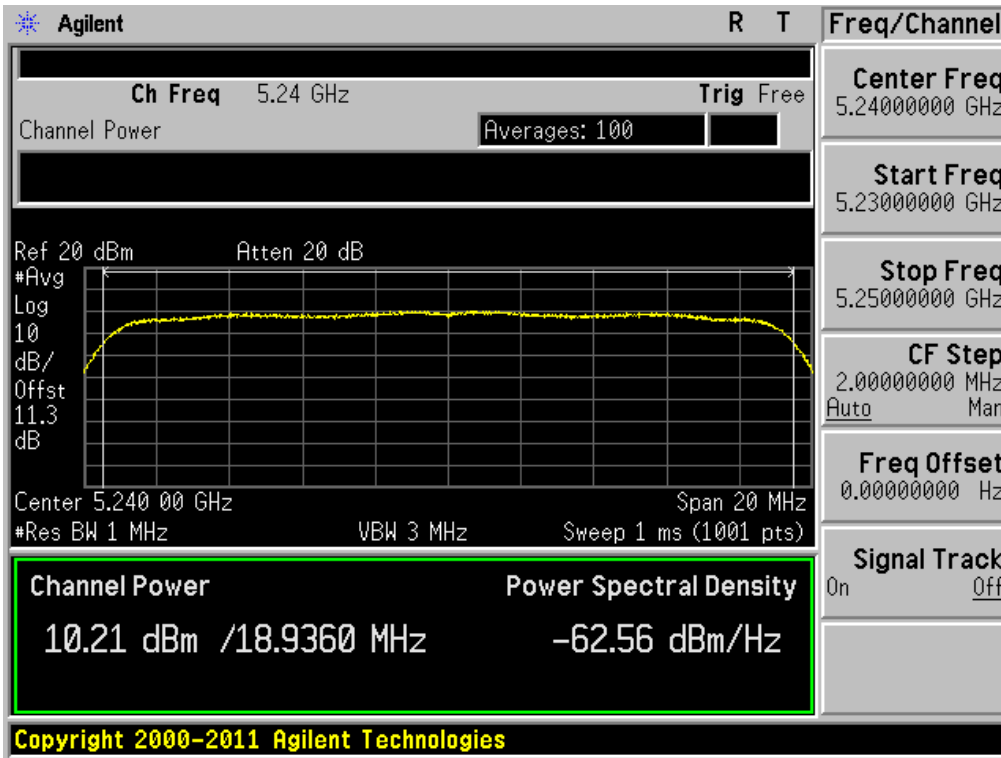
Output Power

Test Mode: 802.11n HT20 & Ch.40



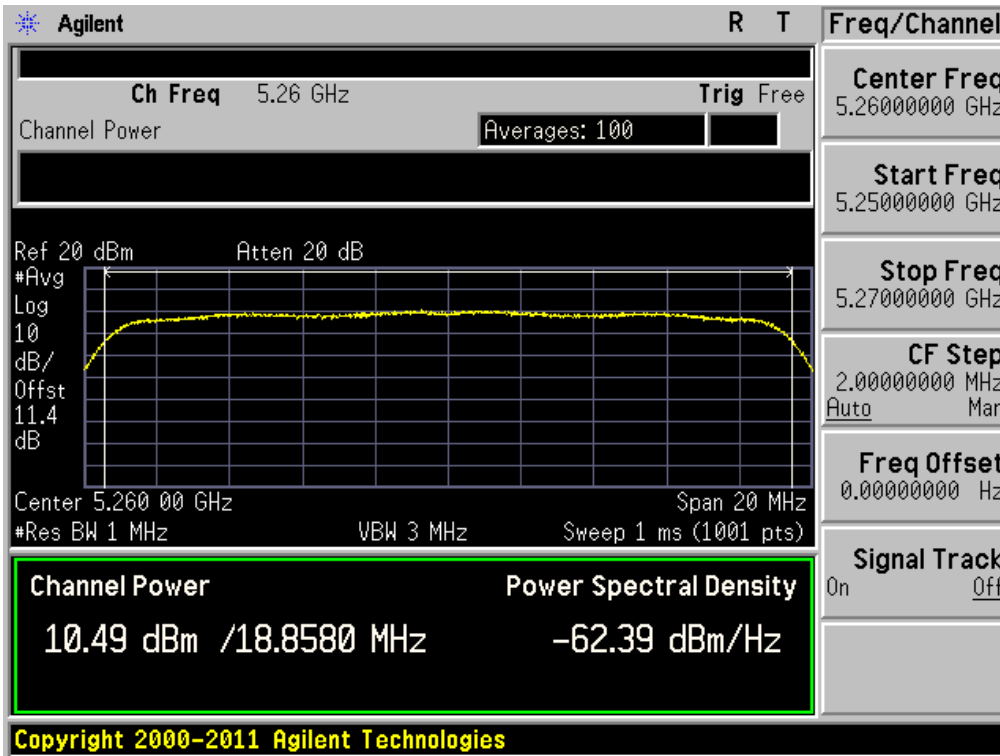
Output Power

Test Mode: 802.11n HT20 & Ch.48



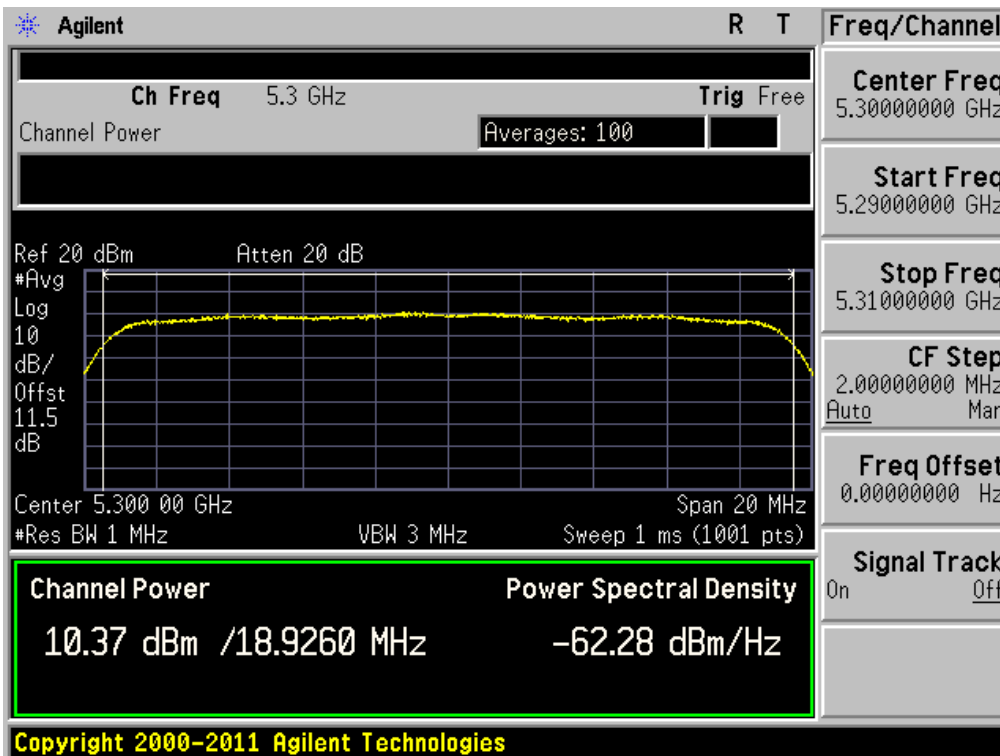
**Output Power**

Test Mode: 802.11n HT20 & Ch.52



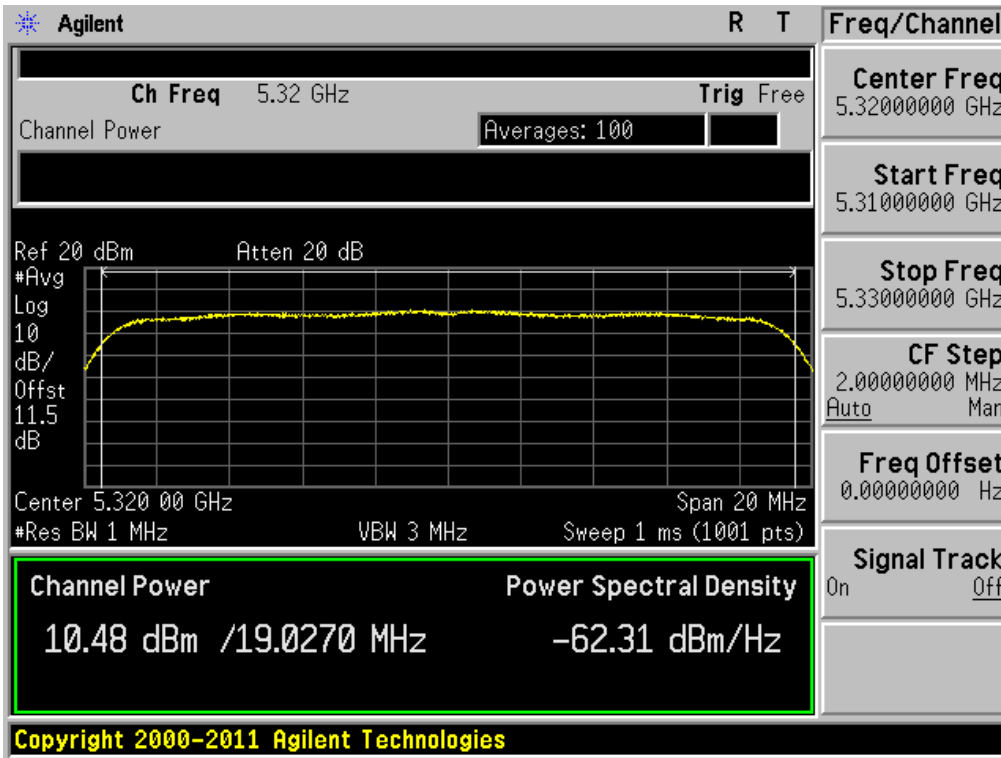
**Output Power**

Test Mode: 802.11n HT20 & Ch.60



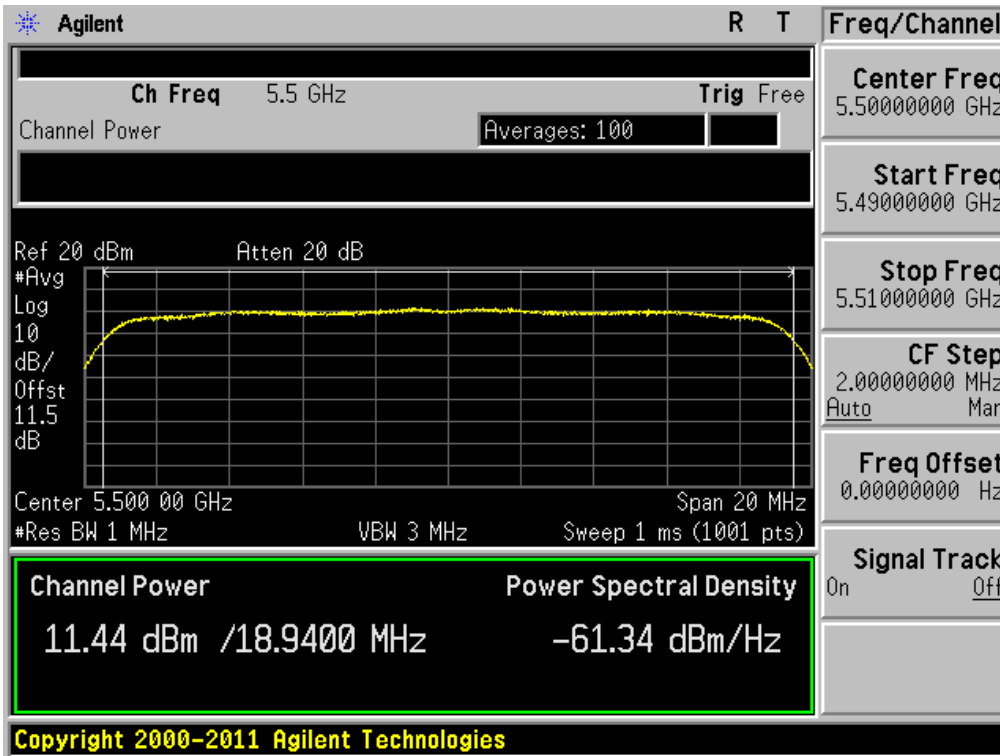
Output Power

Test Mode: 802.11n HT20 & Ch.64



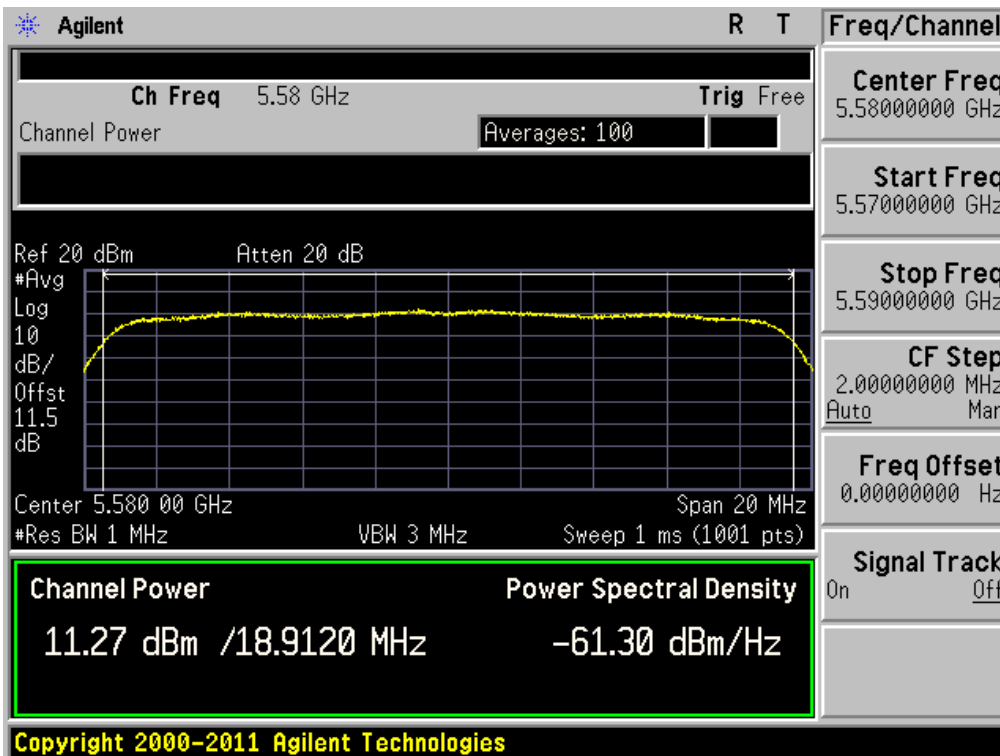
**Output Power**

Test Mode: 802.11n HT20 & Ch.100



**Output Power**

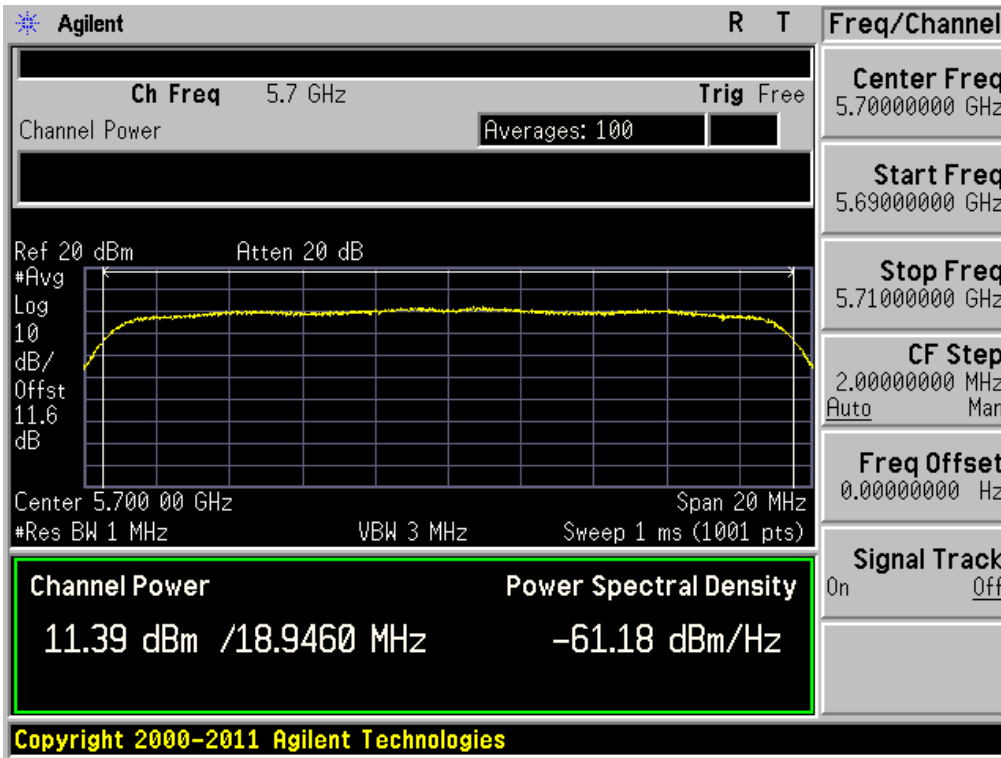
Test Mode: 802.11n HT20 & Ch.116





Output Power

Test Mode: 802.11n HT20 & Ch.140



### 3.2.3 Peak Power Spectral Density

#### Test requirements

- (1) For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 4 dBm in any 1MHz band.
- (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 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.

#### - Peak Power Spectral Density Limit Calculation

Band	Limit [dBm]	ANT Gain [dBi]	Determined Limit [dBm]
Band I	4	-0.63	4
Band II	11	-0.63	11
Band III	11	-0.63	11

#### ■ TEST CONFIGURATION

Refer to the APPENDIX I.

#### ■ TEST PROCEDURE

Peak Power Spectral Density is measured using Measurement Procedure of **KDB789033**

- 1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section C)3) for measuring maximum conducted output power using a spectrum analyzer: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power...". (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
- 2) Use the peak search function on the spectrum analyzer to find the peak of the spectrum.
- 3) Make the following adjustments to the peak value of the spectrum, if applicable:
  - a) **If Method SA-2 or SA-2 Alternative was used, add 10 log(1/x), where x is the duty cycle, to the peak of the spectrum.**
  - b) If Method SA-3 Alternative was used and the linear mode was used in step C)3)g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
- 4) The result is the PPSD.

■ TEST RESULT : **Comply**

Mode	Channel	Frequency [MHz]	Reading [dBm]	Duty Cycle			DCF [dB]	Test Result [dBm]
				On Time[ms]	On+Off Time[ms]	X		
802.11a	36	5180	0.537	2.06	2.16	0.95	0.23	0.767
	40	5200	0.452					0.682
	48	5240	0.606					0.836
	52	5260	0.857	2.06	2.16	0.95	0.23	1.087
	60	5300	0.909					1.139
	64	5320	1.106					1.336
	100	5500	1.877	2.06	2.16	0.95	0.23	2.107
	116	5580	2.002					2.232
140	5700	1.933	2.163					

Mode	Channel	Frequency [MHz]	Reading [dBm]	Duty Cycle			DCF [dB]	Test Result [dBm]
				On Time[ms]	On+Off Time[ms]	X		
802.11n (20MHz)	36	5180	-0.351	1.92	2.02	0.95	0.23	-0.121
	40	5200	0.098					0.328
	48	5240	0.113					0.343
	52	5260	0.669	1.92	2.02	0.95	0.23	0.899
	60	5300	0.546					0.776
	64	5320	0.564					0.794
	100	5500	1.696	1.92	2.02	0.95	0.23	1.926
	116	5580	1.261					1.491
	140	5700	1.809					2.039

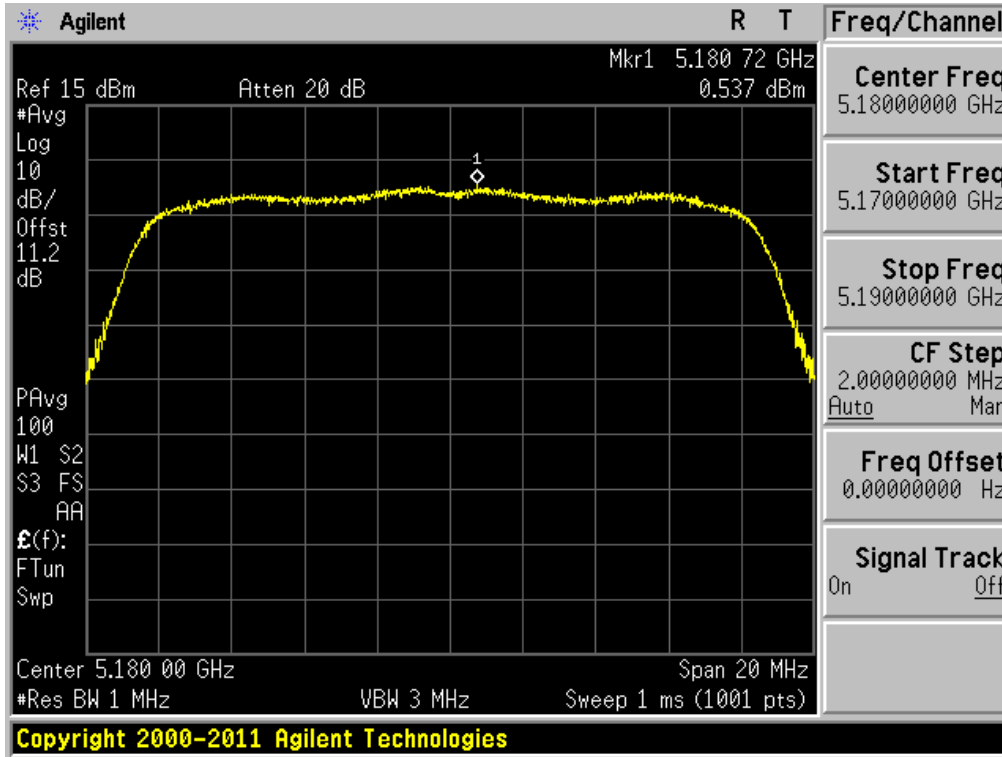
Note 1 :  $DCF = 10\log(1/X)$ ,  $X = \text{On Time} / (\text{On+Off time})$

Note 2 : Test Result = Measurement Data + DCF

Measurement Data PLOTS

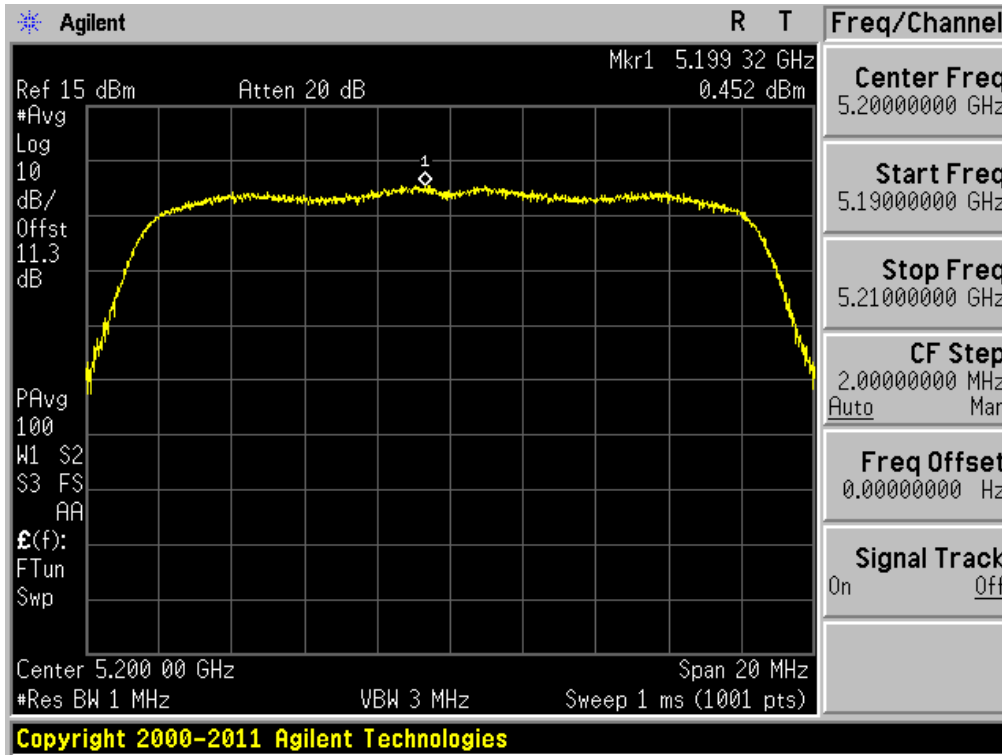
Peak Power Spectral Density

Test Mode: 802.11a & Ch.36



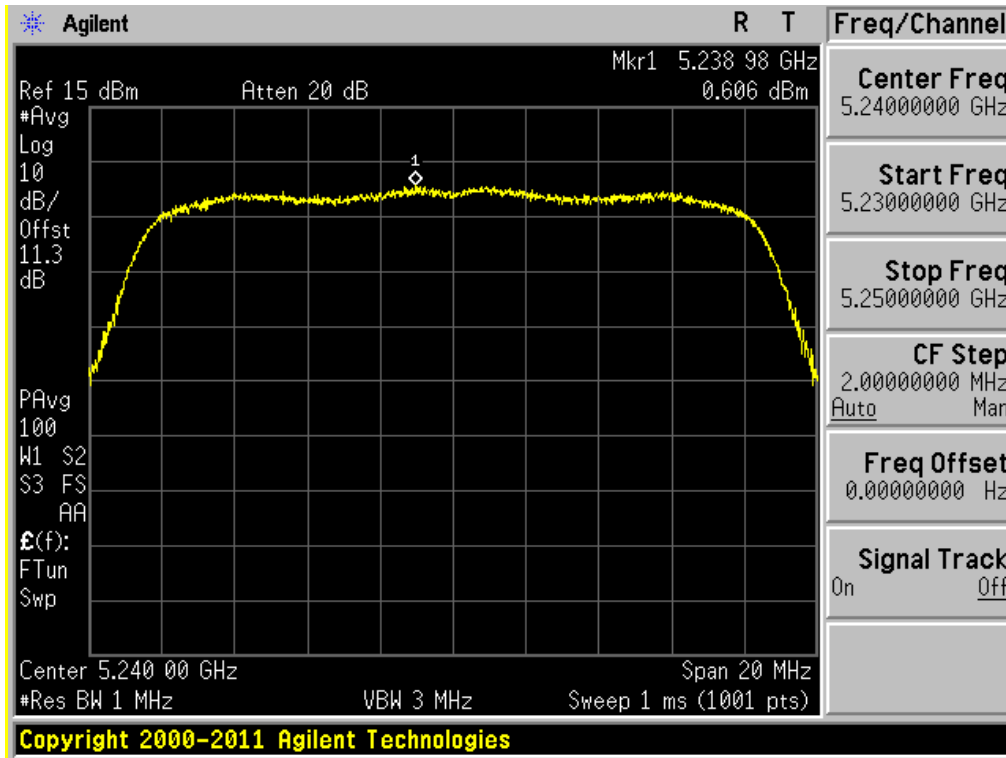
Peak Power Spectral Density

Test Mode: 802.11a & Ch.40



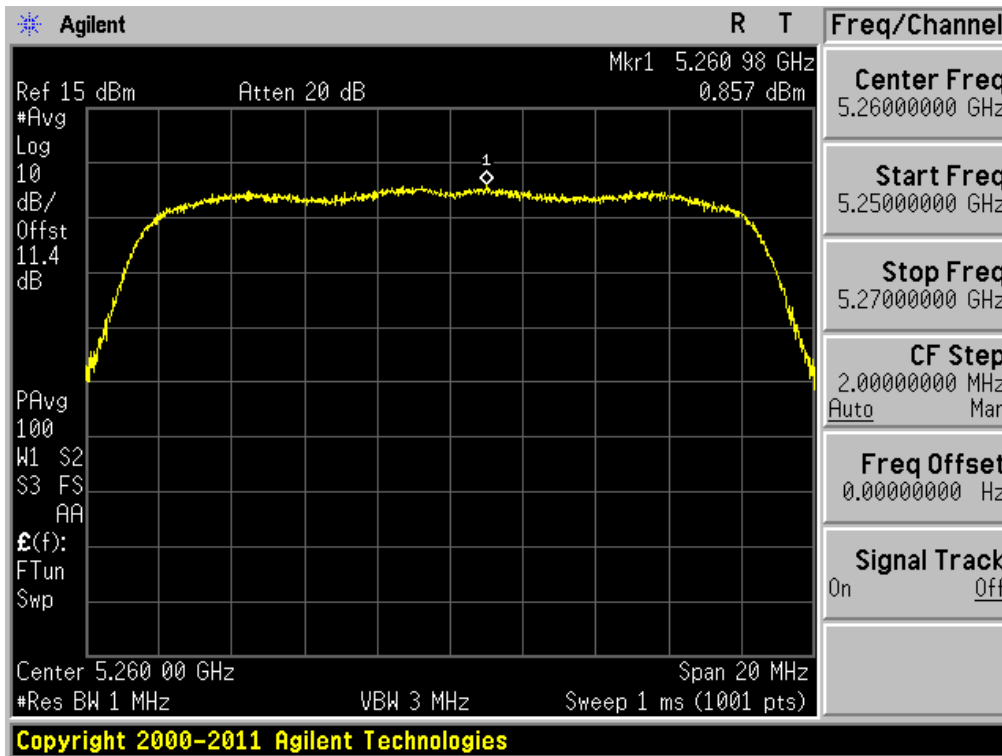
Peak Power Spectral Density

Test Mode: 802.11a & Ch.48



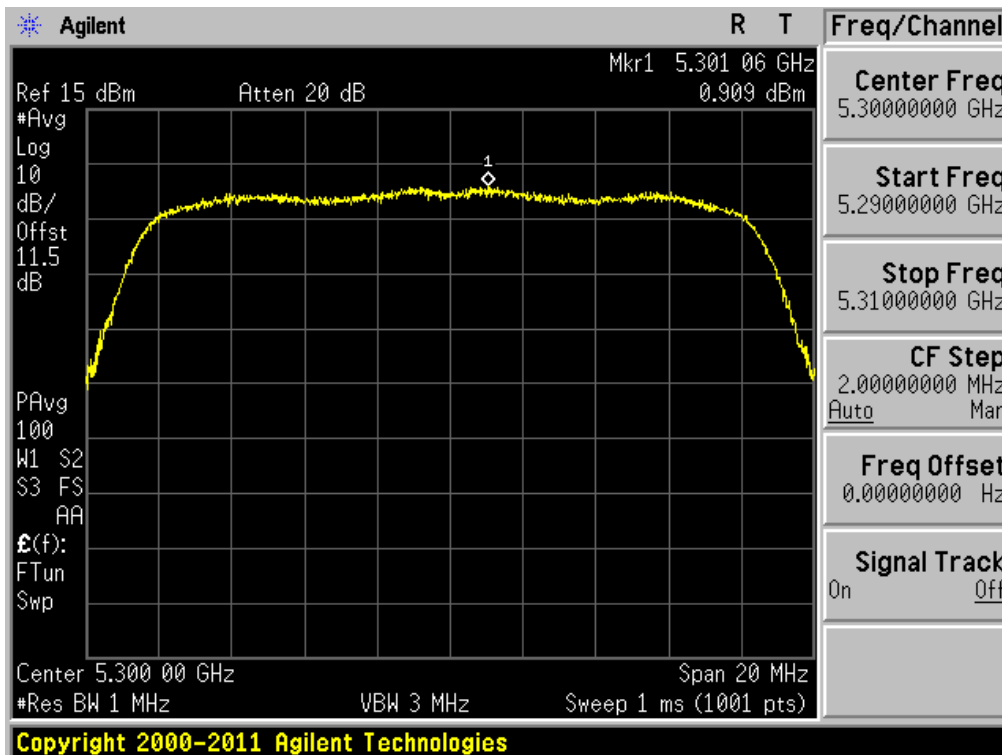
**Peak Power Spectral Density**

Test Mode: 802.11a & Ch.52



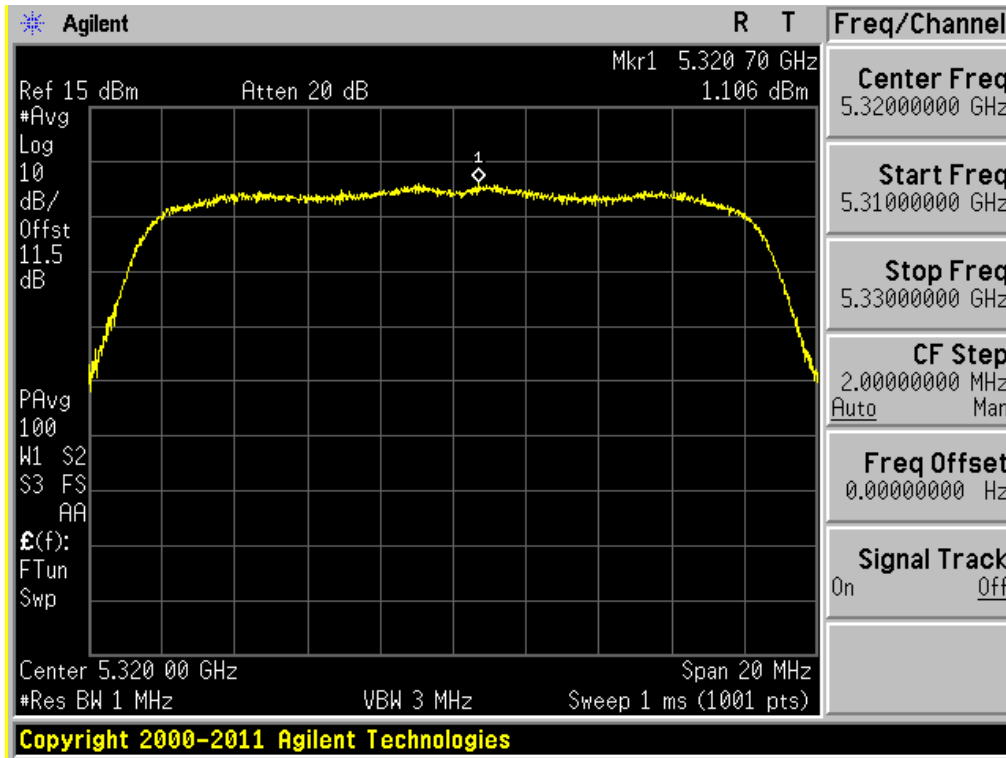
**Peak Power Spectral Density**

Test Mode: 802.11a & Ch.60



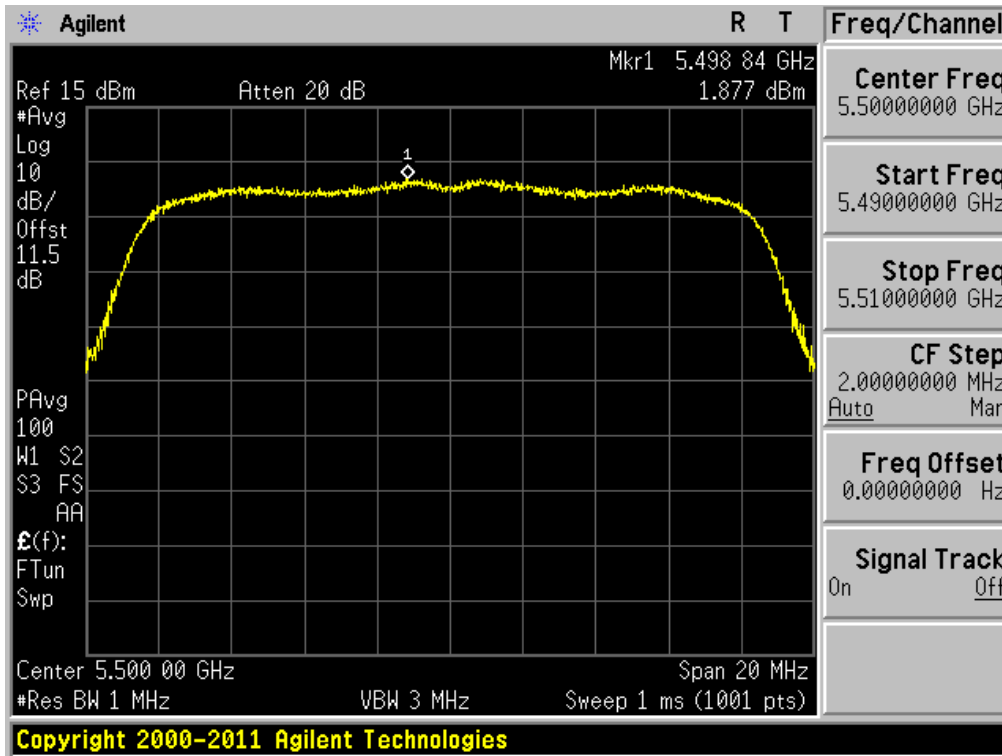
Peak Power Spectral Density

Test Mode: 802.11a & Ch.64



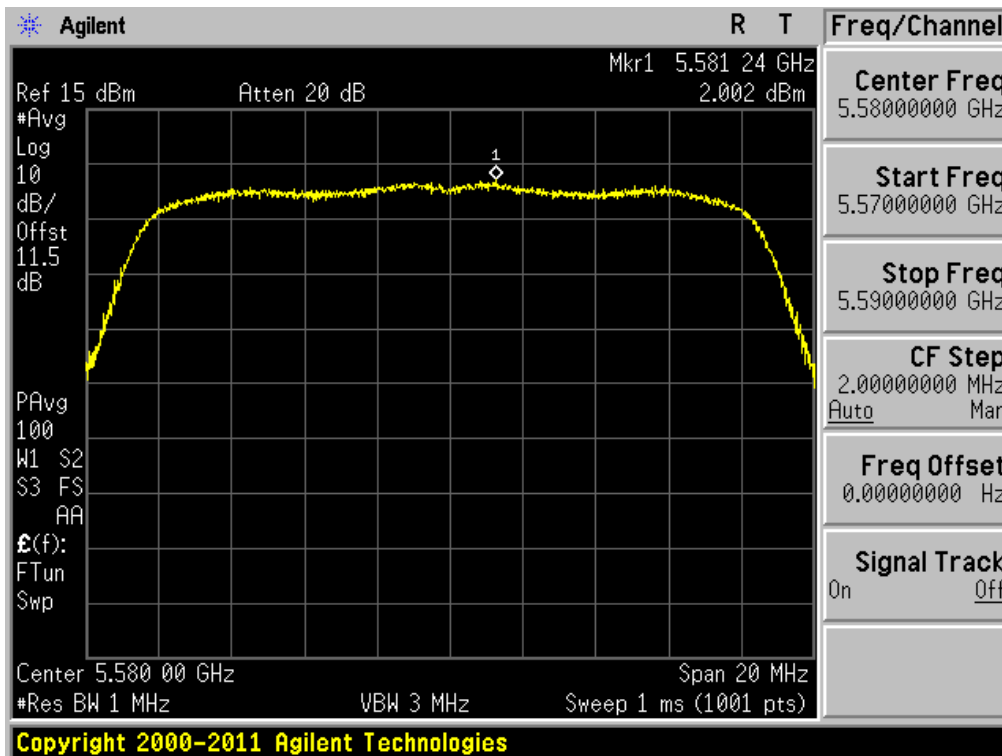
Peak Power Spectral Density

Test Mode: 802.11a & Ch.100



Peak Power Spectral Density

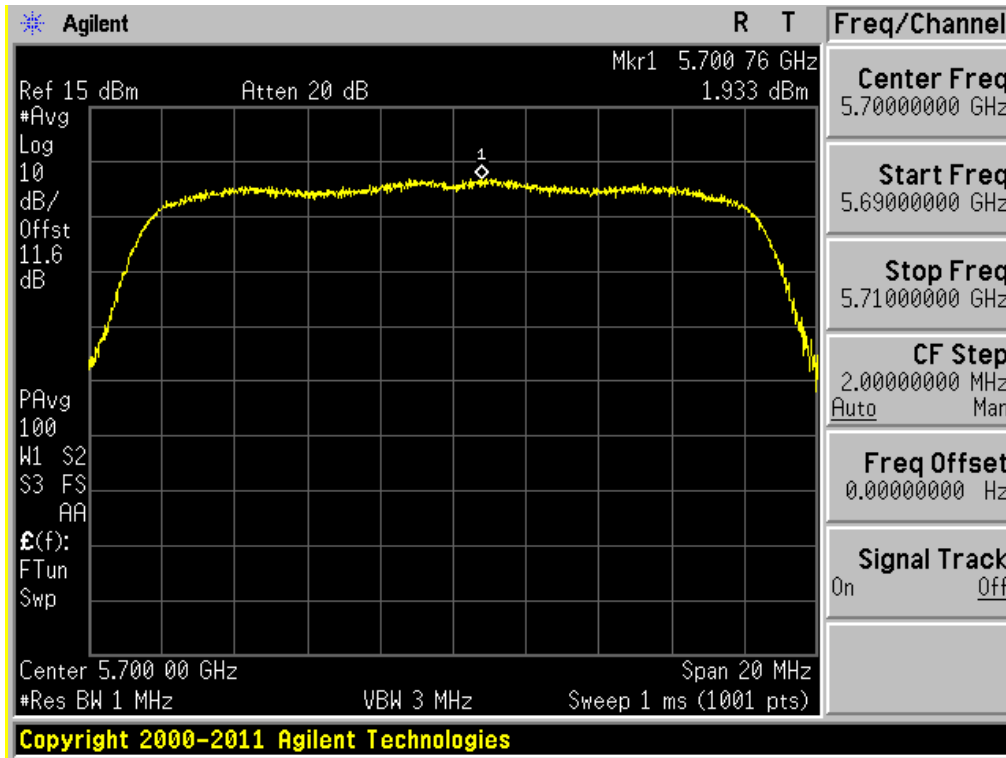
Test Mode: 802.11a & Ch.116





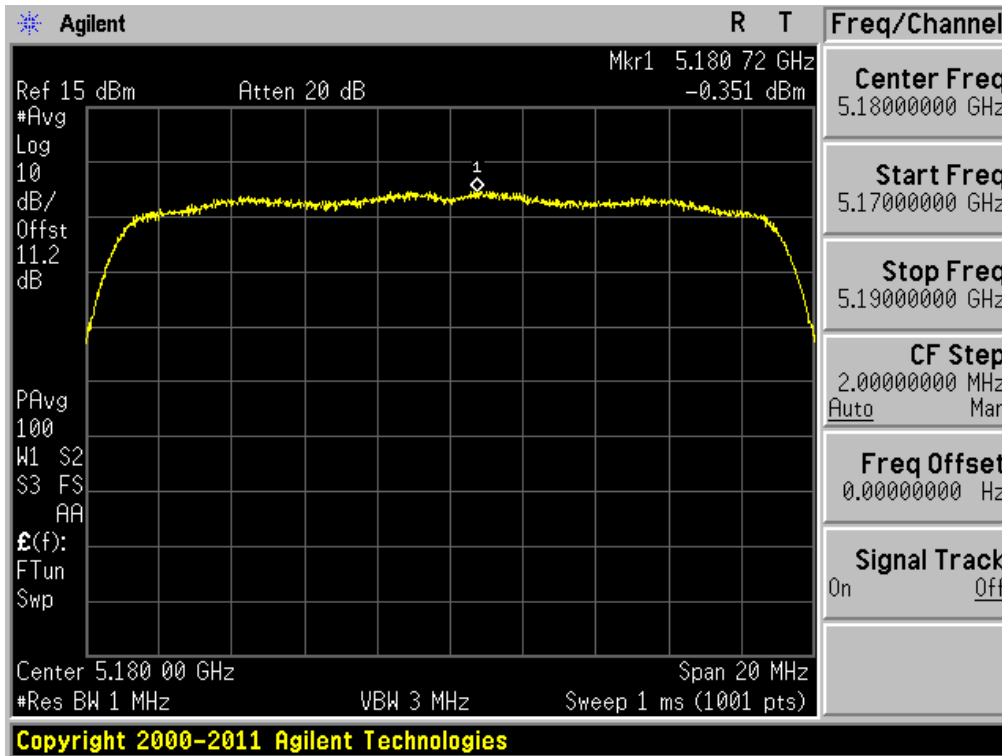
Peak Power Spectral Density

Test Mode: 802.11a & Ch.140



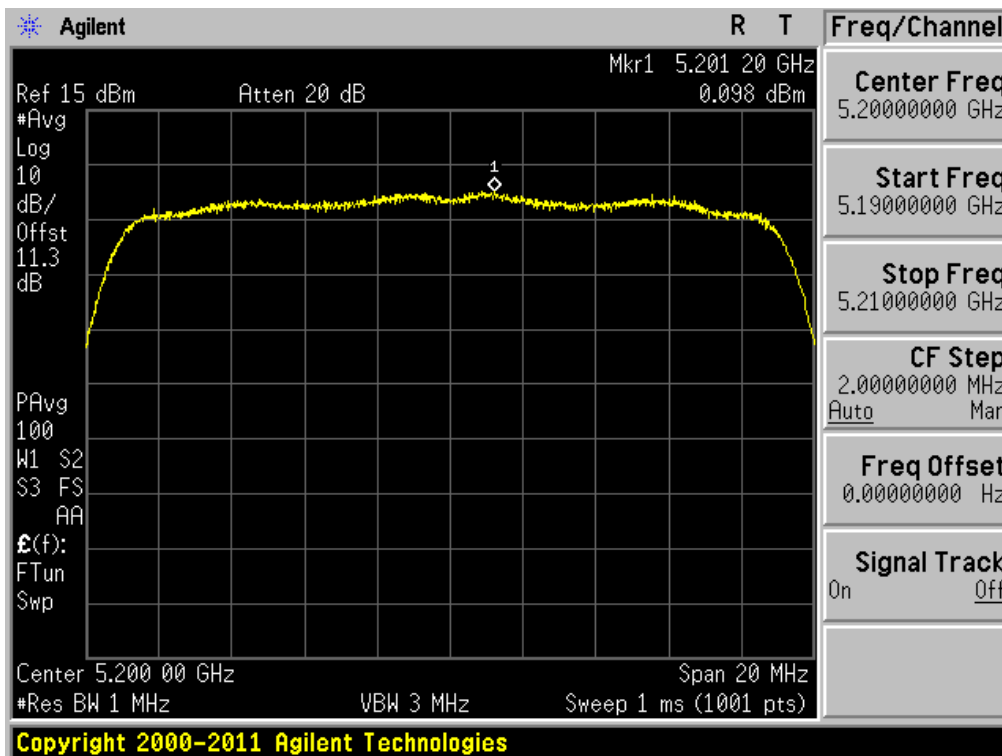
Peak Power Spectral Density

Test Mode: 802.11n HT20 & Ch.36



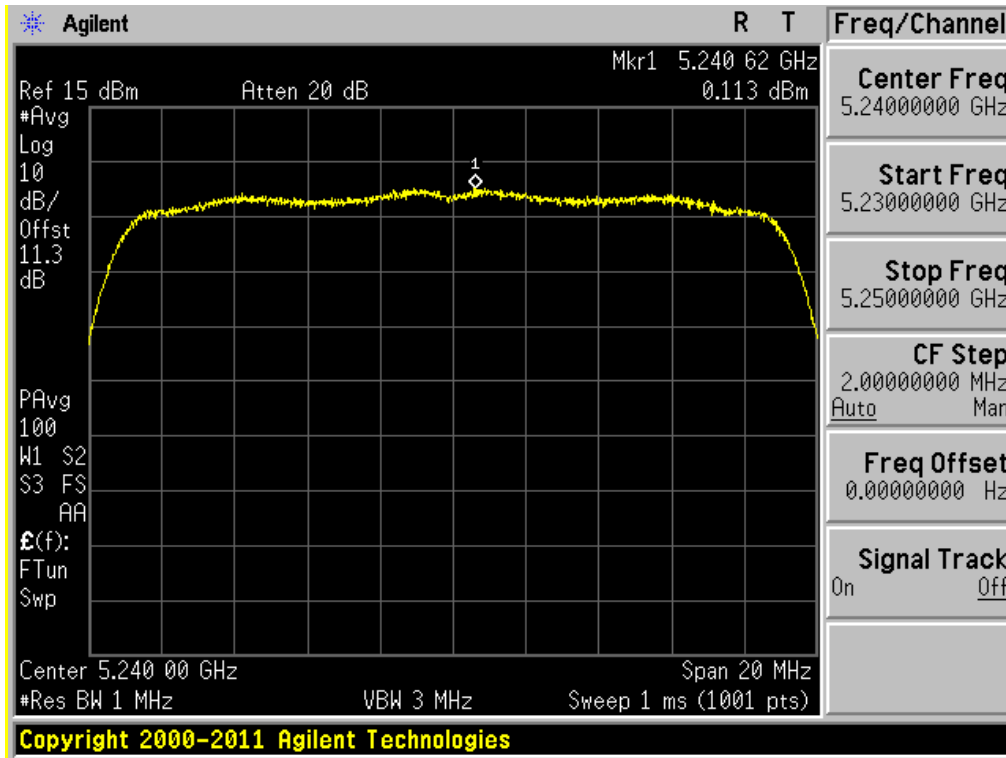
Peak Power Spectral Density

Test Mode: 802.11n HT20 & Ch.40



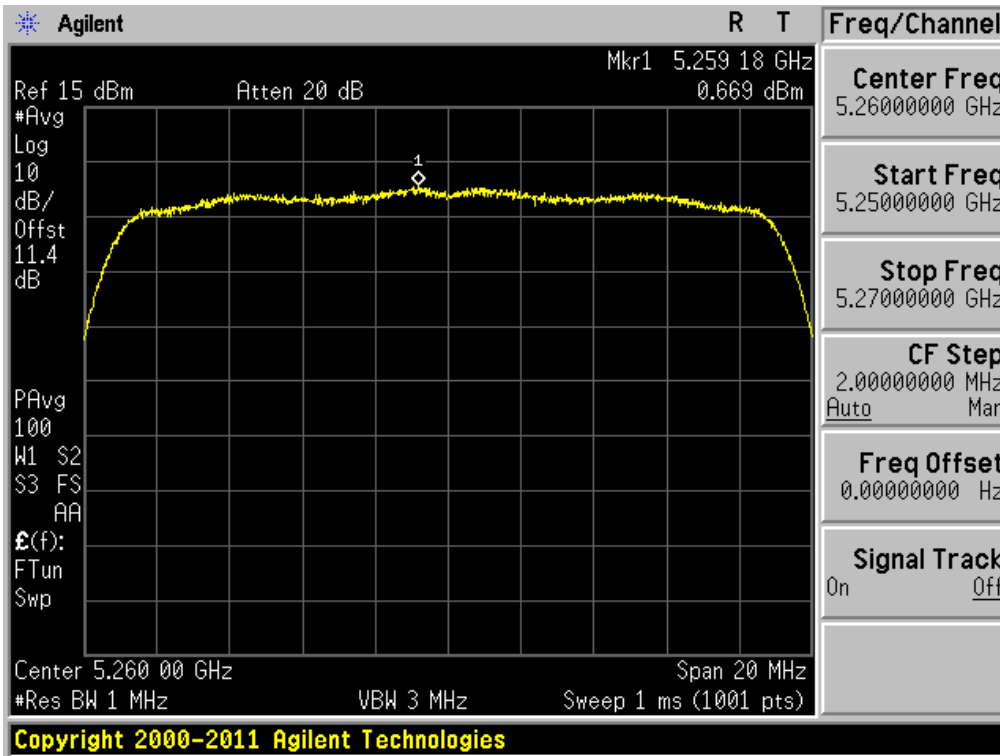
Peak Power Spectral Density

Test Mode: 802.11n HT20 & Ch.48



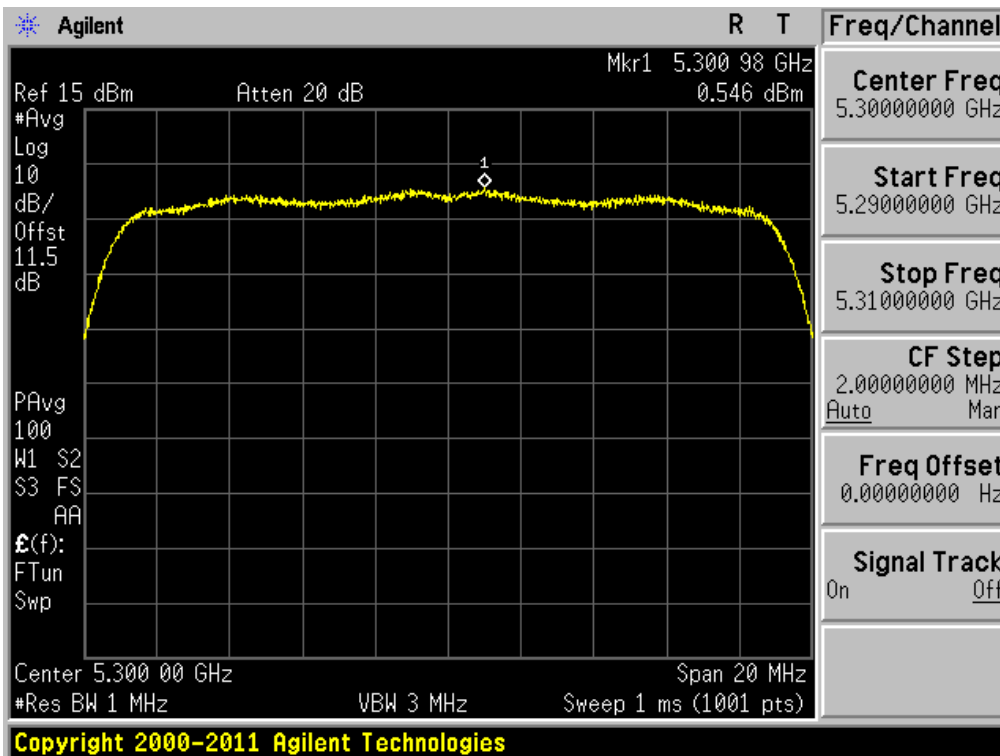
Peak Power Spectral Density

Test Mode: 802.11n HT20 & Ch.52



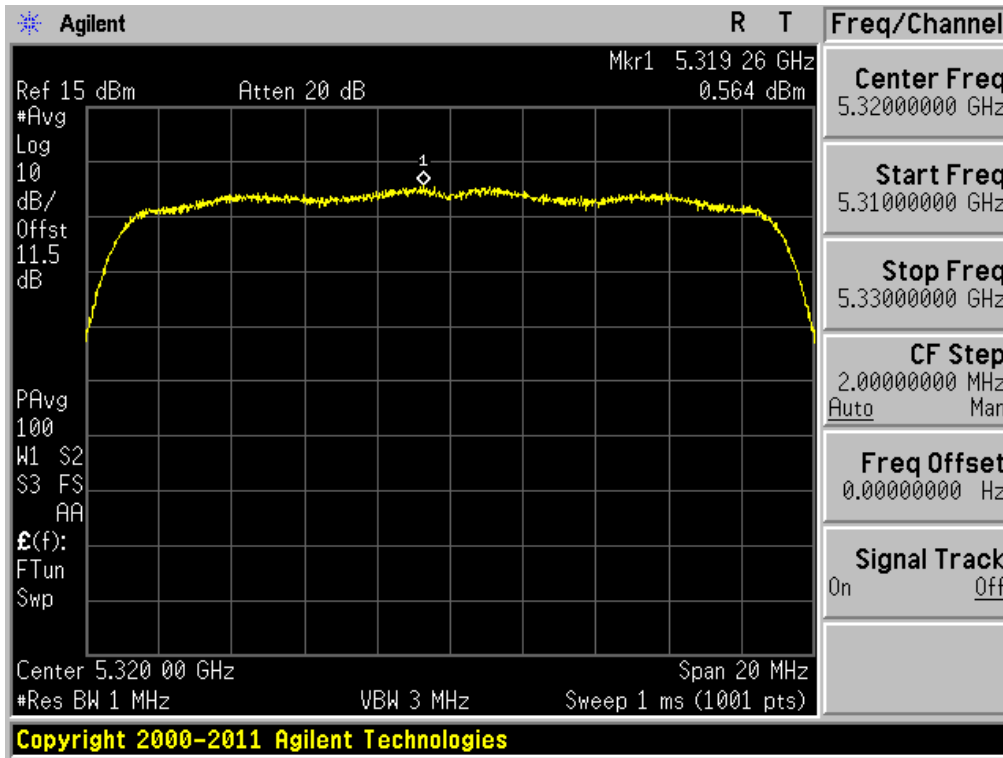
Peak Power Spectral Density

Test Mode: 802.11n HT20 & Ch.60



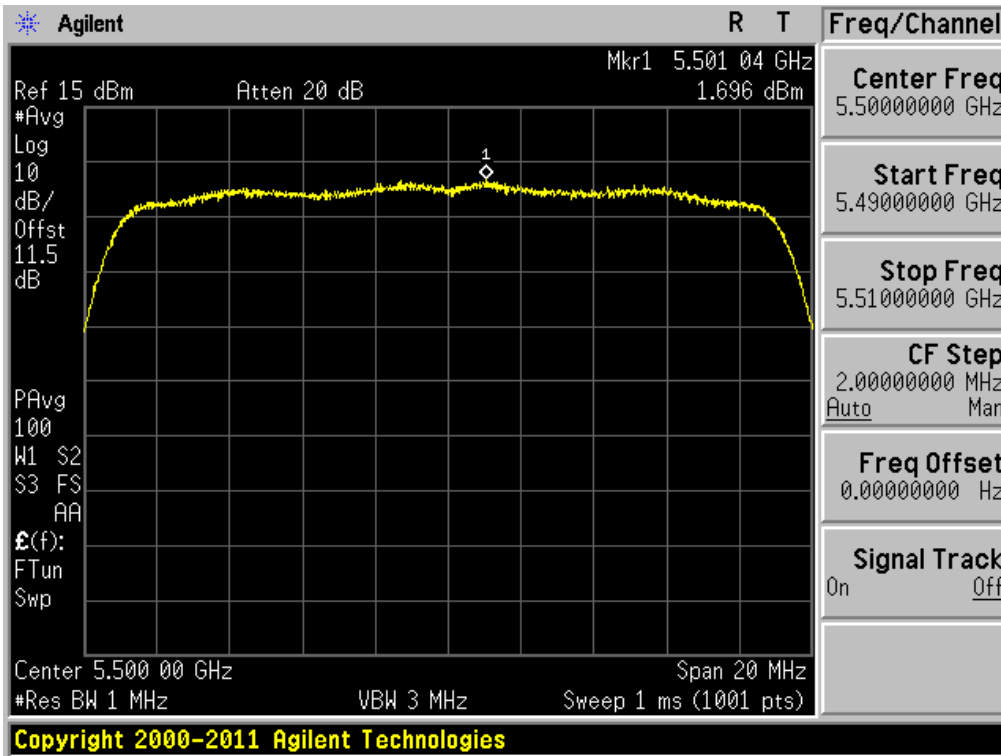
Peak Power Spectral Density

Test Mode: 802.11n HT20 & Ch.64



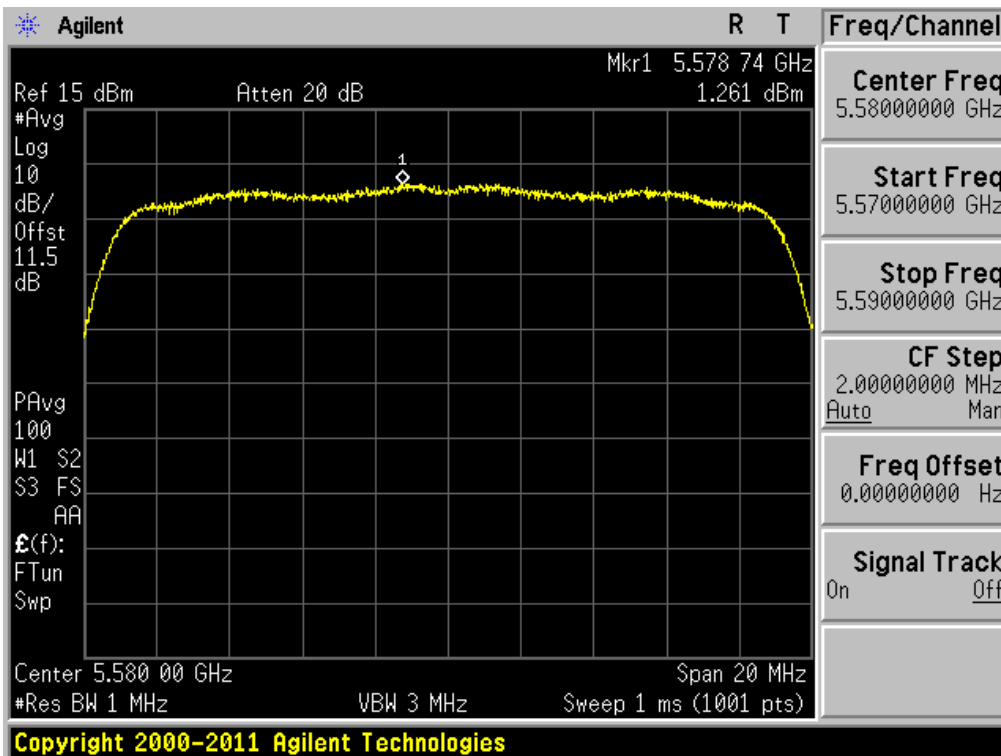
Peak Power Spectral Density

Test Mode: 802.11n HT20 & Ch.100



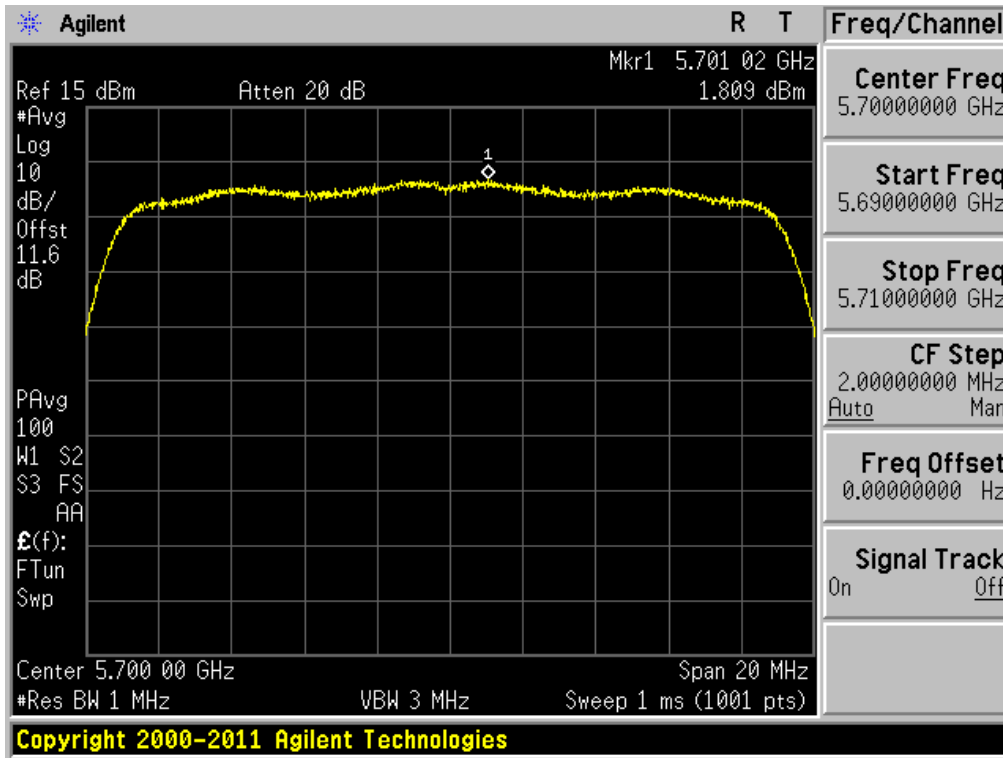
Peak Power Spectral Density

Test Mode: 802.11n HT20 & Ch.116



Peak Power Spectral Density

Test Mode: 802.11n HT20 & Ch.140



### 3.2.4 Peak Excursion Ratio

#### Test requirements

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/MHz**.

■ **TEST CONFIGURATION**

Refer to the APPENDIX I.

■ **TEST PROCEDURE**

Peak Excursion Ratio is measured using Measurement Procedure of **KDB789033**

- 1) Compliance with the peak excursion requirement of Section 15.407(a)(6) shall be demonstrated by confirming that the ratio of the maximum of the peak-max-hold spectrum to the maximum of the average spectrum for continuous transmission does not exceed 13 dB. (Earlier procedures that required computing the ratio of the two spectra at each frequency across the emission bandwidth can lead to unintended failures at band edges and will no longer be required.)
- 2) Set the spectrum analyzer span to view the entire emission bandwidth.
- 3) Find the maximum of the peak-max-hold spectrum.
  - a) Set **RBW = 1 MHz**.
  - b) **VBW ≥ 3 MHz**.
  - c) **Detector = peak**.
  - d) **Trace mode = max-hold**.
  - e) Allow the sweeps to continue until the trace stabilizes.
  - f) Use the peak search function to find the peak of the spectrum.
- 4) **Use the procedure found under E) to measure the PPSD.**
- 5) Compute the ratio of the maximum of the peak-max-hold spectrum to the PPSD.

■ **TEST RESULT : Comply**

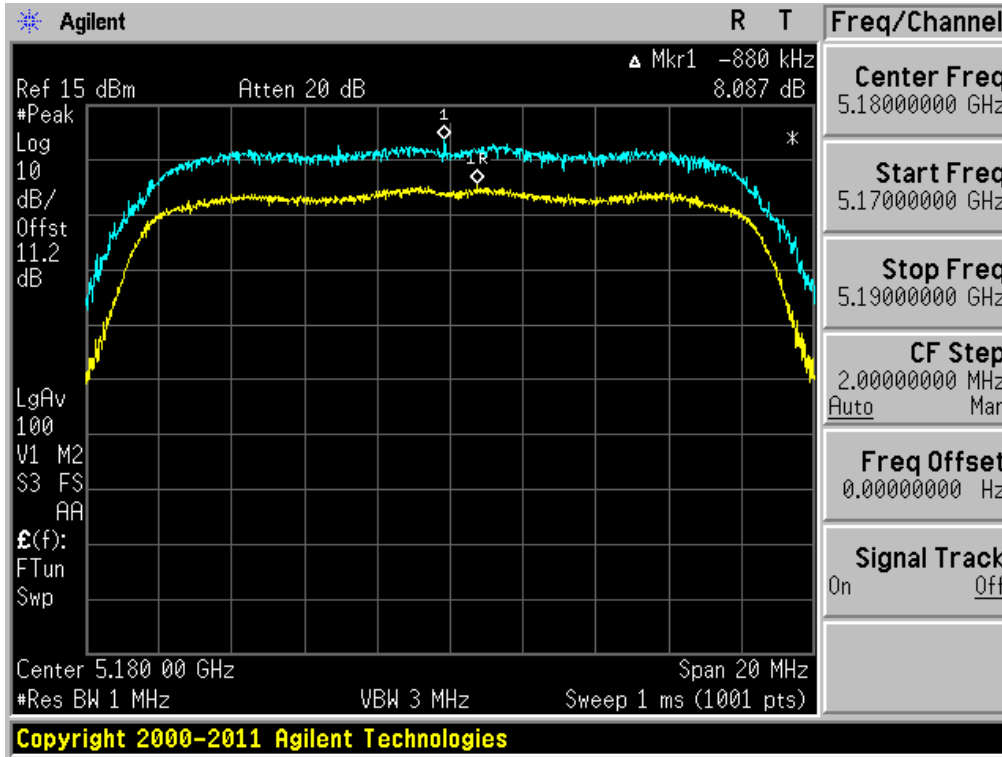
Mode	Band	Channel	Frequency [MHz]	Test Result [dB/MHz]	Limit [dB/MHz]
802.11a	Band I	36	5180	8.087	13.000
		40	5200	7.678	
		48	5240	7.428	
	Band II	52	5260	7.363	
		60	5300	8.236	
		64	5320	7.380	
	Band III	100	5500	7.632	
		116	5580	7.343	
		140	5700	8.036	
802.11n (20MHz)	Band I	36	5180	8.059	
		40	5200	7.733	
		48	5240	8.427	
	Band II	52	5260	7.316	
		60	5300	8.969	
		64	5320	7.605	
	Band III	100	5500	7.348	
		116	5580	9.291	
		140	5700	7.770	



Measurement Data PLOTS

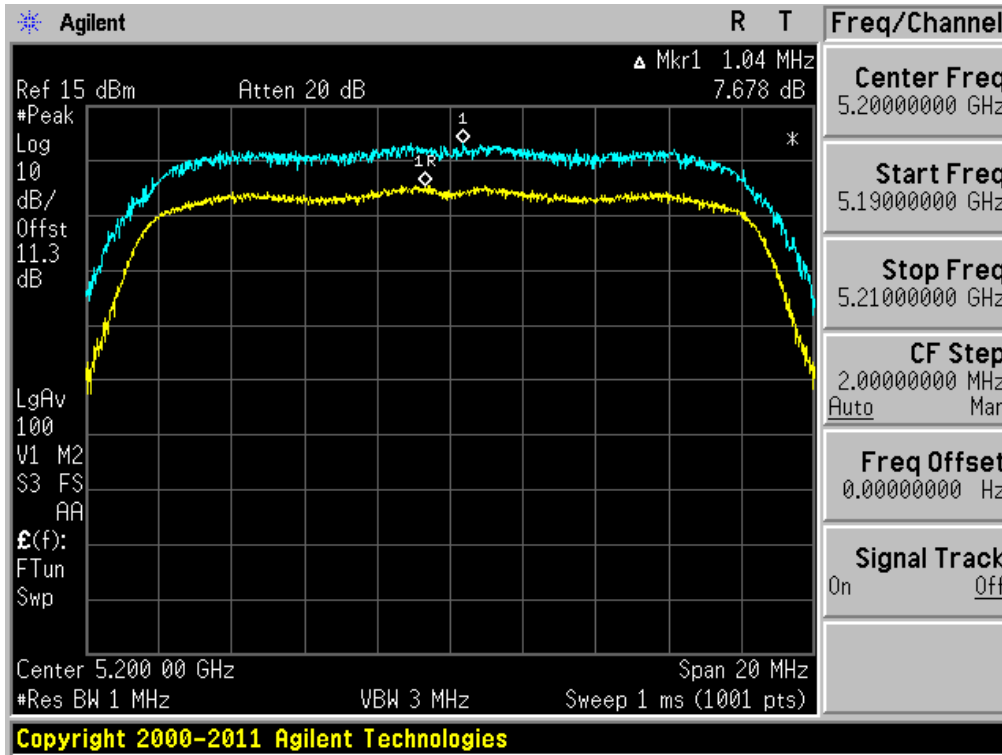
Peak Excursion Ratio

Test Mode: 802.11a & Ch.36



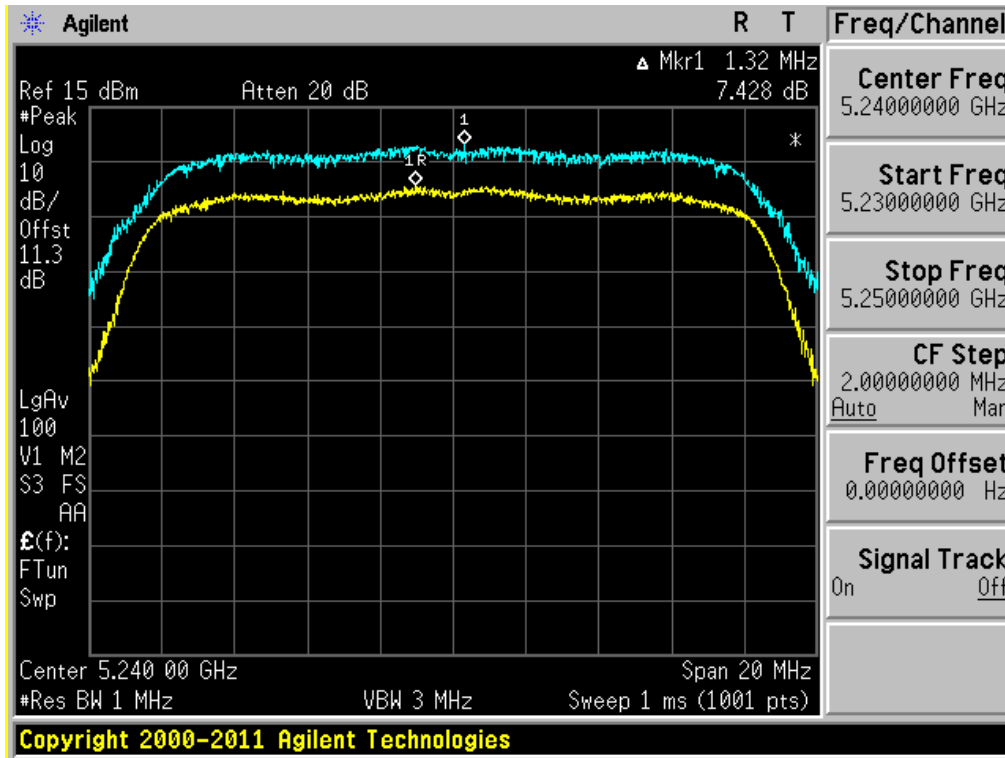
Peak Excursion Ratio

Test Mode: 802.11a & Ch.40



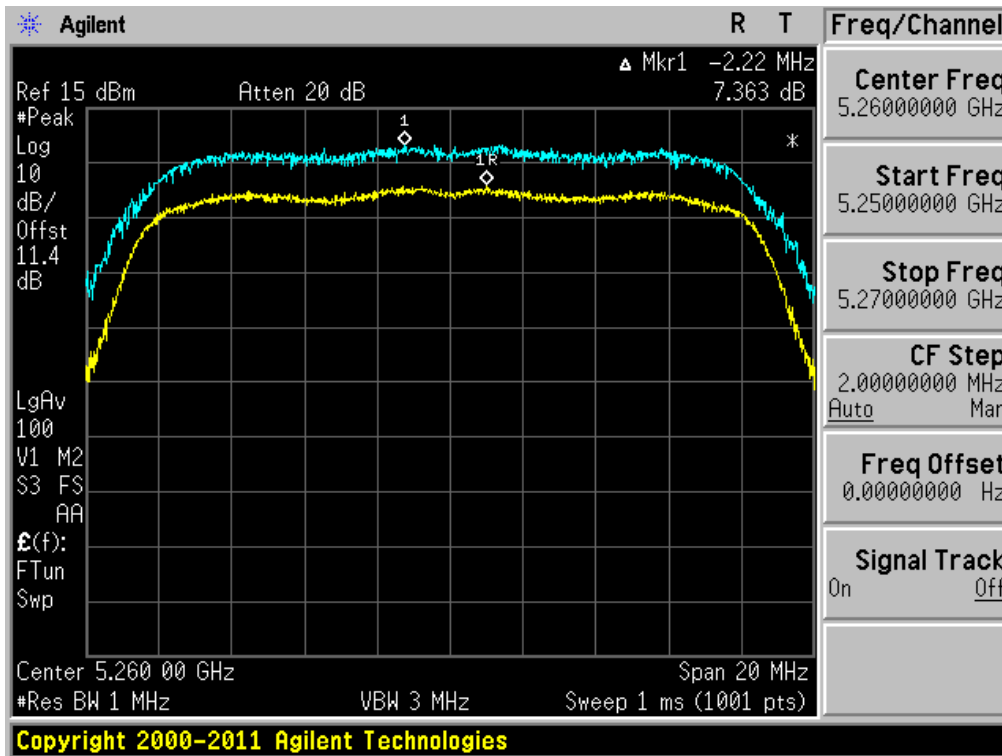
Peak Excursion Ratio

Test Mode: 802.11a & Ch.48



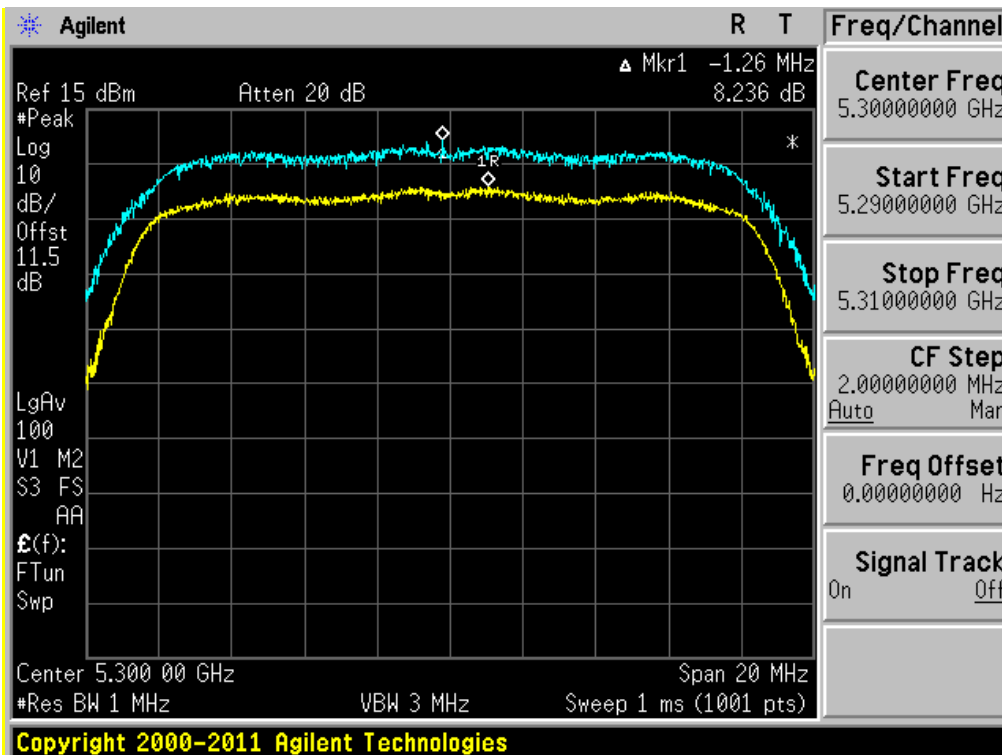
Peak Excursion Ratio

Test Mode: 802.11a & Ch.52



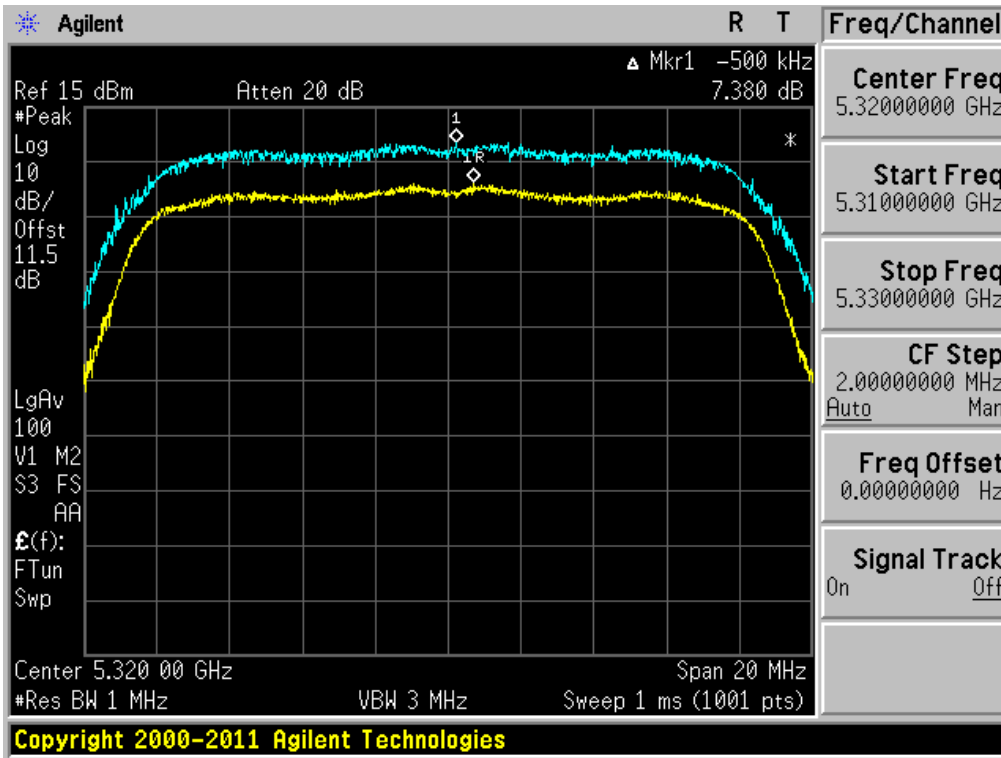
Peak Excursion Ratio

Test Mode: 802.11a & Ch.60



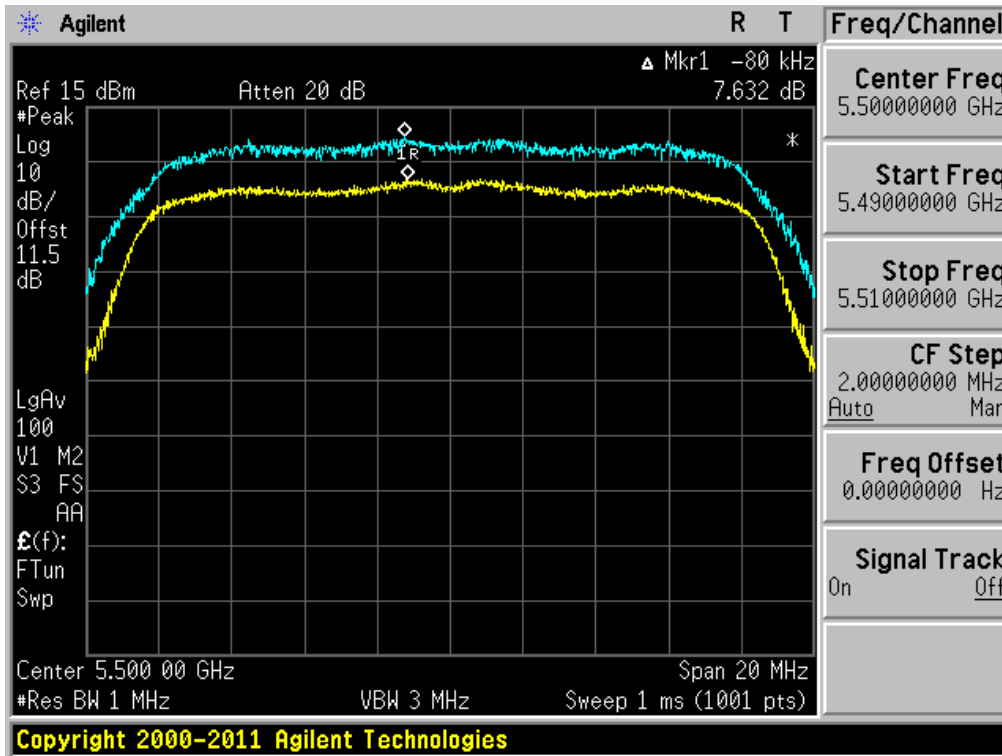
Peak Excursion Ratio

Test Mode: 802.11a & Ch.64



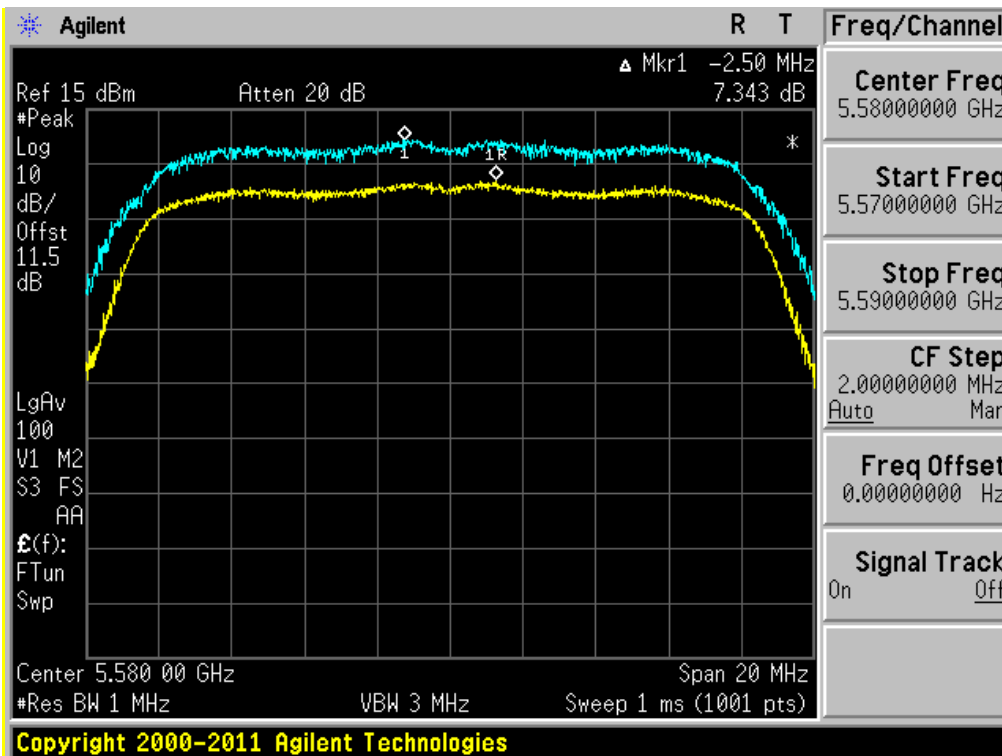
Peak Excursion Ratio

Test Mode: 802.11a & Ch.100



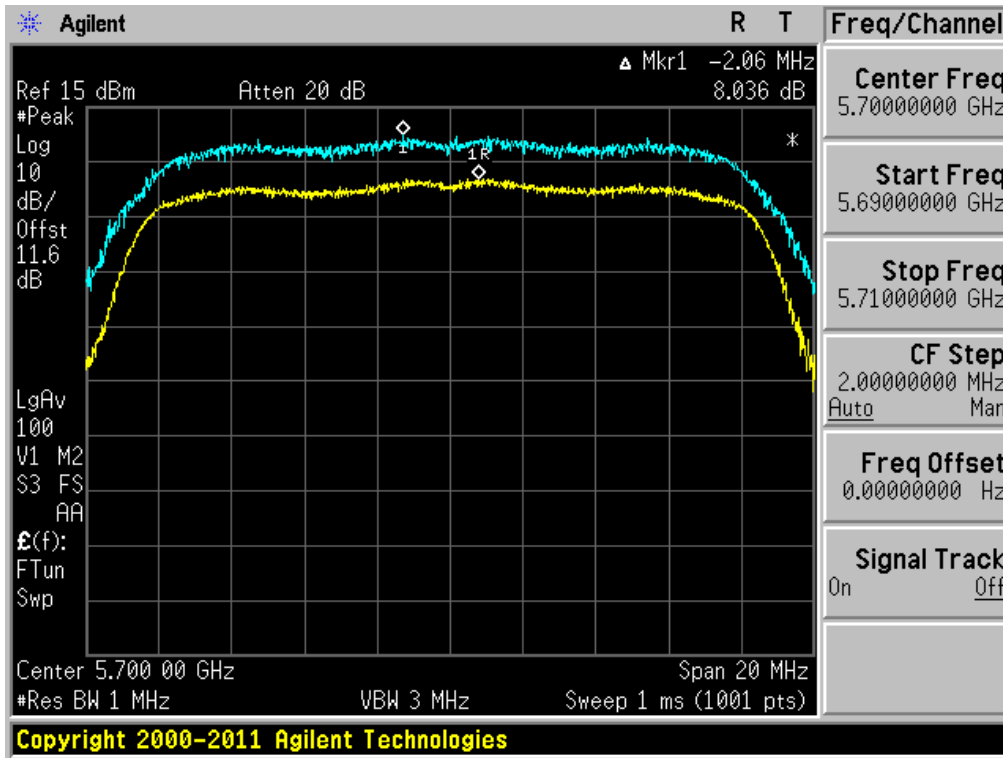
Peak Excursion Ratio

Test Mode: 802.11a & Ch.116



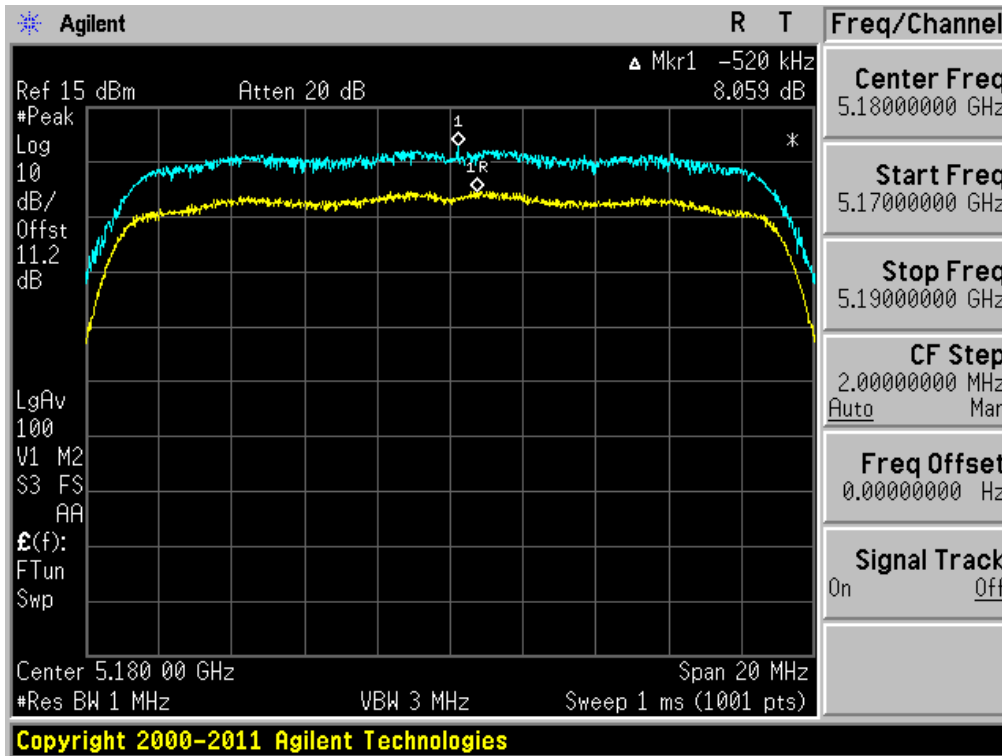
Peak Excursion Ratio

Test Mode: 802.11a & Ch.140



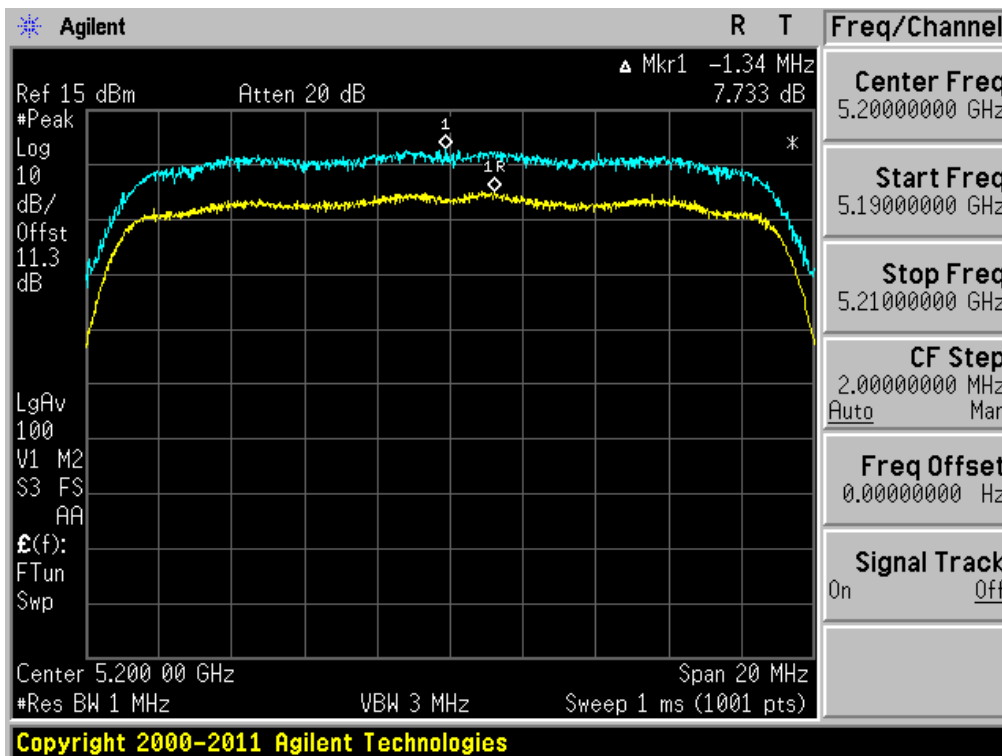
Peak Excursion Ratio

Test Mode: 802.11n HT20 & Ch.36



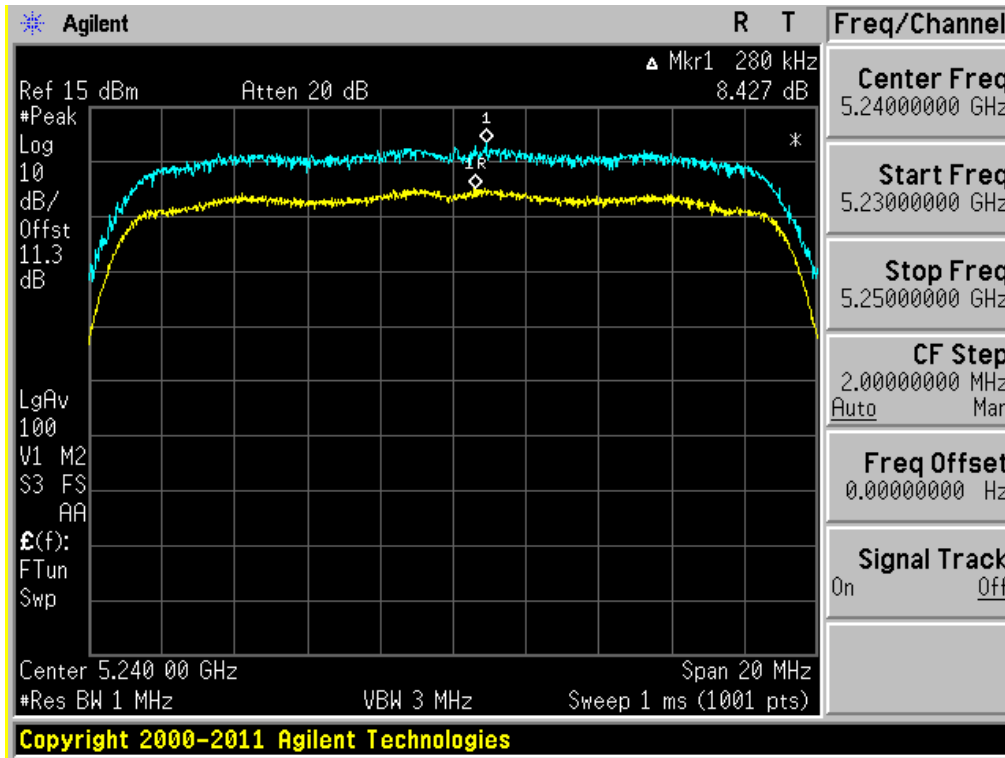
Peak Excursion Ratio

Test Mode: 802.11n HT20 & Ch.40



Peak Excursion Ratio

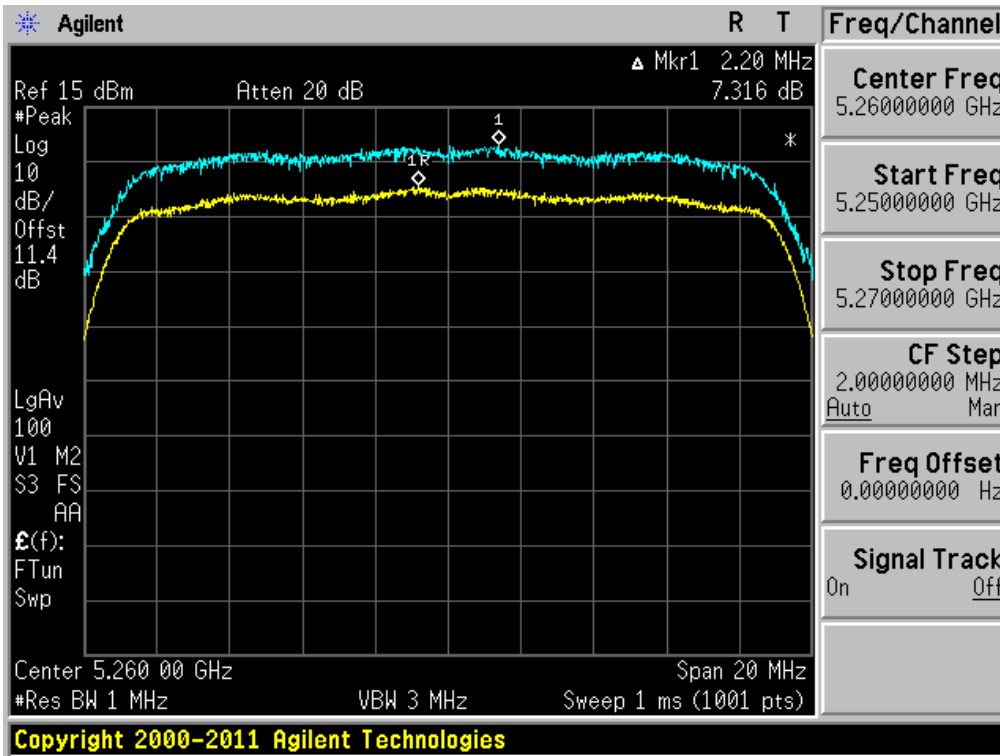
Test Mode: 802.11n HT20 & Ch.48





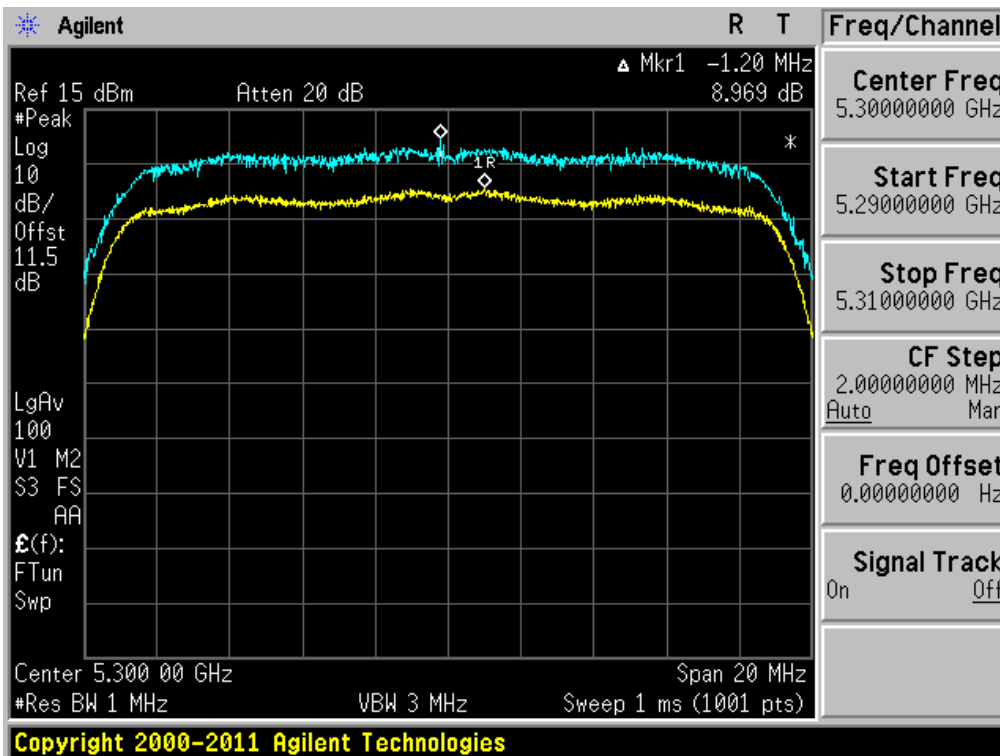
Peak Excursion Ratio

Test Mode: 802.11n HT20 & Ch.52



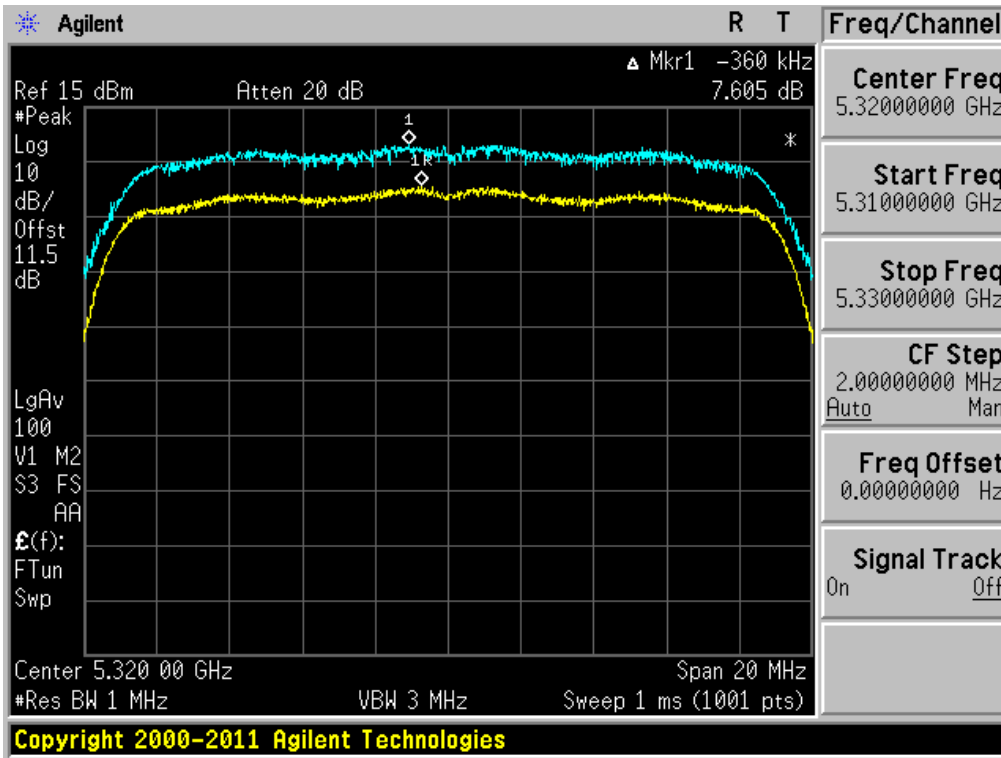
Peak Excursion Ratio

Test Mode: 802.11n HT20 & Ch.60



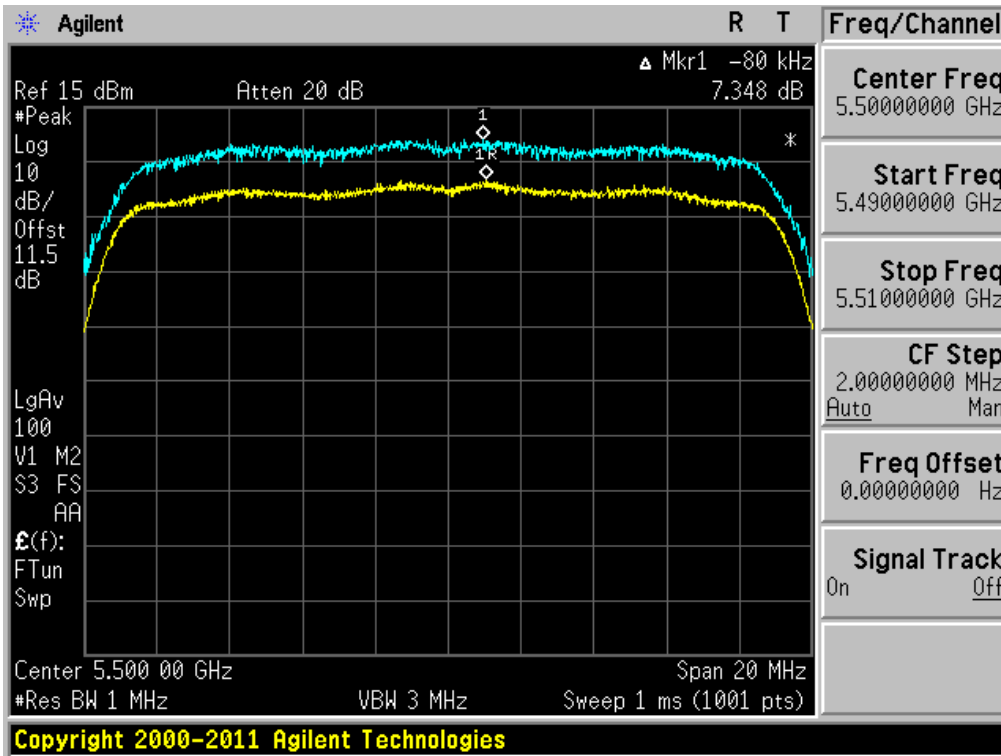
Peak Excursion Ratio

Test Mode: 802.11n HT20 & Ch.64



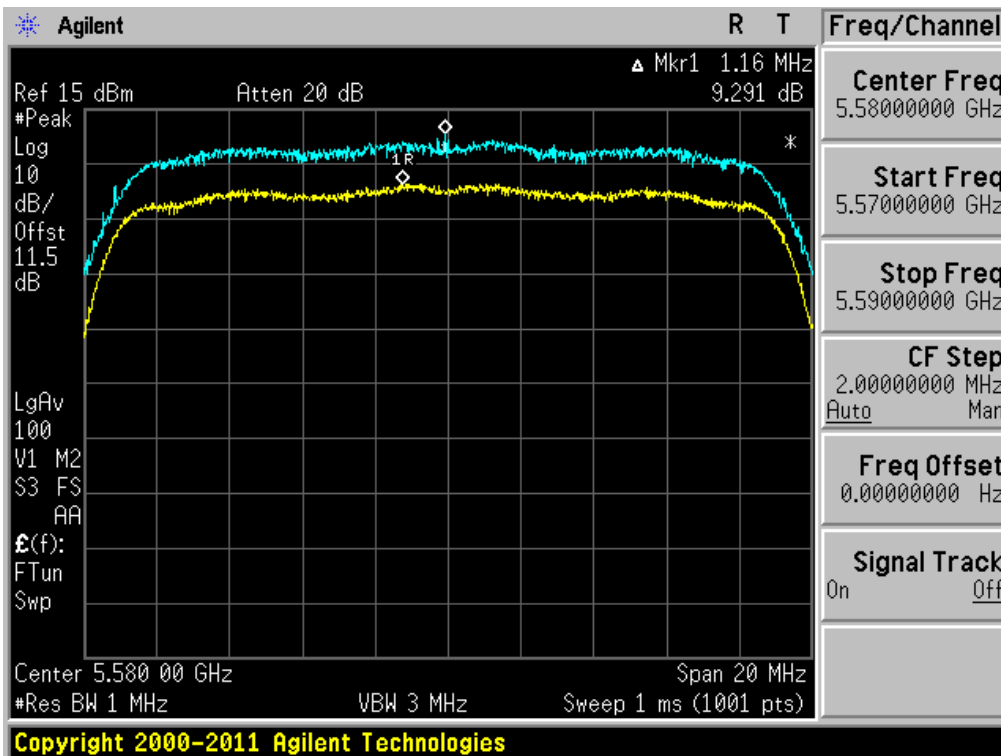
Peak Excursion Ratio

Test Mode: 802.11n HT20 & Ch.100



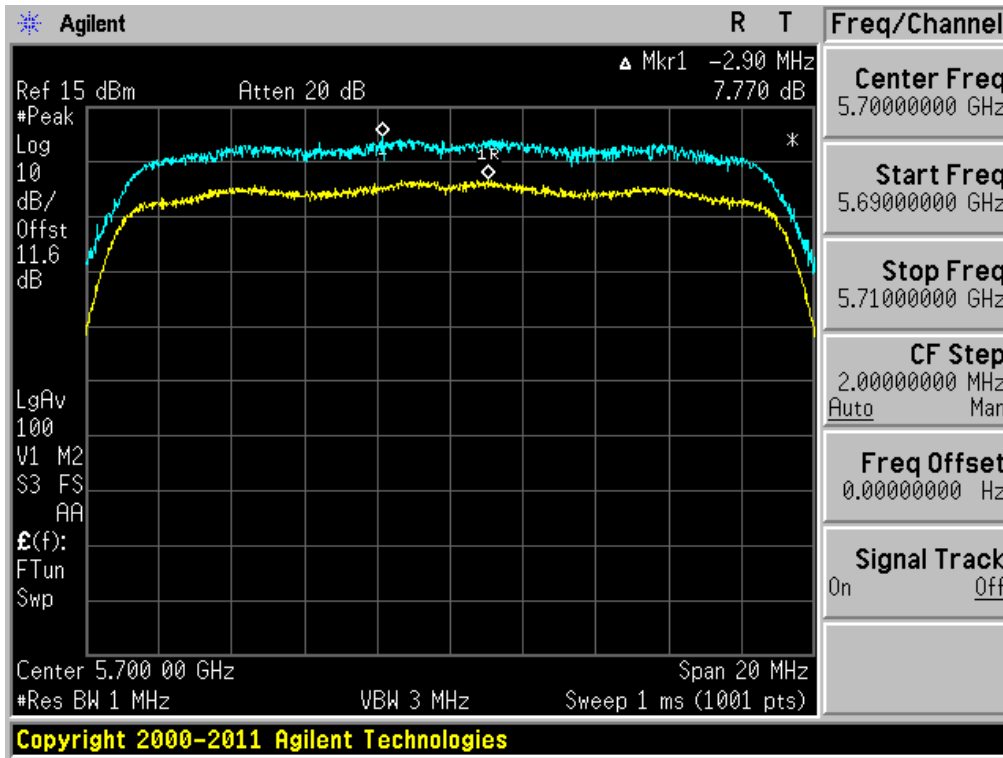
Peak Excursion Ratio

Test Mode: 802.11n HT20 & Ch.116



Peak Excursion Ratio

Test Mode: 802.11n HT20 & Ch.140



### 3.2.5 Frequency Stability

#### Test requirements

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

#### ■ TEST PROCEDURE

The EUT was placed inside of an environmental chamber as the temperature in the chamber was varied between -30°C and +50°C. The temperature was incremented by 10°C intervals and the unit was allowed to stabilize at each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded.

#### ■ TEST RESULT : **Comply**

#### - Measurement Data:

OPERATING FREQUENCY : 5,200,000,000 Hz  
 CHANNEL : 40  
 REFERENCE VOLTAGE : 3.800 V DC

VOLTAGE (%)	POWER (V DC)	TEMP (°C)	FREQ (Hz)	Deviation (%)
100%	3.800	+25(Ref)	5,199,993,285	-0.000129
100%		-30	5,200,019,035	0.000366
100%		-20	5,200,018,897	0.000363
100%		-10	5,200,018,799	0.000362
100%		0	5,200,007,048	0.000136
100%		+10	5,199,998,031	-0.000038
100%		+20	5,199,995,389	-0.000089
100%		+30	5,199,992,305	-0.000148
100%		+40	5,199,991,694	-0.000160
100%		+50	5,199,992,268	-0.000149
100%		+60	5,199,991,342	-0.000167
85%		3.230	+25	5,199,993,261
115%	4.370	+25	5,199,993,004	-0.000135
BATT.ENDPOINT	3.200	+25	5,199,993,293	-0.000129

- Minimum Standard: The emission is maintained within the band of the operation.

**- Measurement Data:**

OPERATING FREQUENCY : 5,300,000,000 Hz  
 CHANNEL : 60  
 REFERENCE VOLTAGE : 3.800 V DC

VOLTAGE (%)	POWER (V DC)	TEMP (°C)	FREQ (Hz)	Deviation (%)
100%	3.800	+25(Ref)	5,299,992,431	-0.000143
100%		-30	5,300,020,035	0.000378
100%		-20	5,300,019,020	0.000359
100%		-10	5,300,019,624	0.000370
100%		0	5,300,006,794	0.000128
100%		+10	5,299,999,835	-0.000003
100%		+20	5,299,994,640	-0.000101
100%		+30	5,299,993,316	-0.000126
100%		+40	5,299,991,335	-0.000163
100%		+50	5,299,992,137	-0.000148
100%		+60	5,299,990,769	-0.000174
85%		3.230	+25	5,299,991,696
115%	4.370	+25	5,299,991,684	-0.000157
BATT.ENDPOINT	3.200	+25	5,299,992,168	-0.000148

**- Minimum Standard: The emission is maintained within the band of the operation.**

**- Measurement Data:**

OPERATING FREQUENCY : 5,580,000,000 Hz  
 CHANNEL : 116  
 REFERENCE VOLTAGE : 3.800 V DC

VOLTAGE (%)	POWER (V DC)	TEMP (°C)	FREQ (Hz)	Deviation (%)
100%	3.800	+25(Ref)	5,579,990,991	-0.000161
100%		-30	5,580,020,156	0.000361
100%		-20	5,580,021,185	0.000380
100%		-10	5,580,018,793	0.000337
100%		0	5,580,006,027	0.000108
100%		+10	5,579,999,024	-0.000017
100%		+20	5,579,992,984	-0.000126
100%		+30	5,579,992,458	-0.000135
100%		+40	5,579,991,564	-0.000151
100%		+50	5,579,990,992	-0.000161
100%		+60	5,579,990,886	-0.000163
85%		3.230	+25	5,579,990,616
115%	4.370	+25	5,579,990,512	-0.000170
BATT.ENDPOINT	3.200	+25	5,579,990,705	-0.000167

**- Minimum Standard: The emission is maintained within the band of the operation.**

### 3.2.6 Radiated Spurious Emission Measurements

#### ■ TEST PROCEDURE

The EUT was placed on a 0.8m high wooden table inside a shielded enclosure. An antenna was placed near the EUT and measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed in semi anechoic chamber. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine the worst-case orientation for maximum emissions.

Radiated spurious emission measured using following Measurement Procedure of **KDB789033**

#### ● Measurements Below 1000MHz

- a) Follow the requirements in section G)3), "General Requirements for Unwanted Emissions Measurements"
- b) Compliance shall be demonstrated using **CISPR quasi-peak detection**; however, **peak detection** is permitted as an alternative to quasi-peak detection.

**G)3)**, General Requirements for Unwanted Emissions Measurements. The following requirements apply to all unwanted emissions measurements, both in and outside of the restricted bands:

#### a) EUT Duty Cycle

- (1) The EUT shall be configured or modified to **transmit continuously** except as stated in (ii), below. The intent is to test at 100 percent duty cycle; however a small reduction in duty cycle (**to no lower than 98 percent**) is permitted if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.
- (2) If **continuous transmission (or at least 98 percent duty cycle) cannot be achieved** due to hardware limitations of the EUT (e.g., overheating), the following additions to the measurement and reporting procedures are required:
  - The EUT shall be configured to operate at the maximum achievable duty cycle.
  - Measure the duty cycle, x, of the transmitter output signal.
  - Adjustments to measurement procedures (e.g., increasing test time and number of traces averaged) shall be performed as described in the procedures below.
  - The test report shall include the following additional information:
    - The reason for the duty cycle limitation.
    - The duty cycle achieved for testing and the associated transmit duration and interval between transmissions.
    - The sweep time and the amount of time used for trace stabilization during max-hold measurements for peak emission measurements.
- (3) **Reduction of the measured emission amplitude levels to account for operational duty factor is not permitted. Compliance is based on emission levels occurring during transmission - not on an average across on and off times of the transmitter.**



**● Measurements Above 1000MHz (Peak)**

- a) Follow the requirements in section G)3), "General Requirements for Unwanted Emissions Measurements".
- b) Peak emission levels are measured by setting the analyzer as follows:
  - (1) **RBW = 1 MHz.**
  - (2) **VBW ≥ 3 MHz.**
  - (3) **Detector = Peak.**
  - (4) Sweep time = auto.
  - (5) Trace mode = max hold.
  - (6) Allow sweeps to continue until the trace stabilizes. Note that if the transmission is not continuous, the time required for the trace to stabilize will increase by a factor of approximately  $1/x$ , where  $x$  is the duty cycle. For example, at 50 percent duty cycle, the measurement time will increase by a factor of two relative to measurement time for continuous transmission.

**● Measurements Above 1000MHz (Method AD)**

- (1) **RBW = 1 MHz.**
- (2) **VBW ≥ 3 MHz.**
- (3) **Detector = RMS**, if  $\text{span}/(\# \text{ of points in sweep}) \leq \text{RBW}/2$ . Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, the detector mode shall be set to peak.
- (4) Averaging type = power (i.e., RMS)
  - As an alternative, the detector and averaging type may be set for linear voltage averaging. Some analyzers require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used.
- (5) Sweep time = auto.
- (6) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, the number of traces shall be increased by a factor of  $1/x$ , where  $x$  is the duty cycle. For example, with 50 percent duty cycle, at least 200 traces should be averaged.
- (7) If tests are performed with the EUT transmitting at a duty cycle less than 98 percent, a correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:
  - If power averaging (RMS) mode was used in step (iv) above, the correction factor is  $10 \log(1/x)$ , where  $x$  is the duty cycle. For example, if the transmit duty cycle was 50 percent, then 3 dB must be added to the measured emission levels.
  - **If linear voltage averaging mode was used in step (iv) above, the correction factor is  $20 \log(1/x)$ , where  $x$  is the duty cycle.** For example, if the transmit duty cycle was 50 percent, then 6 dB must be added to the measured emission levels.

■ **Minimum Standard:**

• **FCC Part 15.209(a) and (b)**

Frequency (MHz)	Limit (uV/m) @ 3m
30 ~ 88	100 **
88 ~ 216	150 **
216 ~ 960	200 **
Above 960	500

\*\* Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

• **FCC Part 15.205 (a):** Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	3600 ~ 4400	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	4.5 ~ 5.15	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~	149.9 ~ 150.05	1645.5 ~ 1646.5	5.35 ~ 5.46	17.7 ~ 21.4
4.125 ~ 4.128	12.52025	156.52475 ~	1660 ~ 1710	7.25 ~ 7.75	22.01 ~ 23.12
4.17725 ~ 4.17775	12.57675 ~	156.52525	1718.8 ~ 1722.2	8.025 ~ 8.5	23.6 ~ 24.0
4.20725 ~ 4.20775	12.57725	156.7 ~ 156.9	2200 ~ 2300	9.0 ~ 9.2	31.2 ~ 31.8
6.215 ~ 6.218	13.36 ~ 13.41	162.0125 ~ 167.17	2310 ~ 2390	9.3 ~ 9.5	36.43 ~ 36.5
6.26775 ~ 6.26825	16.42 ~ 16.423	167.72 ~ 173.2	2483.5 ~ 2500	10.6 ~ 12.7	Above 38.6
6.31175 ~ 6.31225	16.69475 ~	240 ~ 285	2655 ~ 2900	13.25 ~ 13.4	
8.291 ~ 8.294	16.69525	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	16.80425 ~	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	16.80475	608 ~ 614	3345.8 ~ 3358		
	25.5 ~ 25.67	960 ~ 1240			
	37.5 ~ 38.25				
	73 ~ 74.6				
	74.8 ~ 75.2				

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

• **FCC Part 15.407 (b):** Undesirable Emission Limits: Except as shown in Paragraph (b)(6) of this section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the **5.15-5.25 GHz band**: all emissions outside of the **5.15-5.35 GHz band** shall not exceed an **EIRP of -27 dBm/MHz**.
- (2) For transmitters operating in the **5.25-5.35 GHz band**: all emissions outside of the **5.15-5.35 GHz band** shall not exceed an **EIRP of -27 dBm/MHz**. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.
- (3) For transmitters operating in the **5.47-5.725 GHz band**: all emissions outside of the **5.47-5.725 GHz band** shall not exceed an **EIRP of -27 dBm/MHz**.
- (4) For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.
- (5) The above emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
- (6) Unwanted emissions **below 1 GHz** must comply with the general field strength limits set forth in **Section 15.209**. Further, any U-NII devices using an **AC power line** are required to comply also with the conducted limits set forth in **Section 15.207**.

■ **Measurement Data:**

**30MHz ~ 40GHz Radiated Spurious Emissions: 802.11a & 5180MHz(Ch. 36)**

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5147.000	H	X	PK	52.43	3.08	-	-	55.51	74.00	18.49
5147.000	H	X	AV	32.82	3.08	0.46	-	36.36	54.00	17.64
10360.280	H	Z	PK	48.08	11.39	-	-6.02	53.45	68.20	14.75

**30MHz ~ 40GHz Radiated Spurious Emissions: 802.11a & 5200MHz(Ch. 40)**

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10399.630	H	Z	PK	48.84	11.98	-	-6.02	54.80	68.20	13.40
-	-	-	-	-	-	-	-	-	-	-

**30MHz ~ 40GHz Radiated Spurious Emissions: 802.11a & 5240MHz(Ch. 48)**

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10481.570	H	Z	PK	49.16	12.36	-	-6.02	55.50	68.20	12.70
-	-	-	-	-	-	-	-	-	-	-

**Note.**

- This test item was performed in each axis and the worst case data were reported.
- Sample Calculation.  
 Margin = Limit – Result  
 Result = Reading + T.F + DUTY Correction Factor + Distance Correction Factor  
 T.F = AF + CL – AG  
 DUTY Correction Factor : 0.46 dB = 20\*log(1/0.95) for Method AD.
- Measurement Distance above 10 GHz = 1.5 m. So Distance Correction Factor : -6.02dB = 20\*log(1.5m/3m)

■ Measurement Data:

30MHz ~ 40GHz Radiated Spurious Emissions: 802.11a & 5260MHz(Ch. 52)

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10521.150	H	Z	PK	48.69	12.08	-	-6.02	54.75	68.20	13.45
-	-	-	-	-	-	-	-	-	-	-

30MHz ~ 40GHz Radiated Spurious Emissions: 802.11a & 5300MHz(Ch. 60)

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10600.400	H	Z	PK	49.89	12.21	-	-6.02	56.08	74.00	17.92
10600.750	H	Z	AV	39.61	12.21	0.46	-6.02	46.26	54.00	7.74

30MHz ~ 40GHz Radiated Spurious Emissions: 802.11a & 5320MHz(Ch. 64)

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5350.240	H	X	PK	56.23	3.61	-	-	59.84	74.00	14.16
5350.220	H	X	AV	37.21	3.61	0.46	-	41.28	54.00	12.72
10639.950	H	Z	PK	50.27	12.53	-	-6.02	56.78	74.00	17.22
10640.750	H	Z	AV	39.96	12.53	0.46	-6.02	46.93	54.00	7.07

**Note.**

- This test item was performed in each axis and the worst case data were reported.
- Sample Calculation.  
Margin = Limit – Result  
Result = Reading + T.F + DUTY Correction Factor + Distance Correction Factor  
T.F = AF + CL – AG  
DUTY Correction Factor : 0.46 dB = 20\*log(1/0.95) for Method AD.
- Measurement Distance above 10 GHz = 1.5 m. So Distance Correction Factor : -6.02dB = 20\*log(1.5m/3m)

■ **Measurement Data:**

**30MHz ~ 40GHz Radiated Spurious Emissions: 802.11a & 5500MHz(Ch. 100)**

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5469.660	H	Z	PK	55.71	3.4	-	-	59.11	68.20	9.09
11002.400	H	Z	PK	49.25	12.92	-	-6.02	56.15	74.00	17.85
11000.550	H	Z	AV	38.84	12.92	0.46	-6.02	46.20	54.00	7.80

**30MHz ~ 40GHz Radiated Spurious Emissions: 802.11a & 5580MHz(Ch. 116)**

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11161.900	H	Z	PK	50.76	14.65	-	-6.02	59.39	74.00	14.61
11159.100	H	Z	AV	38.99	14.65	0.46	-6.02	48.08	54.00	5.92

**30MHz ~ 40GHz Radiated Spurious Emissions: 802.11a & 5700MHz(Ch. 140)**

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5725.470	H	Z	PK	58.36	3.8	-	-	62.16	68.20	6.04
11398.500	H	Z	PK	52.35	14.65	-	-6.02	60.98	74.00	13.02
11400.850	H	Z	AV	41.93	14.65	0.46	-6.02	51.02	54.00	2.98

**Note.**

- This test item was performed in each axis and the worst case data were reported.
- Sample Calculation.  
 Margin = Limit – Result  
 Result = Reading + T.F + DUTY Correction Factor + Distance Correction Factor  
 T.F = AF + CL – AG  
 DUTY Correction Factor : 0.46 dB = 20\*log(1/0.95) for Method AD.
- Measurement Distance above 10 GHz = 1.5 m. So Distance Correction Factor : -6.02dB = 20\*log(1.5m/3m)

■ **Measurement Data:**

**30MHz ~ 40GHz Radiated Spurious Emissions: 802.11n HT20 & 5180MHz(Ch. 36)**

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5148.950	H	X	PK	54.14	3.08	-	-	57.22	74.00	16.78
5149.500	H	X	AV	34.78	3.08	0.46	-	38.32	54.00	15.68
10360.310	H	Z	PK	48.11	11.39	-	-6.02	53.48	68.20	14.72

**30MHz ~ 40GHz Radiated Spurious Emissions: 802.11n HT20 & 5200MHz(Ch. 40)**

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10400.950	H	Z	PK	47.49	11.98	-	-6.02	53.45	68.20	14.75
-	-	-	-	-	-	-	-	-	-	-

**30MHz ~ 40GHz Radiated Spurious Emissions: 802.11n HT20 & 5240MHz(Ch. 48)**

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10481.620	H	Z	PK	47.87	11.98	-	-6.02	53.83	68.20	14.37
-	-	-	-	-	-	-	-	-	-	-

**Note.**

- This test item was performed in each axis and the worst case data were reported.
- Sample Calculation.  
 Margin = Limit – Result  
 Result = Reading + T.F + DUTY Correction Factor + Distance Correction Factor  
 T.F = AF + CL – AG  
 DUTY Correction Factor : 0.46 dB = 20\*log(1/0.95) for Method AD.
- Measurement Distance above 10 GHz = 1.5 m. So Distance Correction Factor : -6.02dB = 20\*log(1.5m/3m)

■ **Measurement Data:**

**30MHz ~ 40GHz Radiated Spurious Emissions: 802.11n HT20 & 5260MHz(Ch. 52)**

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBUV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBUV/m)	Limit (dBUV/m)	Margin (dB)
10520.960	H	Z	PK	49.75	12.08	-	-6.02	55.81	68.20	12.39
-	-	-	-	-	-	-	-	-	-	-

**30MHz ~ 40GHz Radiated Spurious Emissions: 802.11n HT20 & 5300MHz(Ch. 60)**

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBUV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBUV/m)	Limit (dBUV/m)	Margin (dB)
10600.100	H	Z	PK	50.22	12.21	-	-6.02	56.41	74.00	17.59
10600.250	H	Z	AV	39.56	12.21	0.46	-6.02	46.21	54.00	7.79

**30MHz ~ 40GHz Radiated Spurious Emissions: 802.11n HT20 & 5320MHz(Ch. 64)**

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBUV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBUV/m)	Limit (dBUV/m)	Margin (dB)
5350.760	H	X	PK	55.86	3.61	-	-	59.47	74.00	14.53
5350.100	H	X	AV	37.62	3.61	0.46	-	41.69	54.00	12.31
10640.370	H	Z	PK	50.06	12.53	-	-6.02	56.57	74.00	17.43
10640.640	H	Z	AV	40.28	12.53	0.46	-6.02	47.25	54.00	6.75

**Note.**

- This test item was performed in each axis and the worst case data were reported.
- Sample Calculation.  
 Margin = Limit – Result  
 Result = Reading + T.F + DUTY Correction Factor + Distance Correction Factor  
 T.F = AF + CL – AG  
 DUTY Correction Factor : 0.46 dB = 20\*log(1/0.95) for Method AD.
- Measurement Distance above 10 GHz = 1.5 m. So Distance Correction Factor : -6.02dB = 20\*log(1.5m/3m)

■ **Measurement Data:**

**30MHz ~ 40GHz Radiated Spurious Emissions: 802.11n HT20 & 5500MHz(Ch. 100)**

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5468.480	H	Z	PK	56.02	3.4	-	-	59.42	68.20	8.78
10999.750	H	Z	PK	49.02	12.92	-	-6.02	55.92	74.00	18.08
10999.950	H	Z	AV	39.57	12.92	0.46	-6.02	46.93	54.00	7.07
-	-	-	-	-	-	-	-	-	-	-

**30MHz ~ 40GHz Radiated Spurious Emissions: 802.11n HT20 & 5580MHz(Ch. 116)**

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11160.850	H	Z	PK	50.18	14.65	-	-6.02	58.81	74.00	15.19
11160.850	H	Z	AV	39.73	14.65	0.46	-6.02	48.82	54.00	5.18

**30MHz ~ 40GHz Radiated Spurious Emissions: 802.11n HT20 & 5700MHz(Ch. 140)**

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5725.680	H	Z	PK	57.32	3.8	-	-	61.12	68.20	7.08
11401.800	H	Z	PK	52.98	14.65	-	-6.02	61.61	74.00	12.39
11402.150	H	Z	AV	41.84	14.65	0.46	-6.02	50.93	54.00	3.07

**Note.**

- This test item was performed in each axis and the worst case data were reported.
- Sample Calculation.  
 Margin = Limit – Result  
 Result = Reading + T.F + DUTY Correction Factor + Distance Correction Factor  
 T.F = AF + CL – AG  
 DUTY Correction Factor : 0.46 dB = 20\*log(1/0.95) for Method AD.
- Measurement Distance above 10 GHz = 1.5 m. So Distance Correction Factor : -6.02dB = 20\*log(1.5m/3m)



### 3.2.7 AC Conducted Emissions

■ **TEST PROCEDURE :**

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. Emissions closest to the limit are measured in the quasi-peak mode (QP) and average mode (AV) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

■ **Measurement Data: Comply**

Note 1: See next pages for actual measured spectrum plots and data.

■ **Minimum Standard: FCC Part 15.207(a)/EN 55022**

Frequency Range (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

### AC Line Conducted Emissions (Graph)

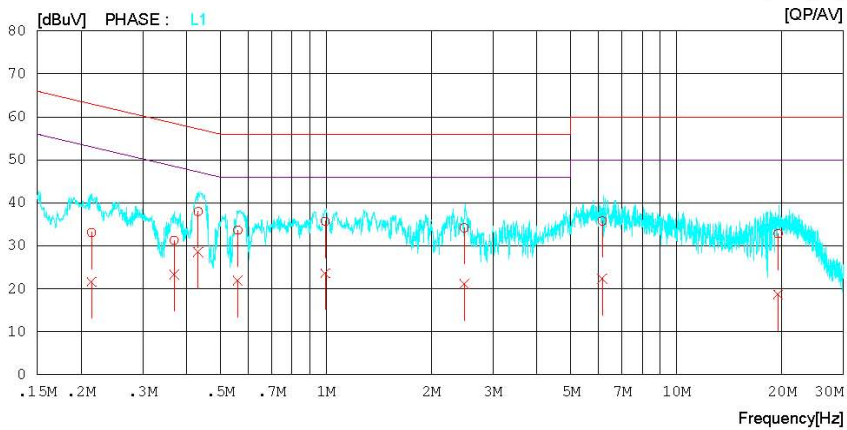
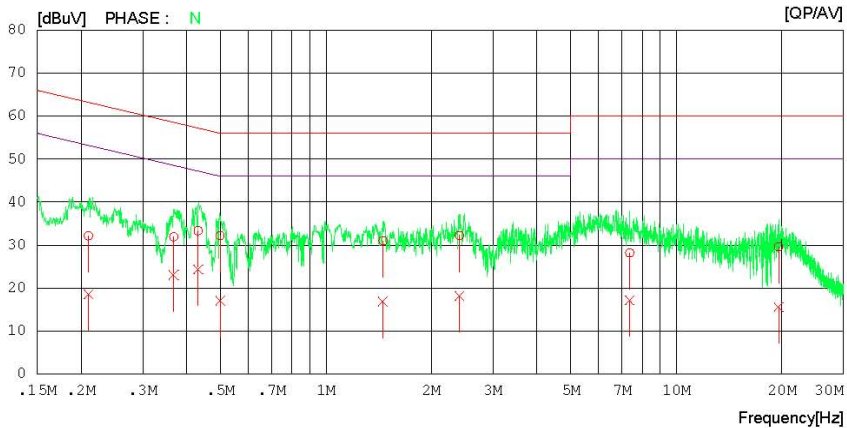
Test Mode: 802.11a\_5.1G



### Results of Conducted Emission

Digital EMC  
Date : 2012-07-29

Model No.	: LG-P768f	Reference No.	:
Type	:	Power Supply	: 120 V 60 Hz
Serial No.	: Identical prototype	Temp/Humi.	: 24 °C 47 % R.H.
Test Condition	: WLAN	Operator	: S.K.RYU
Memo	: 5.1GHz		
LIMIT	: CISPR22_B QP		
	: CISPR22_B AV		



**AC Line Conducted Emissions (Data List)**

Test Mode: 802.11a\_5.1G

Results of Conducted Emission

Digital EMC  
 Date : 2012-07-29

Model No.	: LG-P768f	Reference No.	:
Type	:	Power Supply	: 120 V 60 Hz
Serial No.	: Identical prototype	Temp/Humi.	: 24 °C 47 % R.H.
Test Condition	: WLAN	Operator	: S.K.RYU
Memo	: 5.1GHz		

LIMIT : CISPR22\_B QP  
 CISPR22\_B AV

NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]			
1	0.20996	31.9	18.3	0.2	32.1	18.5	63.2	53.2	31.1	34.7	N
2	0.36766	31.6	22.7	0.3	31.9	23.0	58.6	48.6	26.7	25.6	N
3	0.43166	33.0	24.0	0.3	33.3	24.3	57.2	47.2	23.9	22.9	N
4	0.49933	31.9	16.9	0.2	32.1	17.1	56.0	46.0	23.9	28.9	N
5	1.45450	30.7	16.6	0.3	31.0	16.9	56.0	46.0	25.0	29.1	N
6	2.40350	31.9	17.8	0.3	32.2	18.1	56.0	46.0	23.8	27.9	N
7	7.35900	27.7	16.6	0.5	28.2	17.1	60.0	50.0	31.8	32.9	N
8	19.59600	28.4	14.3	1.2	29.6	15.5	60.0	50.0	30.4	34.5	N
9	0.21445	32.9	21.4	0.2	33.1	21.6	63.0	53.0	29.9	31.4	L1
10	0.36896	31.0	23.0	0.3	31.3	23.3	58.5	48.5	27.2	25.2	L1
11	0.43189	37.7	28.3	0.3	38.0	28.6	57.2	47.2	19.2	18.6	L1
12	0.56033	33.4	21.7	0.2	33.6	21.9	56.0	46.0	22.4	24.1	L1
13	0.99550	35.4	23.3	0.3	35.7	23.6	56.0	46.0	20.3	22.4	L1
14	2.48200	33.9	20.8	0.3	34.2	21.1	56.0	46.0	21.8	24.9	L1
15	6.14600	35.3	21.9	0.5	35.8	22.4	60.0	50.0	24.2	27.6	L1
16	19.51550	31.7	17.5	1.2	32.9	18.7	60.0	50.0	27.1	31.3	L1

### AC Line Conducted Emissions (Graph)

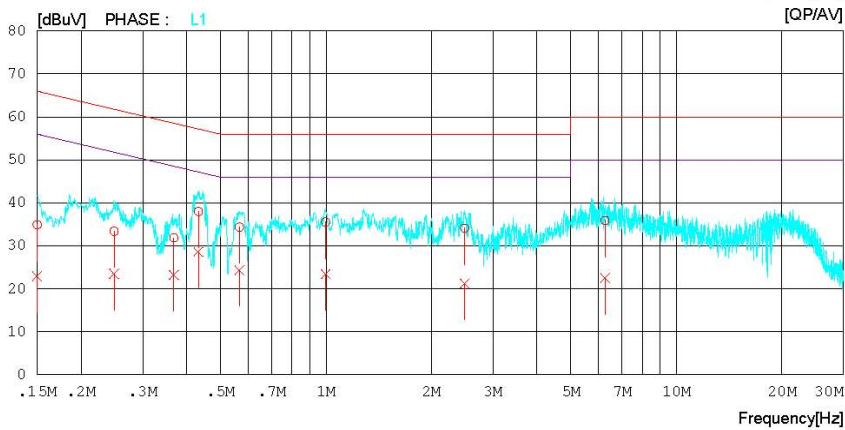
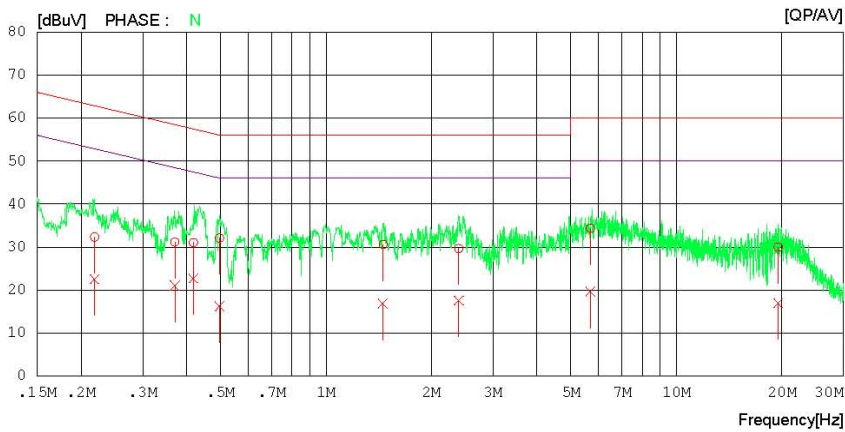
Test Mode: 802.11a\_5.3G



### Results of Conducted Emission

Digital EMC  
Date : 2012-07-29

Model No.	: LG-P768f	Reference No.	:
Type	:	Power Supply	: 120 V 60 Hz
Serial No.	: Identical prototype	Temp/Humi.	: 24 °C 47 % R.H.
Test Condition	: WLAN	Operator	: S.K.RYU
Memo	: 5.3GHz		
LIMIT	: CISPR22_B_QP		
	: CISPR22_B_AV		



**AC Line Conducted Emissions (Data List)**

Test Mode: 802.11a\_5.3G

Results of Conducted Emission

Digital EMC  
 Date : 2012-07-29

Model No.	: LG-P768f	Reference No.	:
Type	:	Power Supply	: 120 V 60 Hz
Serial No.	: Identical prototype	Temp/Humi.	: 24 °C 47 % R.H.
Test Condition	: WLAN	Operator	: S.K.RYU
Memo	: 5.3GHz		

LIMIT : CISPR22\_B QP  
 CISPR22\_B AV

NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.21859	32.1	22.3	0.2	32.3	22.5	62.9	52.9	30.6	30.4	N
2	0.37064	30.8	20.7	0.3	31.1	21.0	58.5	48.5	27.4	27.5	N
3	0.41880	30.7	22.4	0.3	31.0	22.7	57.5	47.5	26.5	24.8	N
4	0.49713	31.9	16.0	0.2	32.1	16.2	56.0	46.0	23.9	29.8	N
5	1.45550	30.3	16.6	0.3	30.6	16.9	56.0	46.0	25.4	29.1	N
6	2.39350	29.4	17.3	0.3	29.7	17.6	56.0	46.0	26.3	28.4	N
7	5.68550	33.8	19.2	0.5	34.3	19.7	60.0	50.0	25.7	30.3	N
8	19.52050	28.8	15.7	1.2	30.0	16.9	60.0	50.0	30.0	33.1	N
9	0.15000	34.6	22.7	0.3	34.9	23.0	66.0	56.0	31.1	33.0	L1
10	0.24864	33.2	23.3	0.2	33.4	23.5	61.8	51.8	28.4	28.3	L1
11	0.36804	31.6	23.0	0.3	31.9	23.3	58.5	48.5	26.6	25.2	L1
12	0.43295	37.7	28.3	0.3	38.0	28.6	57.2	47.2	19.2	18.6	L1
13	0.56639	34.2	24.2	0.2	34.4	24.4	56.0	46.0	21.6	21.6	L1
14	0.99791	35.2	23.2	0.3	35.5	23.5	56.0	46.0	20.5	22.5	L1
15	2.48750	33.8	20.9	0.3	34.1	21.2	56.0	46.0	21.9	24.8	L1
16	6.25750	35.4	22.0	0.5	35.9	22.5	60.0	50.0	24.1	27.5	L1

### AC Line Conducted Emissions (Graph)

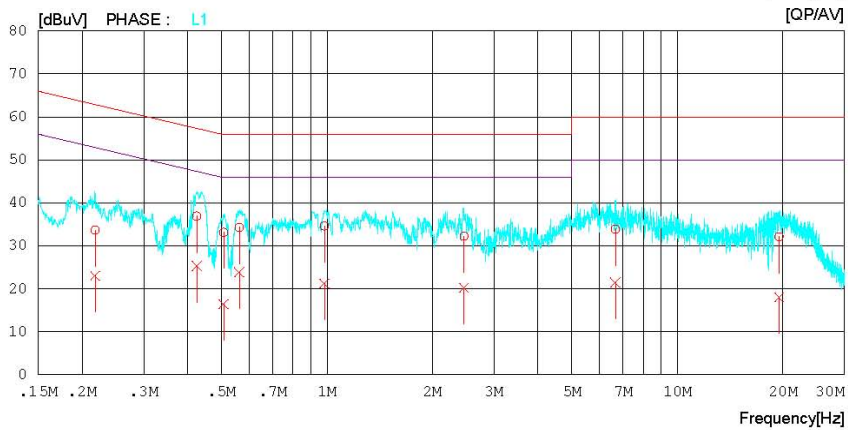
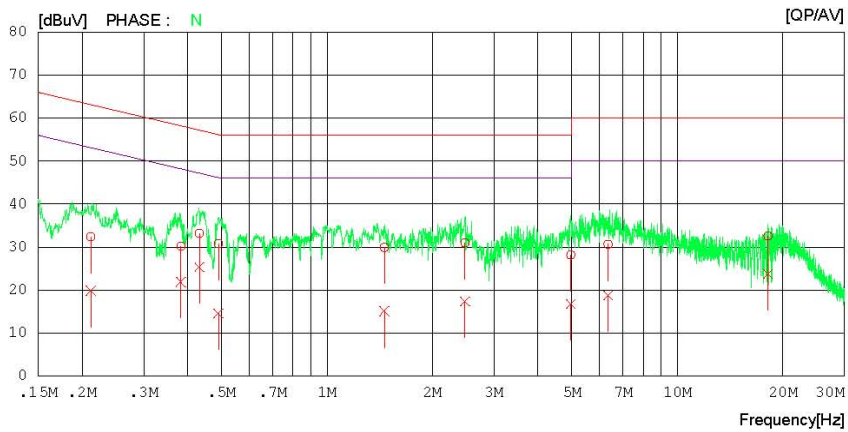
Test Mode: 802.11a\_5.5G



### Results of Conducted Emission

Digital EMC  
Date : 2012-07-29

Model No.	: LG-P768f	Reference No.	:
Type	:	Power Supply	: 120 V 60 Hz
Serial No.	: Identical prototype	Temp/Humi.	: 24 °C 47 % R.H.
Test Condition	: WLAN	Operator	: S.K.RYU
Memo	: 5.5GHz		
LIMIT	: CISPR22_B QP		
	: CISPR22_B AV		



**AC Line Conducted Emissions (Data List)**

Test Mode: 802.11a\_5.5G

Results of Conducted Emission

Digital EMC  
 Date : 2012-07-29

Model No.	: LG-P768f	Reference No.	:
Type	:	Power Supply	: 120 V 60 Hz
Serial No.	: Identical prototype	Temp/Humi.	: 24°C 47% R.H.
Test Condition	: WLAN	Operator	: S.K.RYU
Memo	: 5.5GHz		

LIMIT : CISPR22\_B QP  
 CISPR22\_B AV

NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.21178	32.2	19.6	0.2	32.4	19.8	63.1	53.1	30.7	33.3	N
2	0.38293	29.9	21.6	0.3	30.2	21.9	58.2	48.2	28.0	26.3	N
3	0.43286	32.9	25.0	0.3	33.2	25.3	57.2	47.2	24.0	21.9	N
4	0.49000	30.6	14.3	0.2	30.8	14.5	56.2	46.2	25.4	31.7	N
5	1.45850	29.6	14.8	0.3	29.9	15.1	56.0	46.0	26.1	30.9	N
6	2.47650	30.7	17.0	0.3	31.0	17.3	56.0	46.0	25.0	28.7	N
7	4.96550	27.7	16.3	0.4	28.1	16.7	56.0	46.0	27.9	29.3	N
8	6.34500	30.1	18.3	0.5	30.6	18.8	60.0	50.0	29.4	31.2	N
9	18.13800	31.4	22.5	1.2	32.6	23.7	60.0	50.0	27.4	26.3	N
10	0.21829	33.5	22.8	0.2	33.7	23.0	62.9	52.9	29.2	29.9	L1
11	0.42508	36.6	25.0	0.3	36.9	25.3	57.3	47.3	20.4	22.0	L1
12	0.50719	33.0	16.3	0.2	33.2	16.5	56.0	46.0	22.8	29.5	L1
13	0.56196	34.1	23.7	0.2	34.3	23.9	56.0	46.0	21.7	22.1	L1
14	0.98358	34.3	20.9	0.3	34.6	21.2	56.0	46.0	21.4	24.8	L1
15	2.46050	32.0	19.9	0.3	32.3	20.2	56.0	46.0	23.7	25.8	L1
16	6.65150	33.4	21.0	0.5	33.9	21.5	60.0	50.0	26.1	28.5	L1
17	19.51850	30.9	16.8	1.2	32.1	18.0	60.0	50.0	27.9	32.0	L1

### 3.2.8 Antenna Requirements

■ **Procedure:**

Describe how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT.

■ **Conclusion: **Comply****

The internal antenna is attached on the main PCB using the special spring tension. (Refer to Internal Photo file.)

■ **Minimum Standard:**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions.



### 3.2.9 Occupied Bandwidth

■ **TEST Requirements**

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured

■ **TEST CONFIGURATION**

■ **TEST PROCEDURE :**

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual

■ **TEST RESULT : N/A**

Minimum Standard : N/A
------------------------

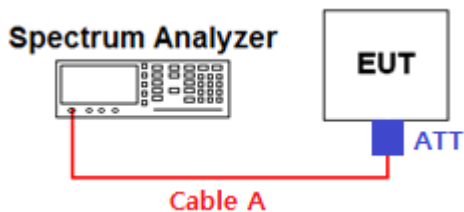
■ **RESULT PLOT : N/A**

**4. LIST OF TEST EQUIPMENT**

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent	E4440A	11/09/30	12/09/30	MY45304199
Spectrum Analyzer	Rohde Schwarz	FSQ26	12/01/09	13/01/09	200445
Harmonic Mixer	OML	M28HWD	12/02/06	13/02/06	Ka100224-1
Digital Multimeter	H.P	34401A	12/03/05	13/03/05	3146A13475, US36122178
Spectrum Analyzer	Agilent	N9020A	12/01/09	13/01/09	MY49100833
Signal Generator	Rohde Schwarz	SMR20	12/03/05	13/03/05	101251
Vector Signal Generator	Rohde Schwarz	SMJ100A	12/01/09	13/01/09	100148
Thermo hygrometer	BODYCOM	BJ5478	12/01/13	13/01/13	090205-2
DC Power Supply	HP	6622A	12/03/05	13/03/05	3448A03760
High-Pass Filter	Wainwright	WHKX8.5	11/09/19	12/09/19	1
BILOG ANTENNA	SCHAFFNER	CBL6112D	10/12/21	12/12/21	2737
HORN ANT	ETS	3115	12/02/20	13/02/20	6419
HORN ANT	A.H.Systems	SAS-574	11/03/25	13/03/25	154
Attenuator (10dB)	WEINSCHL	86-10-11	11/09/30	12/09/30	408
Amplifier (22dB)	H.P	8447E	12/01/09	13/01/09	2945A02865
Amplifier (30dB)	Agilent	8449B	12/03/05	13/03/05	3008A01590
EMI TEST RECEIVER	R&S	ESU	12/03/05	13/03/05	100014
EMI TEST RECEIVER	R&S	ESCI	12/03/06	13/03/06	100364
CVCF	KIKUSUI	PCR1000L	11/09/15	12/09/15	14110610
LISN	R&S	ESH2-Z5	11/09/30	12/09/30	8287391006
RFI/Field intensity Meter	KYORITSU	KNM-2402	12/07/02	13/07/02	4N-170-3
TEMP & HUMIDITY Chamber	SJ SCIENCE	TEMI850-10	12/03/06	13/03/06	S7400LE267 1226

## APPENDIX I Conducted Test set up Diagram & Path loss Information

### ▪ Conducted Measurement



#### Path loss value information

Frequency (GHz)	Path Loss (dB)	Frequency (GHz)	Path Loss (dB)
5.180	11.23	5.320	11.49
5.520	11.30	5.500	11.50
5.240	11.34	5.580	11.48
5.260	11.42	5.700	11.55
5.300	11.46		

Note. 1: The path loss from EUT to Spectrum analyzer was measured and used for test.  
 Path loss (=S/A's offset value) = Cable A + ATT (Attenuator, Applied only when it was used externally)

## APPENDIX II

### Duty cycle plots

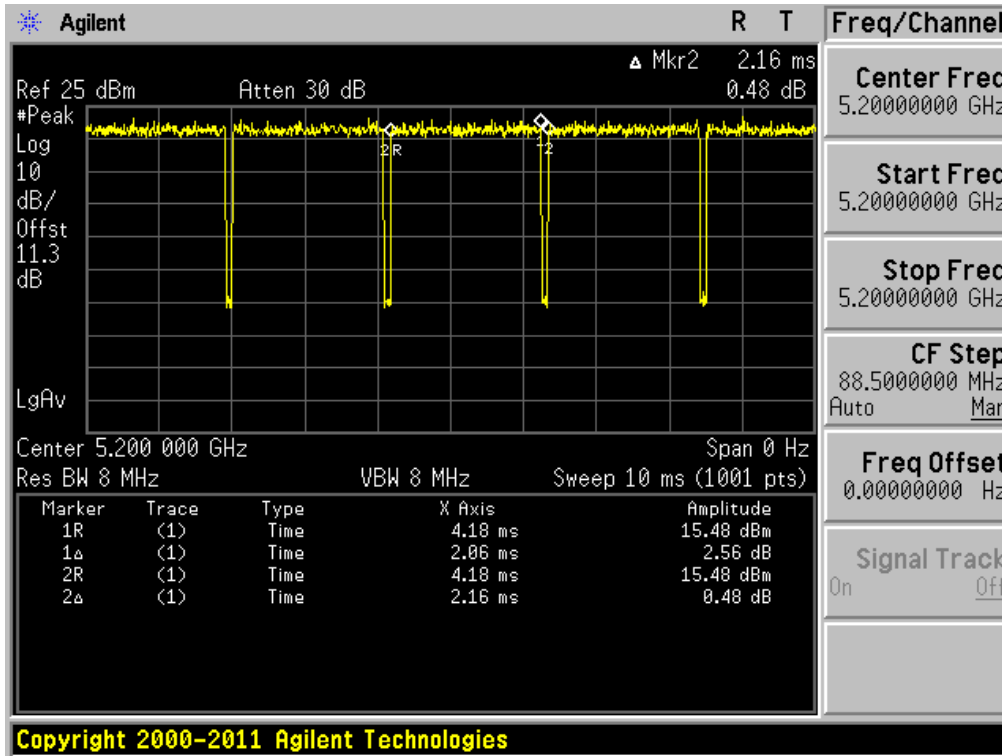
#### TEST PROCEDURE

Duty Cycle [ $X = \text{On Time} / (\text{On} + \text{Off time})$ ] is measured using Measurement Procedure of KDB789033

1. Set the center frequency of the spectrum analyzer to the center frequency of the transmission.
2. Set RBW  $\geq$  EBW if possible; otherwise, set RBW to the largest available value.
3. Set VBW  $\geq$  RBW.
4. Set detector = peak.
5. Note : The zero-span measurement method shall not be used unless both **RBW and VBW are  $> 50/T$** , where  $T$  is defined in section B)1)a), and **the number of sweep points across duration  $T$  exceeds 100**. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if  $T \leq 16.7$  microseconds.)

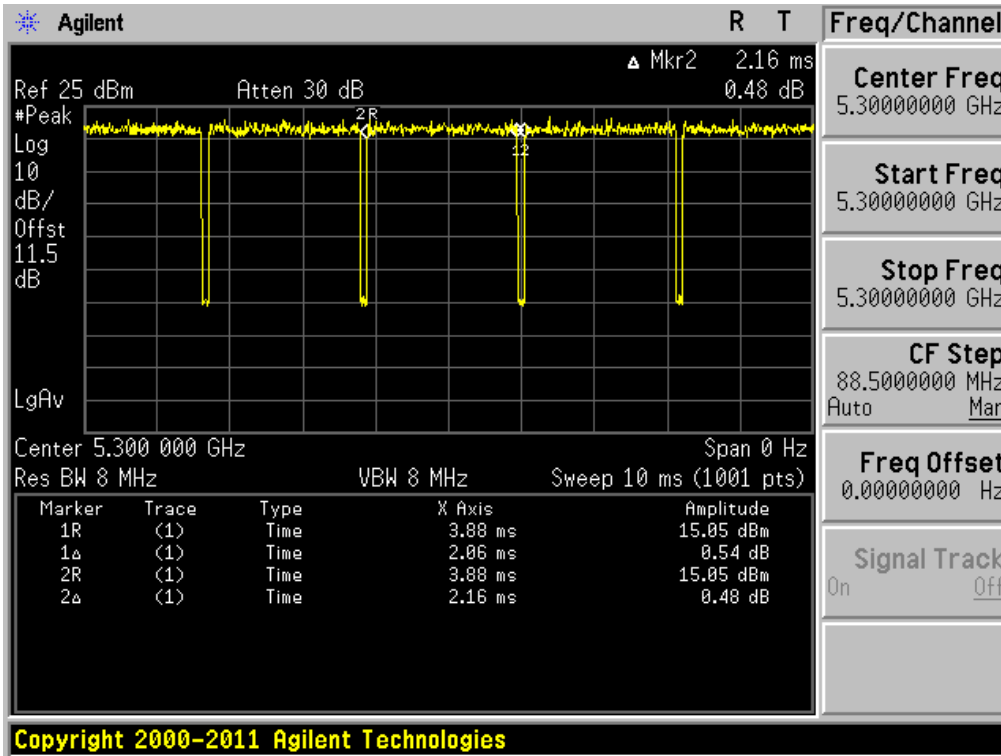
#### Duty Cycle

Test Mode: 802.11a & Ch.40



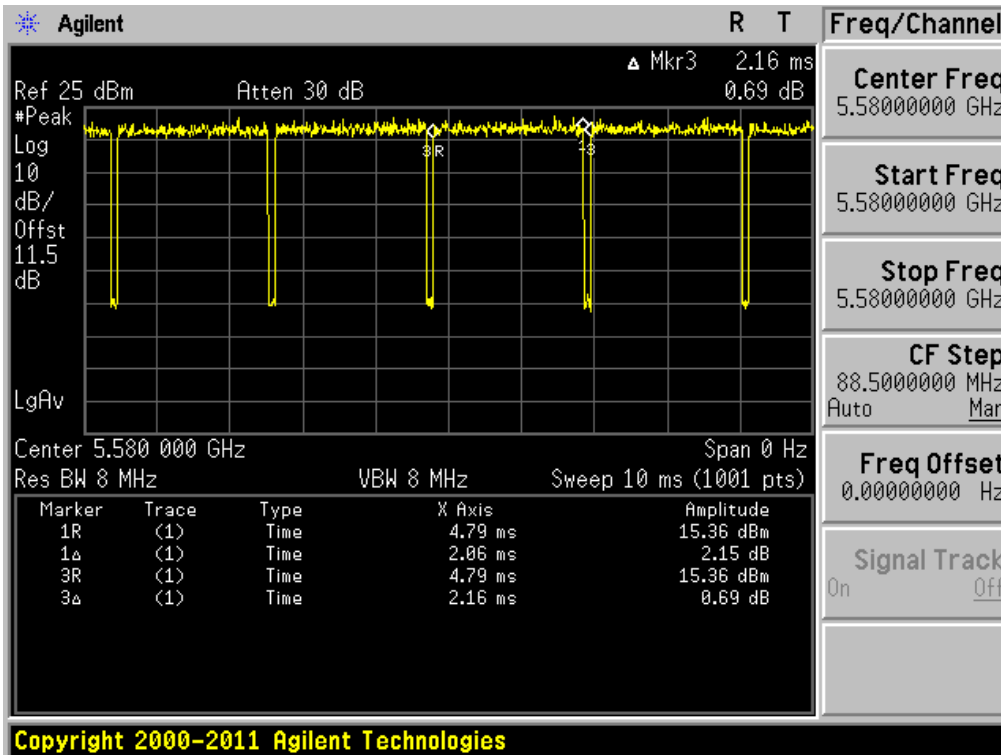
Duty Cycle

Test Mode: 802.11a & Ch.60



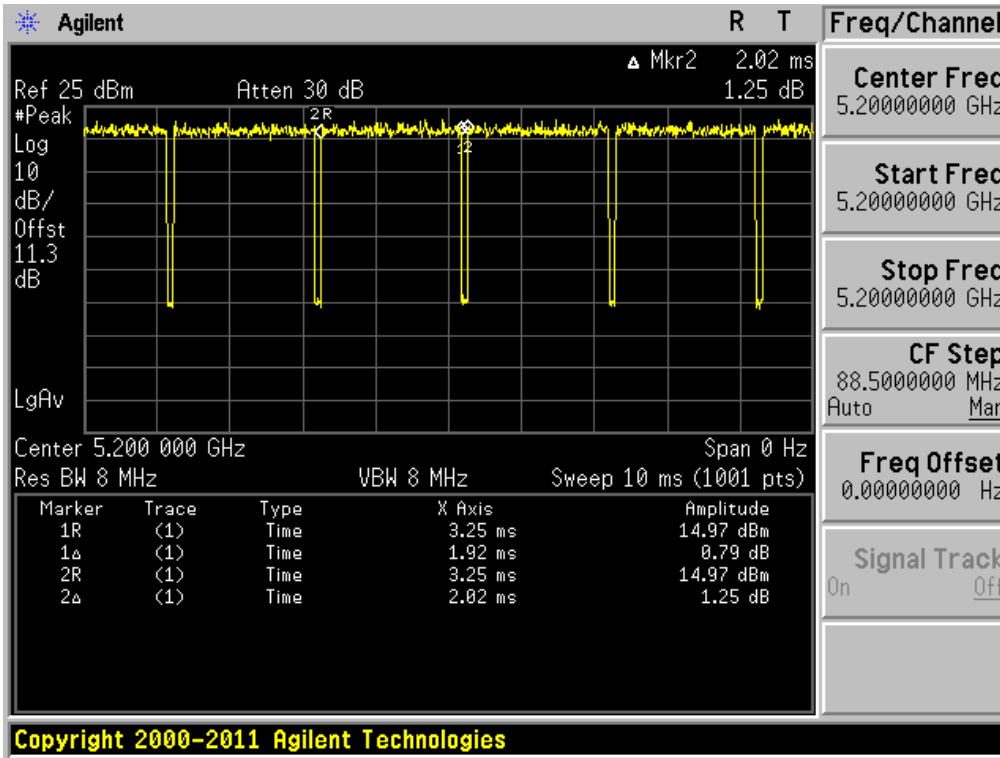
Duty Cycle

Test Mode: 802.11a & Ch.116



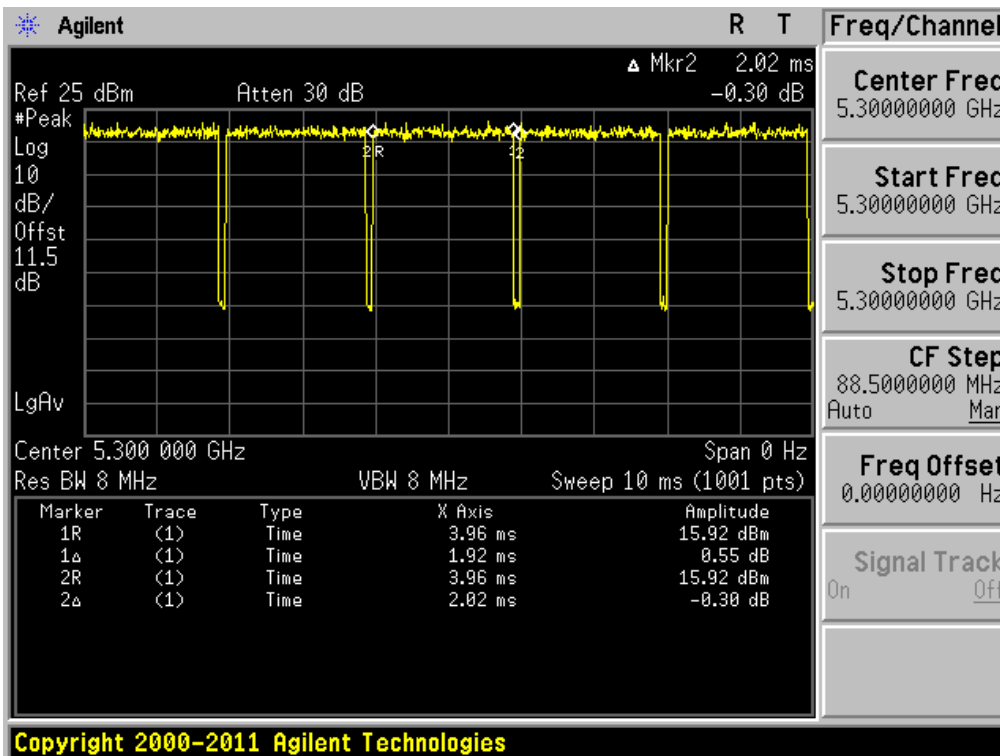
Duty Cycle

Test Mode: 802.11n(HT20) & Ch.40



Duty Cycle

Test Mode: 802.11n(HT20) & Ch.60



**Duty Cycle**

Test Mode: 802.11n(HT20) & Ch.116

