cisco

### Test Report

# AIR-LAP1142N-A-K9

## **Cisco Aironet 802.11n Draft 2.0 Dual Band Access Point**

### 5250-5350, 5470-5725 MHz

### FCC ID: LDK102070, IC: 2461B-102070

Against the following Specifications: CFR47 Part 15.407 RSS210

### Cisco Systems

170 West Tasman Drive San Jose, CA 95134

> Author: James Nicholson Approved By: Title:

This report replaces any previously entered test report under EDCS - 674054

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#### 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.
- 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.
- 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.

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### 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:

Temperature15°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 start of testing

22-May-2008

#### 2.3 Report Issue Date

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#### 2.4 Testing facilities

This assessment was performed by:

#### **Testing Laboratory**

Cisco Systems, Inc.,	Cisco Systems, Inc.		
4125 Highlander Parkway	170 West Tasman Drive		
Richfield, OH 44286	San Jose, CA 95134		
USA	USA		

#### **Test Engineers**

James Nicholson

#### 2.5 Equipment Assessed (EUT)

AIR-LAP1142N-A-K9 Cisco Aironet 802.11n Draft 2.0 Dual Band Access Point

#### 2.6 EUT Description

The AIR-LAP1142N-A-K9 Cisco Aironet 802.11n Draft 2.0 Dual Band Access Point supports the following modes of operation. The modes are further defined in the radio Theory of Operation. The modes included in this report represent the worst case data for all modes.

Legacy OFDM, Non HT-20, Single Antenna, 6 to 54 Mbps Legacy OFDM, Non HT-20, Dual Antennas, 6 to 54 Mbps Legacy OFDM , Non HT-20 Dual Antennas with Beam Forming, 6 to 54 Mbps HT-20, Single Antenna, M0 to M7 HT-20, Dual Antennas, M0 to M15 Non HT-40 Duplicate, Single Antenna, 6-54 Mbps Non HT-40 Duplicate, Dual Antennas, 6-54 Mbps HT-40, Single Antenna, M0 to M7 HT-40, Dual Antennas, M0 to M15

The following integral antennas are supported by this product.

2.4 GHz 4 dBi inverted-F Omni-directional Antenna 5 GHz 3 dBi inverted-F Omni-directional Antenna

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### 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. Please also refer to the "Justification for worst Case test Configuration" section of this report for further details on the selection of EUT samples.

#### 4.1 Sample Details (Photographs of the test samples, where appropriate can be found in appendix H)

Sample No.	Equipment Details	Part Number	Manufacturer	Hardware Rev.	Firmware Rev.	Software Rev.	Serial Number
S01	AIR-LAP1142N-A-K9	73-11494-01	Cisco Systems	NA	NA	NA	FHH1217 00LP
S02	AIR-PWR-SPLY1	341-0211-01	Cisco Systems	NA	NA	NA	DTH1030 902Z

#### 4.2 System Details

System #	Description	Samples
1	EUT	S01, S02

#### 4.3 Mode of Operation Details

Mode#	Description	Comments
1	Continuous Transmitting	Continuous Transmitting

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### Appendix A: Emission Test Results

Testing Laboratory: Cisco Systems, Inc., 4125 Highlander Parkway, Richfield, OH, USA

### **Average Output Power**

Connect the antenna(s) to the power meter at the average power sensor input. Configure the power meter to measure average power for the transmitter frequencies listed below (be sure to enter all losses between the transmitter output and the power meter).

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Place the radio in continuous transmit mode and record the reading on the power meter.

		Data	Targe	Target Power Level		Actual Power Level
Frequency	Mode	Rate	Tx A	Tx B	Total	Total
5260	Non HT-20 Beam Forming	54	17	17	20	20.5
5320	HT-20	M7	16	16	19	18.6
5320	Non HT-20 Beam Forming	54	16	16	19	19.2
5500	Non HT-20 Beam Forming	54	17	17	20	20.3
5580	Non HT-20 Beam Forming	54	17	17	20	20.5
5700	Non HT-20 Beam Forming	54	17	17	20	20.5
5260/5280	Non HT-40 Duplicate	54	17	17	20	20.0
5260/5280	HT-40	M7	17	17	20	19.7
5280/5320	Non HT-40 Duplicate	54	13	13	16	16.0
5280/5320	HT-40	M7	14	14	17	17.4
5500/5520	Non HT-40 Duplicate	54	13	13	16	15.9
5500/5520	HT-40	M7	15	15	18	18.4
5540/5560	Non HT-40 Duplicate	54	17	17	20	20.2
5540/5560	HT-40	M7	17	17	20	20.2
5660/5680	Non HT-40 Duplicate	54	17	17	20	20.4
5660/5680	HT-40	M7	17	17	20	20.1

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

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

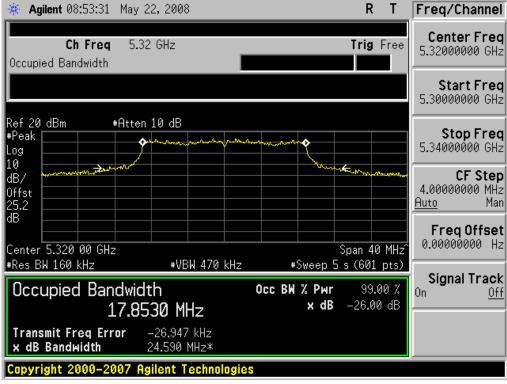
Frequency (MHz)	Mode	Data Rate (Mbps)	26dB BW (MHz)	99% BW (MHz)
5260	Non HT-20 Beam Forming	54	23.5	16.7
5320	HT-20	M7	24.6	17.9
5320	Non HT-20 Beam Forming	54	20.4	16.6
5500	Non HT-20 Beam Forming	54	21.9	16.6
5580	Non HT-20 Beam Forming	54	23.1	16.7
5700	Non HT-20 Beam Forming	54	24.1	16.7
5260/5280	Non HT-40 Duplicate	54	76.1	36.8
5260/5280	HT-40	M7	51.5	36.3
5280/5320	Non HT-40 Duplicate	54	40.7	36.4
5280/5320	HT-40	M7	40.0	36.2
5500/5520	Non HT-40 Duplicate	54	40.9	36.4
5500/5520	HT-40	M7	40.1	36.3
5540/5560	Non HT-40 Duplicate	54	70.7	36.8
5540/5560	HT-40	M7	53.1	36.2
5660/5680	Non HT-40 Duplicate	54	76.1	37.0
5660/5680	HT-40	M7	58.9	36.3

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🔆 🔆 Agilent 08:07:31 May	(22,2008	H	<b>र</b> T	Freq/Channel
	.26 GHz	Tris	<b>g</b> Free	Center Freq 5.26000000 GHz
Occupied Bandwidth				
				<b>Start Freq</b> 5.24000000 GHz
	en 10 dB			64
#Peak Log 10 → www.ww	• ····································			<b>Stop Freq</b> 5.28000000 GHz
10 dB/			mon	CF Step
0ffst				4.00000000 MHz <u>Auto</u> Man
dB				Freq Offset
		<u> </u>		0.00000000 Hz
Center 5.260 00 GHz #Res BW 160 kHz	#VBW 470 kHz	opan #Sweep 5 s (60	40 MHz^ )1 pts)	
Occupied Bandwi	dth	Occ BW % Pwr 9	9.00 %	Signal Track
			00 dB	0n <u>0ff</u>
10.0	6879 MHz	h við Lv.	00 aD	
Transmit Freq Error × dB Bandwidth	-60.314 kHz 23.549 MHz≭			
Copyright 2000-2007	Agilent Technologies			

### 99%/26 dB Bandwidth, 5260 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths

99%/26 dB Bandwidth, 5320 MHz, M7, HT-20, Dual Transmit Path

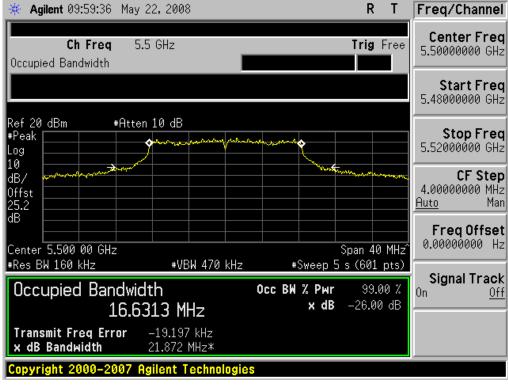


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<b>Agilent</b> 11:16:24 May	22, 2008		кі	Freq/Channel
<b>Ch Freq</b> 5.3 Occupied Bandwidth	32 GHz	Tr	<b>ig</b> Free	Center Freq 5.32000000 GHz
	-			Start Freq 5.30000000 GHz
#Peak	n 10 dB			<b>Stop Freq</b> 5.34000000 GHz
dB/ when the second sec				<b>CF Step</b> 4.0000000 MHz <u>Auto</u> Man
dB			40 MHz^	FreqOffset 0.00000000 Hz
*Res BW 160 kHz Occupied Bandwic 16.6	*VBW 470 kHz Ith 032 MHz		01 pts) )9.00 % ).00 dB	<b>Signal Track</b> On <u>Off</u>
Transmit Freq Error x dB Bandwidth	–33.722 kHz 20.405 MHz*			
Copyright 2000-2007 A	igilent Technologie	S		

# 99%/26 dB Bandwidth, 5320 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths

99%/26 dB Bandwidth, 5500 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths

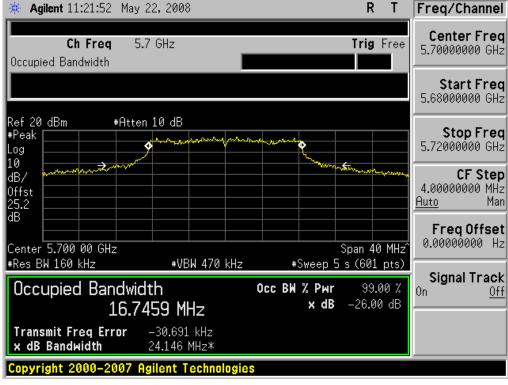


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<b>Agilent</b> 11:20:56 May	22,2008	R I	Freq/Channel
<b>Ch Freq</b> 5. Occupied Bandwidth	58 GHz	Trig Fre	Center Freq 5.58000000 GHz
			Start Freq 5.56000000 GHz
#Peak Log	n 10 dB		<b>Stop Freq</b> 5.60000000 GHz
10 dB/ 0ffst 25.2			CF Step 4.00000000 MHz <u>Auto</u> Man
dB Center 5.580 00 GHz		Span 40 MH	
*Res BW 160 kHz Occupied Bandwig 16.6	*VBW 470 kHz 1th 769 MHz	#Sweep 5 s (601 pts Occ BW % Pwr 99.00 % x dB -26.00 df	Signal Track
Transmit Freq Error x dB Bandwidth	–12.606 kHz 23.082 MHz*		
Copyright 2000-2007	igilent Technologie	S	

# 99%/26 dB Bandwidth, 5580 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths

99%/26 dB Bandwidth, 5700 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths



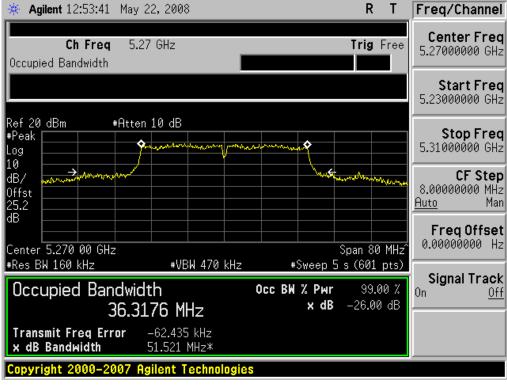
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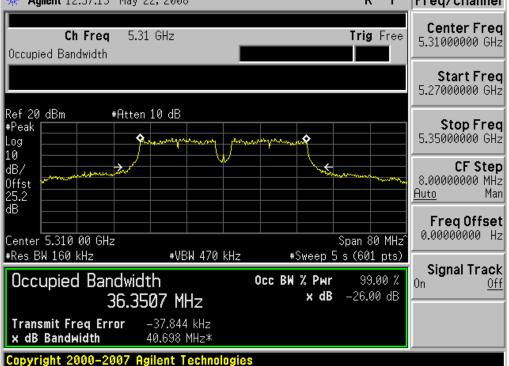
💥 Agilent 12:48:52 May	22,2008	RT	Freq/Channel
	27 GHz	Trig Free	Center Freq 5.27000000 GHz
Occupied Bandwidth			
			Start Freq 5.23000000 GHz
Ref 20 dBm #Atte	en 10 dB		
#Peak Log 10	<u>hanna pra</u>	and the second s	<b>Stop Freq</b> 5.31000000 GHz
dB/		Mar m	CF Step
0ffst 25.2			8.00000000 MHz <u>Auto</u> Man
dB			Eron Offeet
Center 5.270 00 GHz		Span 80 MHz	
#Res BW 160 kHz	#VBW 470 kHz	#Sweep 5 s (601 pts)	
Occupied Bandwi		Осс ВЖ % Рыг 99.00 % × dB -26.00 dB	<b>Signal Track</b> On <u>Off</u>
36.8	1355 MHz	X dB -20.00 dD	
Transmit Freq Error x dB Bandwidth	–149.784 kHz 76.074 MHz*		
Copyright 2000-2007	Agilent Technologies		

### 99%/26 dB Bandwidth, 5260/5280 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

99%/26 dB Bandwidth, 5260/5280 MHz, M7, HT-40, Dual Transmit Paths

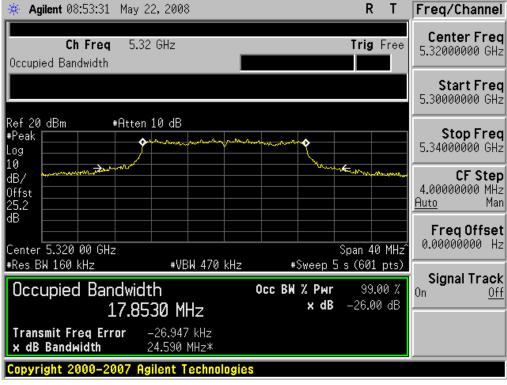


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99%/26 dB Bandwidth, 5300/5320MHz, M7, HT-40, Dual Transmit Paths



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### 99%/26 dB Bandwidth, 5500/5520 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

99%/26 dB Bandwidth, 5500/5520 MHz, M7, HT-40, Dual Transmit Paths

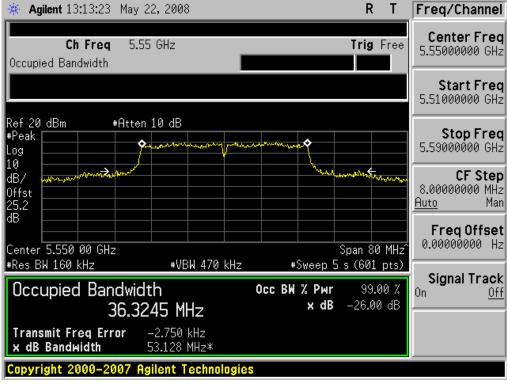


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💥 Agilent 13:10:36 May	22, 2008	R	Т	Freq/Channel
	55 GHz	Trig	Free	Center Freq 5.55000000 GHz
Occupied Bandwidth				
				<b>Start Freq</b> 5.51000000 GHz
	en 10 dB			Chan Enam
10	on and here the	angunan		Stop Freq 5.59000000 GHz
dB/			months	CF Step
0ffst				8.00000000 MHz <u>Auto</u> Man
dB				Freq Offset
Center 5.550 00 GHz		Span 80	 1 M∐⇒^	0.00000000 Hz
#Res BW 160 kHz	₩VBW 470 kHz	#Sweep 5 s (601		
Occupied Bandwi	dtb	Осс ВЖ % Рмг 99.	00 Y	Signal Track
	305 MHz	x dB -26.0		0n <u>0ff</u>
Transmit Freq Error x dB Bandwidth	37.141 kHz 70.653 MHz≭			
Copyright 2000-2007	Agilent Technologies	3		

### 99%/26 dB Bandwidth, 5540/5560 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

99%/26 dB Bandwidth, 5540/5560 MHz, M7, HT-40, Dual Transmit Paths



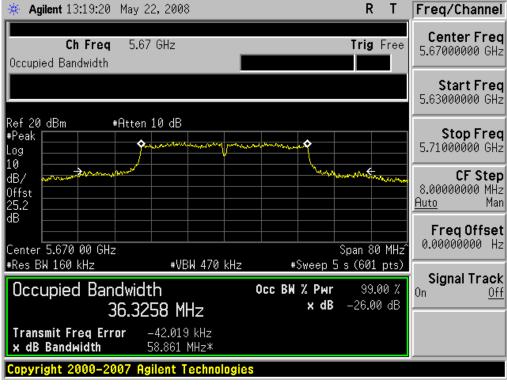
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🔆 💥 Agilent 13:17:28 May	22, 2008	R	T	Freq/Channel
Ch Freq 5.1	67 GHz	Trig	Free	Center Freq 5.67000000 GHz
Occupied Bandwidth				
				Start Freq 5.63000000 GHz
#Peak	n 10 dB	mphrome a		<b>Stop Freq</b> 5.71000000 GHz
dB/			~~~~~{~	<b>CF Step</b> 8.00000000 MHz <u>Auto</u> Man
dB		Span 8		FreqOffset 0.00000000 Hz
#Res BW 160 kHz	₩VBW 470 kHz	#Sweep 5 s (601	pts)	Signal Track
Occupied Bandwid 36.9	dth 9 833 MHz	Осс В₩ % Рмг 99. × dB -26.0		On <u>Off</u>
Transmit Freq Error x dB Bandwidth	–162.694 kHz 76.064 MHz*			
Copyright 2000-2007 A	Agilent Technologies			

### 99%/26 dB Bandwidth, 5660/5680 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

99%/26 dB Bandwidth, 5660/5680 MHz, M7, HT-40, Dual Transmit Paths



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### **Peak Output Power**

15.407: For the bands 5.25-5.35 and 5.47-5.725 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, 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 20.4 MHz. The maximum conducted output power is calculated as 11dBm+10\*log(20.4MHz) = 24dBm

The maximum supported antenna gain for all bands is 3dBi. In beamforming mode, the 3dBi behaves as 3dBi+10log(n) (n=2 radiating elements) = 6dBi. Therefore the maximum allowable output power requires no reduction in beam forming mode.

### **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 beamforming mode is 6dBi. Therefore the maximum allowable peak power spectral density requires no reduction in beamforming mode.

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

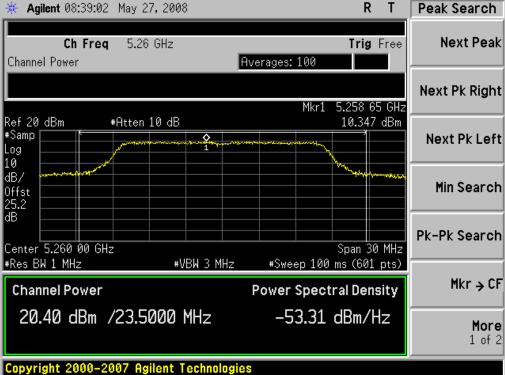
Enable "Channel Power	" function of analyzer
Center Frequency:	Frequency from table below
Span:	20 MHz (must be greater than 26dB bandwidth, adjust as
necessary)	
Ref Level Offset:	Correct for attenuator and cable loss.
Reference Level:	20 dBm
Attenuation:	20 dB
Sweep Time:	100ms, Single sweep
Resolution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

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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.

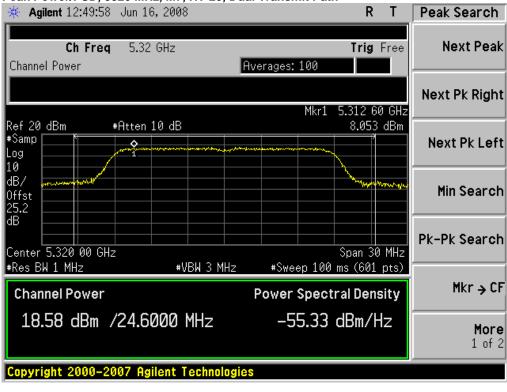
Frequency (MHz)	Mode	Data Rate (Mbps)	Peak Power (dBm)	Limit (dBm)	Margin (dB)	PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5260	Non HT-20 Beam Forming	54	20.4	24	3.6	10.3	11	0.7
5320	HT-20	M7	18.6	24	5.4	8.1	11	2.9
5320	Non HT-20 Beam Forming	54	19.1	24	4.9	8.7	11	2.3
5500	Non HT-20 Beam Forming	54	20.8	24	3.2	10.9	11	0.1
5580	Non HT-20 Beam Forming	54	20.9	24	3.1	10.4	11	0.6
5700	Non HT-20 Beam Forming	54	20.8	24	3.2	10.6	11	0.4
5260/5280	Non HT-40 Duplicate	54	19.5	24	4.5	6.3	11	4.7
5260/5280	HT-40	M7	19.2	24	4.8	5.5	11	5.5
5280/5320	Non HT-40 Duplicate	54	16.0	24	8.0	2.8	11	8.2
5280/5320	HT-40	M7	16.9	24	7.1	3.3	11	7.7
5500/5520	Non HT-40 Duplicate	54	15.9	24	8.1	2.7	11	8.3
5500/5520	HT-40	M7	18.4	24	5.6	4.9	11	6.1
5540/5560	Non HT-40 Duplicate	54	20.6	24	3.4	7.1	11	3.9
5540/5560	HT-40	M7	20.1	24	3.9	6.5	11	4.5
5660/5680	Non HT-40 Duplicate	54	20.3	24	3.7	6.9	11	4.1
5660/5680	HT-40	M7	20.1	24	3.9	6.5	11	4.5

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### Peak Power/PSD, 5260 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths

Peak Power/PSD, 5320 MHz, M7, HT-20, Dual Transmit Path

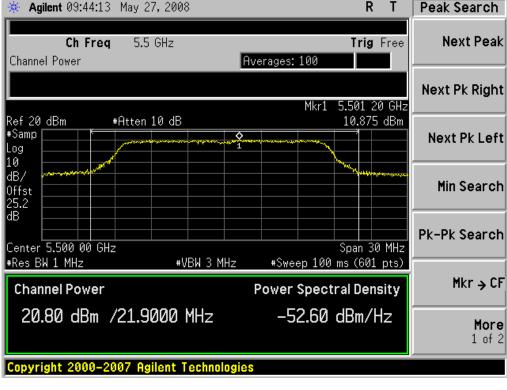


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### Peak Power/PSD, 5320 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths

Peak Power/PSD, 5500 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths

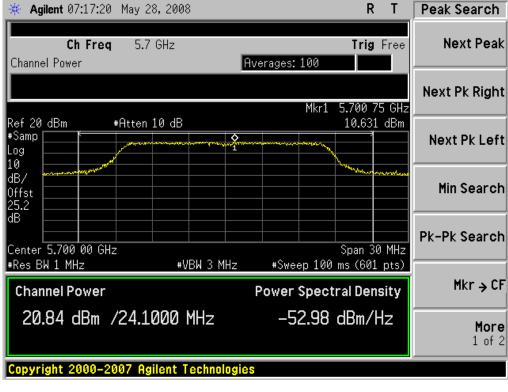


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### Peak Power/PSD, 5580 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths

Peak Power/PSD, 5700 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths

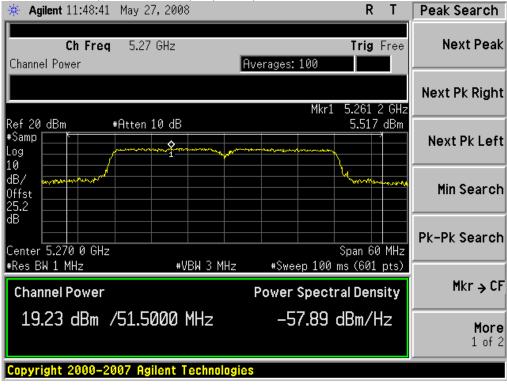


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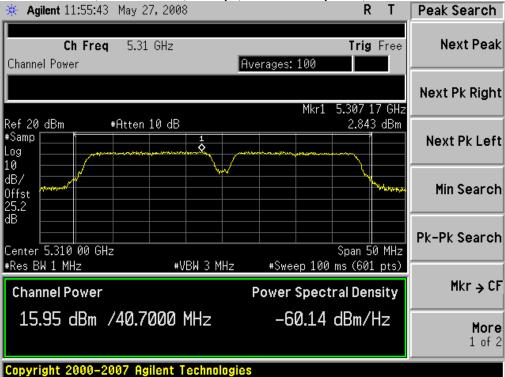


### Peak Power/PSD, 5260/5280 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

Peak Power/PSD, 5260/5280 MHz, M7, HT-40, Dual Transmit Paths

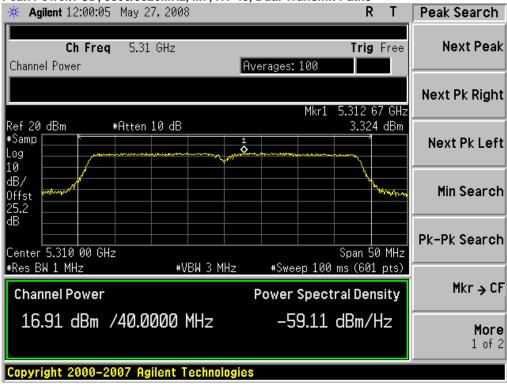


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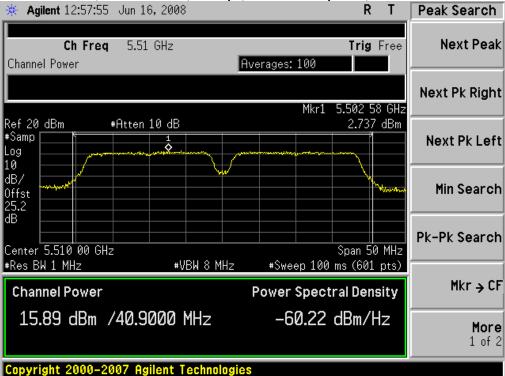


### Peak Power/PSD, 5300/5320MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

Peak Power/PSD, 5300/5320MHz, M7, HT-40, Dual Transmit Paths



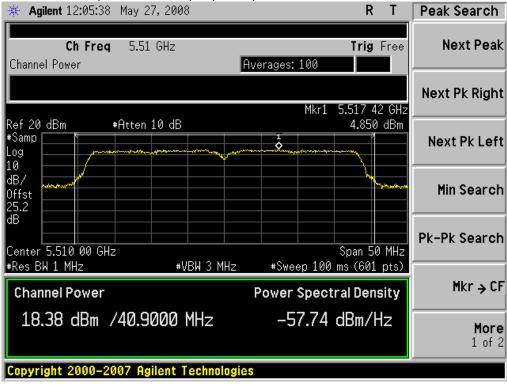
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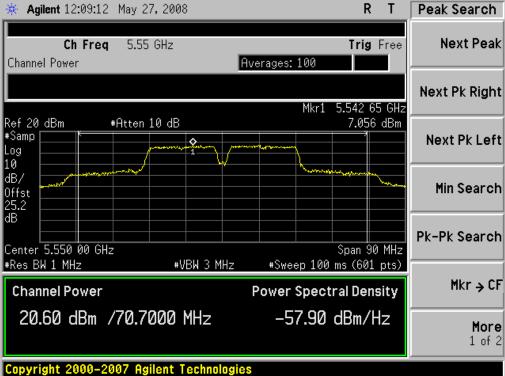
### Peak Power/PSD, 5500/5520 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

I I I I I I

Peak Power/PSD, 5500/5520 MHz, M7, HT-40, Dual Transmit Paths

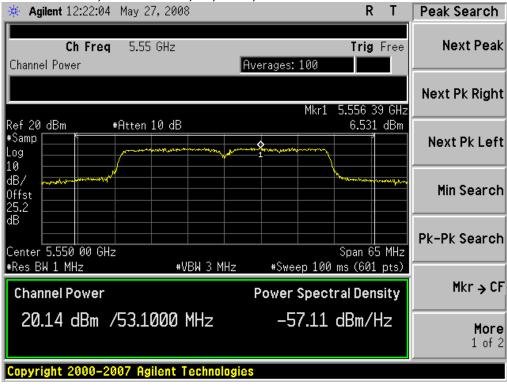


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### Peak Power/PSD, 5540/5560 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

Peak Power/PSD, 5540/5560 MHz, M7, HT-40, Dual Transmit Paths



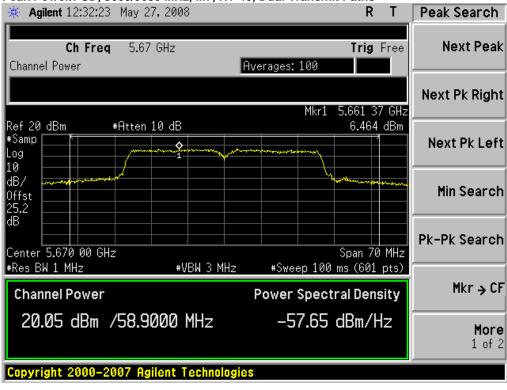
Page No: 25 of 83



### Peak Power/PSD, 5660/5680 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

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Peak Power/PSD, 5660/5680 MHz, M7, HT-40, Dual Transmit Paths



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### **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

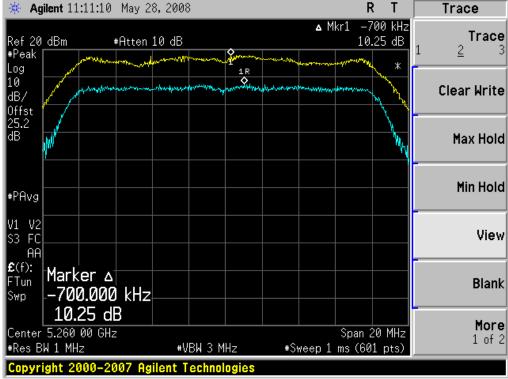
Record the difference between the Peak and Average Markers

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C	S	C	0	

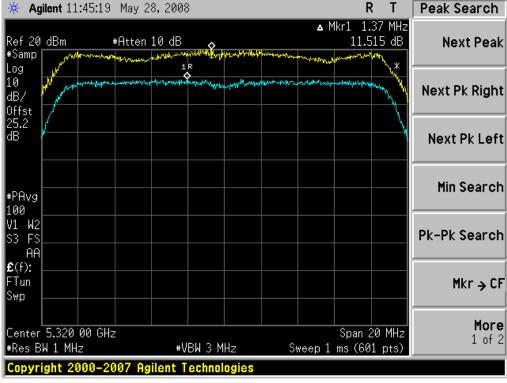
Frequency (MHz)	Mode	Data Rate (Mbps)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
5260	Non HT-20 Beam Forming	54	10.3	13	2.7
5320	HT-20	M7	11.5	13	1.5
5320	Non HT-20 Beam Forming	54	11.2	13	1.8
5500	Non HT-20 Beam Forming	54	10.9	13	2.1
5580	Non HT-20 Beam Forming	54	10.9	13	2.1
5700	Non HT-20 Beam Forming	54	10.9	13	2.1
5260/5280	Non HT-40 Duplicate	54	10.6	13	2.4
5260/5280	HT-40	M7	10.0	13	3.0
5280/5320	Non HT-40 Duplicate	54	9.7	13	3.3
5280/5320	HT-40	M7	10.1	13	2.9
5500/5520	Non HT-40 Duplicate	54	10.5	13	2.5
5500/5520	HT-40	M7	10.4	13	2.6
5540/5560	Non HT-40 Duplicate	54	10.8	13	2.2
5540/5560	HT-40	M7	10.6	13	2.4
5660/5680	Non HT-40 Duplicate	54	10.5	13	2.5
5660/5680	HT-40	M7	10.5	13	2.5

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### Peak Excursion, 5260 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths

### Peak Excursion, 5320 MHz, M7, HT-20, Dual Transmit Path

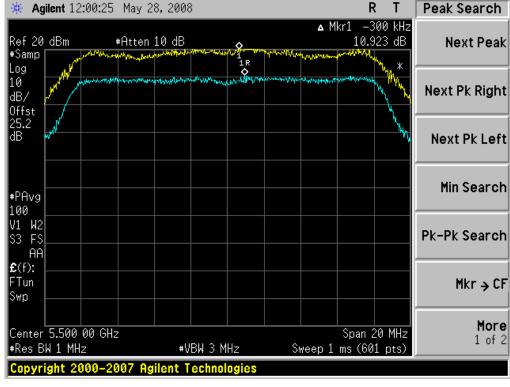


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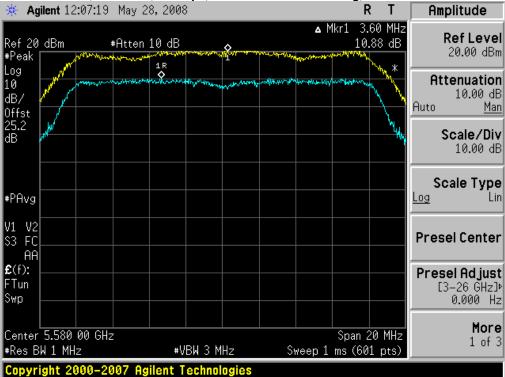


### Peak Excursion, 5320 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths

Peak Excursion, 5500 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths



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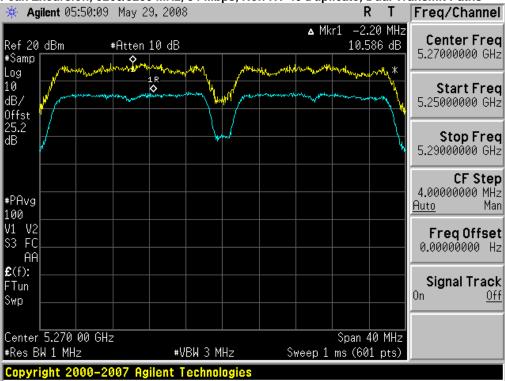


### Peak Excursion, 5580 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths

Peak Excursion, 5700 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths

Peak Search	RT				28, 2008	2:08 May 2	ilent 12	🔆 Aç
	and the show when a show of the show of th				10 dB	#Atten مىرىيىسىسىسى		Ref 20 #Samp
Next Pk Right	Martin Martin K.	www.eeroberghapa	Wanner		v	Notion and a start of the second of	× /	Log 10 dB/ Offst
Next Pk Left							Me lov	25.2 dB
Min Search								#PAvg 100
Pk-Pk Search								V1 W2 S3 FS AA
Mkr → CF								€(f): FTun Swp
	Span 20 MHz ns (601 pts)	Sweep 1		BW 3 M			5.700 W 1 MH:	#Res B
			ogies	echnol	gilent T	0-2007 A	ight 20	Copyr

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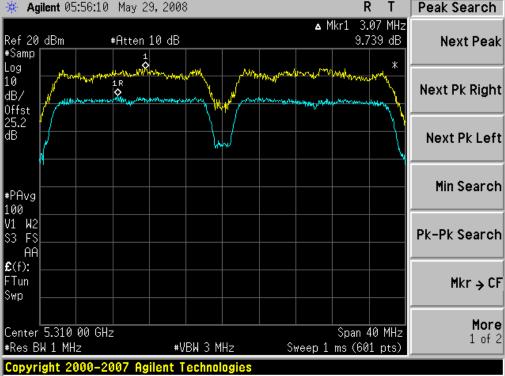


### Peak Excursion, 5260/5280 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

Peak Excursion, 5260/5280 MHz, M7, HT-40, Dual Transmit Paths

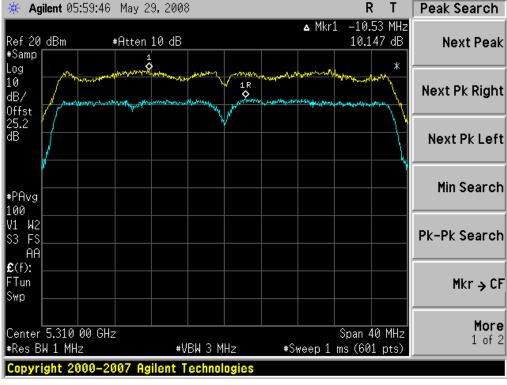
Peak Search	₹ T	F		-,		9, 2008		5:53:20	ilent 0	₩ Ag
Next Peak	533 kHz .01 dB	lkr1 –5 10.	۸ <u>م</u>			10 dB	#Atten	;	dBm	Ref 20 #Peak
Next Pk Right	mm *	alanna ya sa	*****	Jane Carpet	where the	1 R		and a second		Log 10 dB/
Next Pk Left				* 					/	Offst 25.2 dB
Min Search										#PAvg
Pk-Pk Search										M1 V2 S3 FC AA
Mkr → CF										€(f): FTun Swp
<b>More</b> 1 of 2	40 MHz 1 pts)		Sweep 1	lHz	BW 3 M	#V	2	00 GHz Iz		Center #Res B
				logies	echno	ilent T	)07 Ag	000-20	ght 2	Copyr

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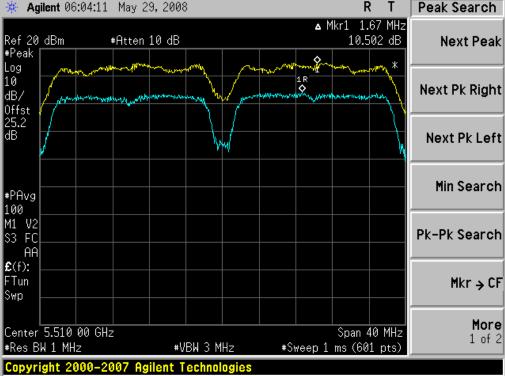


### Peak Excursion, 5300/5320MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

Peak Excursion, 5300/5320MHz, M7, HT-40, Dual Transmit Paths

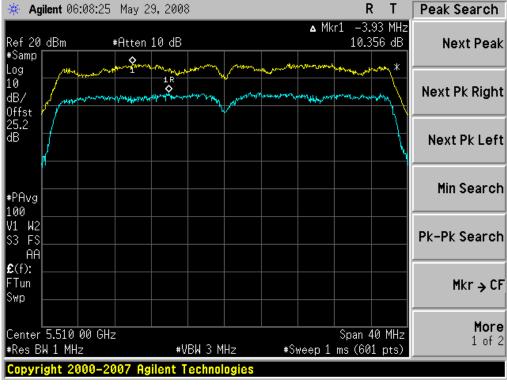


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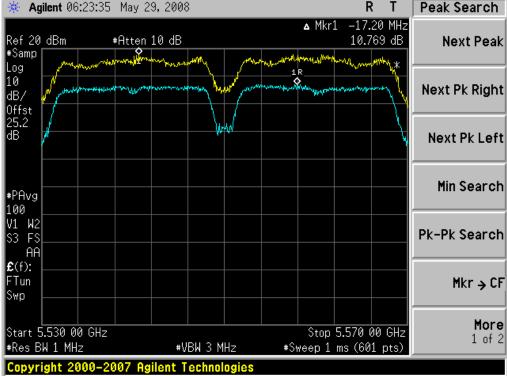


### Peak Excursion, 5500/5520 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

Peak Excursion, 5500/5520 MHz, M7, HT-40, Dual Transmit Paths

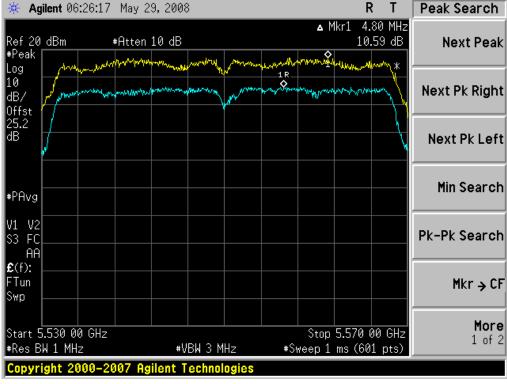


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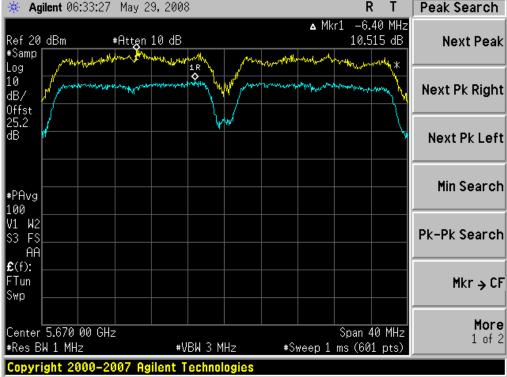


### Peak Excursion, 5540/5560 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

Peak Excursion, 5540/5560 MHz, M7, HT-40, Dual Transmit Paths

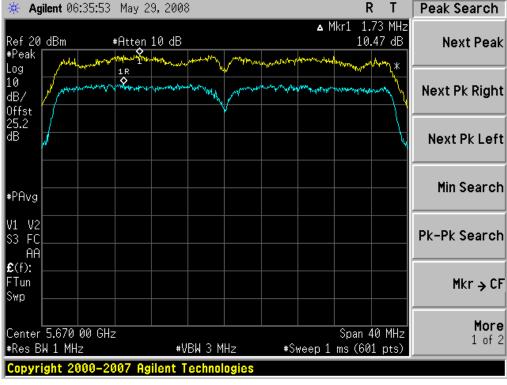


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### Peak Excursion, 5660/5680 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

Peak Excursion, 5660/5680 MHz, M7, HT-40, Dual Transmit Paths



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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

			Conducted		
Frequency (MHz)	Mode	Data Rate (Mbps)	Spurs (dBm)	Limit (dBm)	Margin (dB)
5260	Non HT-20 Beam Forming	54	-37.8	-27	10.8
5320	HT-20	M7	-38.8	-27	11.8
5320	Non HT-20 Beam Forming	54	-36.5	-27	9.5
5500	Non HT-20 Beam Forming	54	-30.0	-27	3.0
5580	Non HT-20 Beam Forming	54	-27.3	-27	0.3
5700	Non HT-20 Beam Forming	54	-28.5	-27	1.5
5260/5280	Non HT-40 Duplicate	54	-36.2	-27	9.2
5260/5280	HT-40	M7	-35.5	-27	8.5
5280/5320	Non HT-40 Duplicate	54	-42.5	-27	15.5
5280/5320	HT-40	M7	-41.9	-27	14.9
5500/5520	Non HT-40 Duplicate	54	-34.8	-27	7.8
5500/5520	HT-40	M7	-37.1	-27	10.1
5540/5560	Non HT-40 Duplicate	54	-27.5	-27	0.5
5540/5560	HT-40	M7	-31.5	-27	4.5
5660/5680	Non HT-40 Duplicate	54	-27.6	-27	0.6
5660/5680	HT-40	M7	-31.1	-27	4.1

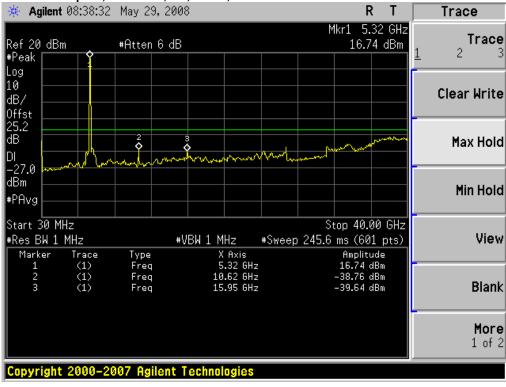
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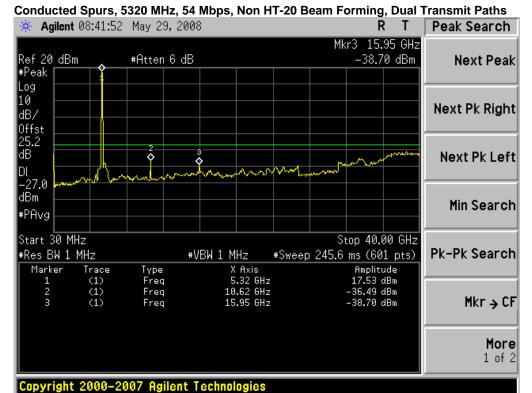
Peak Search	RT			108	May 29, 20	8:30:06	🔆 Agilent 0
Next Peak	Mkr3 15.75 GHz -37.77 dBm			B	#Atten 6 d		Ref 20 dBm #Peak
Next Pk Right							Log 10 dB/ 0ffst
Next Pk Left	a sura and a sura a	Multhannon	www	Å	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Mun	25.2 dB DI
Min Search							-27.0 dBm #PAvg
Pk-Pk Search	Stop 40.00 GHz .6 ms (601 pts) Amplitude	#Sweep 245.	X Axis		Туре		Start 30 MHz #Res BW 1 MM Marker
Mkr → CF	18.51 dBm -37.94 dBm -37.77 dBm		5.26 GHz 0.49 GHz 5.75 GHz	1	Freq Freq Freq	(1) (1) (1)	1 2 3
More 1 of 2							
			logies	Techno	07 Agilent	000-20	Copyright 2

## Conducted Spurs, 5260 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths

#### Conducted Spurs, 5320 MHz, M7, HT-20, Dual Transmit Path



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	3 May 29, 2008	po,	R T	Marker
Ref 20 dBm	#Atten 6 dB		Mkr3 26.74 GHz -37.79 dBm	<b>Select Marker</b> 1 2 <u>3</u> 4
Log 10 dB/ Offst				Normal
25.2 dB DI	2	worknow Whenha	auround a second	Delta
-27.0				<b>Delta Pair</b> (Tracking Ref) Ref <u>▲</u>
Start 30 MHz #Res BW 1 MHz Marker Trace 1 (1)	Type Freq	X Axis 5.50 GHz	Stop 40.00 GHz 245.6 ms (601 pts) Amplitude 18.16 dBm	<b>Span Pair</b> Span <u>Center</u>
2 (1) 3 (1)	Freq Freq	11.02 GHz 26.74 GHz	-29.98 dBm -37.79 dBm	Off
Copyright 2000-2	9007 Agilent Tecl	nningies		More 1 of 2

#### Conducted Spurs, 5500 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths

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# cisco

🔆 Agilent 08:22:11	L Jun 2, 2008			RT	Freq/Channel
Ref 20 dBm 🔥	#Atten 6 dB		Mkr3 	16.75 GHz -38.63 dBm	Center Freq 20.0150000 GHz
Log 10 dB/ Offst	2-				<b>Start Freq</b> 30.0000000 MHz
25.2 dB DI	~~~~	3 Annorman	hand have been been a second		<b>Stop Freq</b> 40.0000000 GHz
-27.0					<b>CF Step</b> 3.99700000 GHz <u>Auto</u> Man
Start 30 MHz #Res BW 1 MHz Marker Trace	Type	X Axis	Sweep 199.9 ms A	Implitude	Freq Offset 0.00000000 Hz
$ \begin{array}{ccc} 1 & (1) \\ 2 & (1) \\ 3 & (1) \end{array} $	Freq Freq Freq	5.58 GHz 11.15 GHz 16.75 GHz	-27	9.10 dBm 7.29 dBm 8.63 dBm	<b>Signal Track</b> <sup>On <u>Off</u></sup>
Copyright 2000-2	2007 Agilent T	echnologies			

## Conducted Spurs, 5580 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths

Conducted Spurs, 5700 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths

🔆 Agilent 08:17:34	Jun 2, 2008		RT	Peak Search
Ref20dBm <b>∧</b> #Peak 4	#Atten 6 dB		Mkr3 17.08 GHz -35.89 dBm	Next Peak
Log 10 dB/ Offst				Next Pk Right
25.2 dB	2			Next Pk Left
dBm				Min Search
Start 30 MHz #Res BW 1 MHz Marker Trace	Type	X Axis	Stop 40.00 GHz 199.9 ms (601 pts) Amplitude	Pk-Pk Search
$ \begin{array}{cccc} 1 & (1) \\ 2 & (1) \\ 3 & (1) \end{array} $	Freq Freq Freq	5.70 GHz 11.42 GHz 17.08 GHz	19.33 dBm -28.54 dBm -35.89 dBm	Mkr→CF
				<b>More</b> 1 of 2
Copyright 2000-20	007 Agilent T	echnologies		

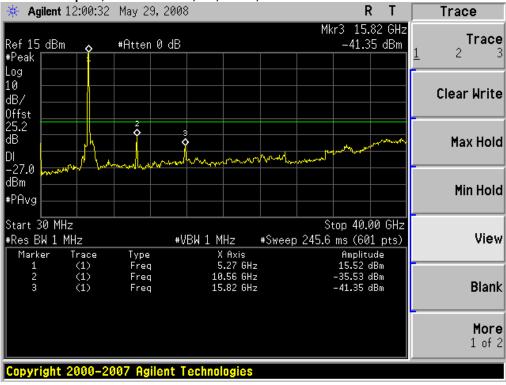
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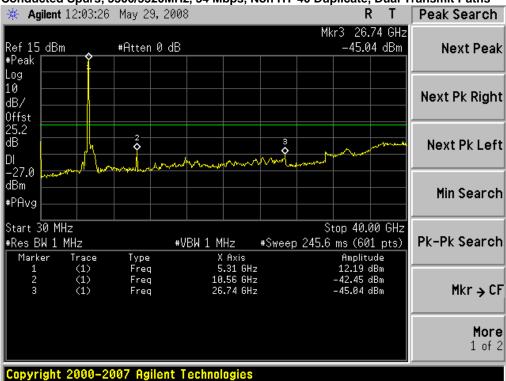
🔆 Agilent 11:55:43	8 May 29, 2008		RT	Trace
Ref 15 dBm 💊	#Atten 0 dB		Mkr3 15.82 GHz -40.33 dBm	<b>Trace</b> 1 2 3
#Peak Log 10 dB/ Offst				Clear Write
25.2 dB		www.www.www.	and and the second second	Max Hold
dBm #PAvg				Min Hold
Start 30 MHz #Res BW 1 MHz Marker Trace	#VBW 1	MHz #Sweep X Axis	Stop 40.00 GHz 245.6 ms (601 pts) Amplitude	Viev
$ \begin{array}{cccc} 1 & (1) \\ 2 & (1) \\ 3 & (1) \end{array} $	Freq 1 Freq 1	5.27 GHz L0.56 GHz L5.82 GHz	15.60 dBm -36.20 dBm -40.33 dBm	Blank
	007 Agilent Techn			More 1 of 2

#### Conducted Spurs, 5260/5280 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

#### Conducted Spurs, 5260/5280 MHz, M7, HT-40, Dual Transmit Paths

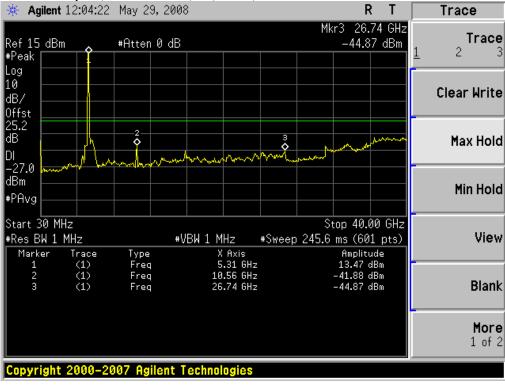


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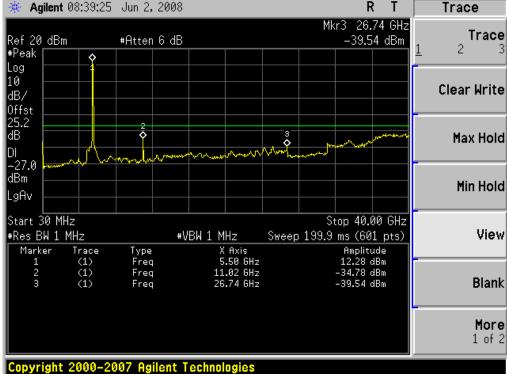
#### Conducted Spurs, 5300/5320MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

#### Conducted Spurs, 5300/5320MHz, M7, HT-40, Dual Transmit Paths



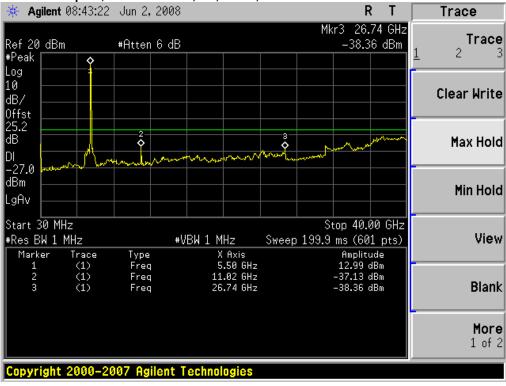
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# cisco



#### Conducted Spurs, 5500/5520 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

#### Conducted Spurs, 5500/5520 MHz, M7, HT-40, Dual Transmit Paths



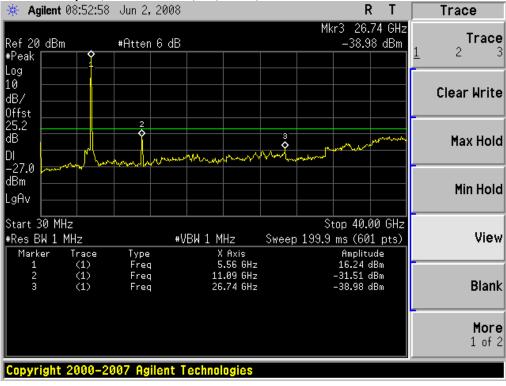
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R T Peak Search	R		Jun 2, 2008	nt 08:50:28	🔆 🔆 Agilen
3 26.74 GHz -39.80 dBm Next Peak			#Atten 6 dB	3m ↓	Ref 20 dB #Peak
Next Pk Right			2		Log 10 dB/ Offst
Next Pk Left	3 Martine and and and a	Mumm	$\diamond$		25.2 dB DI
Min Search					-27.0
p 40.00 GHz s (601 pts) Amplitude	Sweep 199.9 ms (601	/BW 1 MHz X Axis	#\ Type		Start 30 M #Res BW 1 Marker
.6.46 dBm 17.47 dBm 19.80 dBm Mkr→CF		5.56 GHz 11.09 GHz 26.74 GHz	Freq Freq Freq	(1) (1) (1)	1 2 3
More 1 of 2					
		echnologies	007 Agilent 1	t 2000–20	Copyright

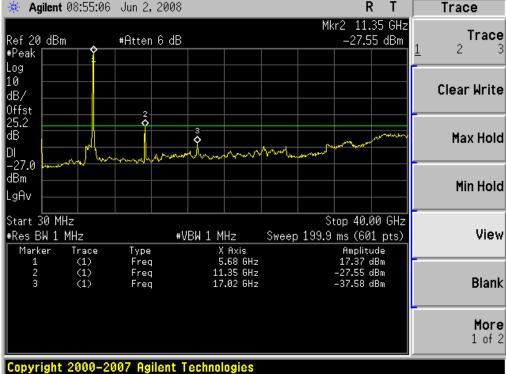
### Conducted Spurs, 5540/5560 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

#### Conducted Spurs, 5540/5560 MHz, M7, HT-40, Dual Transmit Paths



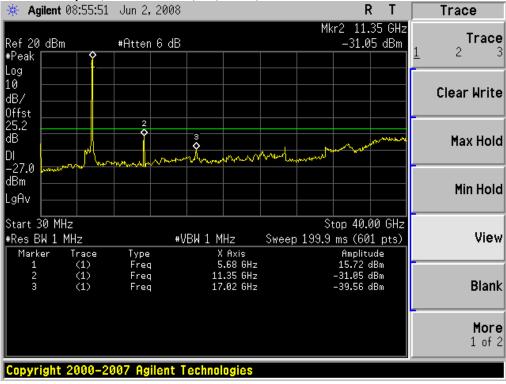
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# cisco

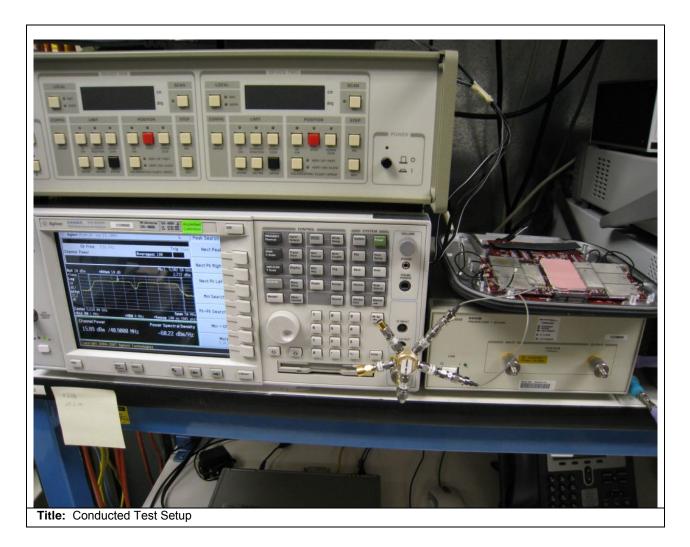


#### Conducted Spurs, 5660/5680 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths

#### Conducted Spurs, 5660/5680 MHz, M7, HT-40, Dual Transmit Paths



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#### Appendix B: Emission Test Results

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

#### **Radiated Bandedge**

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.

........

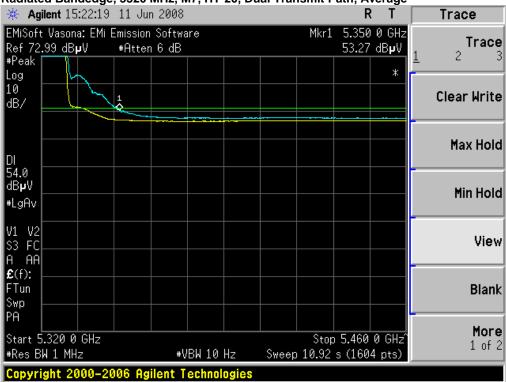
Reference Level:	110 dBuV
Attenuation:	20 dB
Sweep Time:	Coupled
Resolution Bandwidth:	1MHz
Video Bandwidth:	1 MHz for peak, 10 Hz for average
Detector:	Peak

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.

Frequency (MHz)	Mode	Data Rate (Mbps)	(dBuV/m)	Limit (dBuV/m)	Margin (dB)
5320	HT-20	M7	53.3	54	0.7
5320	Non HT-20 Beam Forming	54	53.1	54	0.9
5500	Non HT-20 Beam Forming	54	51.7	54	2.3
5700	Non HT-20 Beam Forming	54	53.4	68	14.6
5280/5320	Non HT-40 Duplicate	54	53.7	54	0.3
5280/5320	HT-40	M7	53.5	54	0.5
5500/5520	Non HT-40 Duplicate	54	52.7	54	1.3
5500/5520	HT-40	M7	53.5	54	0.5
5660/5680	Non HT-40 Duplicate	54	57.9	68	10.1
5660/5680	HT-40	M7	53.4	68	14.6



#### Radiated Bandedge, 5320 MHz, M7, HT-20, Dual Transmit Path, Average

Radiated Bandedge, 5320 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths, Average

* Agilent 15:25:54			·	,			R		Trace
EMiSoft Vasona: EMi E Ref 72.99 dB <b>µ</b> V #Peak			re			Mkr1		0 GHz dB <b>µ</b> V	<b>Trace</b> <u>1</u> 2 3
Log 10 dB/	1							*	Clear Write
DI									Max Hold
54.0 dBµV #LgAv									Min Hold
V1 V2 S3 FC A AA									View
£(f): FTun Swp									Blank
PA Start 5.320 0 GHz #Res BW 1 MHz		#V	BW 10	Hz	Sweep	Stop 10.92		0 GHz^ 4 pts)	More 1 of 2
Copyright 2000-20	106 Agi	lent T	echnol	ogies					

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#### Radiated Bandedge, 5500 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths, Average

Radiated Bandedge, 5700 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths, Average

<b>∦ Agilent</b> 15:57:54	11 Jun 20	08				R	T	Trace
EMiSoft Vasona: EMi & Ref 72.99 dBµV #Peak	Emission Sof #Atten 6				Mkr1		i 0 GHz dB <b>µ</b> V	<b>Trace</b> <u>1</u> 2 3
Log 10 dB/	h, 1						*	Clear Write
								Max Hole
54.0 dB <b>µ</b> V #LgAv								Min Hol
И1 V2 53 FC Э. АА								Vie
2(f): Tun								Blan
PA Start 5.700 0 GHz #Res BW 1 MHz		#VBW 10	Hz	Sweep	Stop 7.798		0 GHzî 4 pts)	<b>Mor</b> 1 of
Copyright 2000-20	06 Agilen	t Techno	logies					

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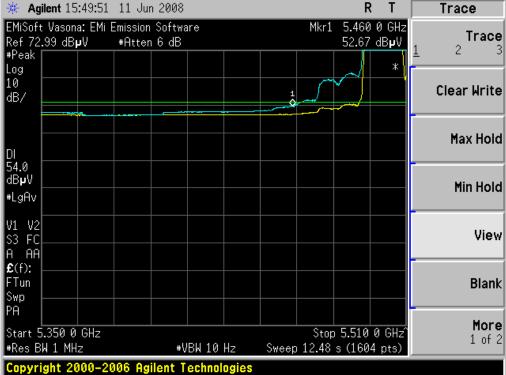


#### Radiated Bandedge, 5300/5320MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths, Average

Radiated Bandedge, 5300/5320MHz, M7, HT-40, Dual Transmit Paths, Average

🔆 Agilent 15:31:43 1		, 111 40, Duai Trans	RT	Trace
EMiSoft Vasona: EMi Em Ref 72.99 dB <b>µ</b> V <b>#</b> #Peak	ission Software Atten 6 dB	Mkr1	5.350 0 GHz 53.47 dB <b>µ</b> V	<b>Trace</b> 1 <u>2</u> 3
Log 10 dB/	1		*	Clear Write
				Max Hold
54.0 dBµV #LgAv				Min Hold
V1 V2 S3 FC A AA				View
£(f): FTun Swp PA				Blank
Start 5.310 0 GHz #Res BW 1 MHz	#VBW 10	Hz Sweep 11.7	5.460 0 GHz^ s (1604 pts)	<b>More</b> 1 of 2
Copyright 2000-200	6 Agilent Technol	ogies		

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#### Radiated Bandedge, 5500/5520 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths, Average

Radiated Bandedge, 5500/5520 MHz, M7, HT-40, Dual Transmit Paths, Average

✤ Agilent 15:50:58	11 Jun 2008			RT	Trace
EMiSoft Vasona: EMi E Ref 72.99 dBµV #Peak	mission Softwa #Atten 6 dB	are	Mkr1	5.460 0 GHz 53.50 dBµV	<b>Trace</b> 1 2 3
Log 10				*	
dB/			1		Clear Write
					- Max Hold
DI					
dBµV #LgAv					Min Hold
V1 V2					
\$3 FC					View
€(f): FTun					- Blank
Swp PA					
Start 5.350 0 GHz				5.510 0 GHz <sup>°</sup>	More 1 of 2
#Res BW 1 MHz Copyright 2000-20		'BW 10 Hz echnologies	Sweep 12.48	s (1604 pts)	

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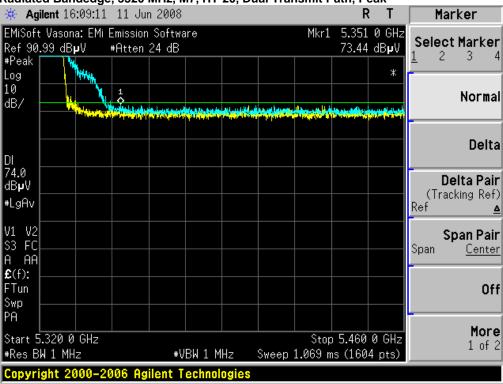


#### Radiated Bandedge, 5660/5680 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths, Average

Radiated Bandedge, 5660/5680 MHz, M7, HT-40, Dual Transmit Paths, Average

🔆 Agilent 16:03:15 1	1 Jun 2008		RT	Trace
EMiSoft Vasona: EMi Em Ref 72.99 dB <b>µ</b> V <b>#</b> #Peak	ission Software Atten 6 dB	Mkr1	5.725 0 GHz 53.41 dBµV	<b>Trace</b> <u>1</u> 2 3
Log 10 dB/			*	Clear Write
DI				Max Hold
54.0 dBµV #LgAv				Min Hold
V1 V2 \$3 FC				View
£(f): FTun Swp				Blank
PA Start 5.670 0 GHz #Res BW 1 MHz	#VBW 10 H		5.800 0 GHz^ s (1604 pts)	More 1 of 2
Copyright 2000-200	6 Agilent Technolo	gies		

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#### Radiated Bandedge, 5320 MHz, M7, HT-20, Dual Transmit Path, Peak

Radiated Bandedge, 5320 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths, Peak

Marker	RT			·				7:22:50		
Select Marker	350 0 GHz .30 dB <b>µ</b> V				are			na:EMi{ µV		
Normal	*	hr, a citali hitaanita	er had den so i fan ste		al à de succes	aldu, bei verse aldu	1			Log 10 dB/
- Delta			Alexandressed							DI
<b>Delta Pair</b> (Tracking Ref) Ref <b>∆</b>										74.0 dB <b>µ</b> V #LgAv
 <b>Span Pair</b> Span <u>Center</u>										V1 M2 S3 FC A AF
Off										€(f): FTun Swp
More 1 of 2	60 0 GHz .604 pts)	Stop 5.4 069 ms (1	Sweep :	Hz	BW 1 M	#\			5.320 0 3W 1 MH	
				ogies	echnol	ilent T	006 Ag	000-20	ight 2	Copyr

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#### 244 Agilent 17:27:56 11 Jun 2008 R Т Marker EMiSoft Vasona: EMi Emission Software Mkr1 5.460 0 GHz Select Marker Ref 90.99 dBµV 68.99 dB**µ**V #Atten 24 dB 2 3 4 #Peak Log ж 10 Normal dB/ alastinaana ay amatiki ing والترجيبان والبروا المرابع Delta DI 74.0 dB**µ**V Delta Pair (Tracking Ref) #LgAv Ref ≙ V1 V2 Span Pair S3 FC Span <u>Center</u> A AA **£**(f): FTun Off Swp ΡĤ More Start 5.350 0 GHz Stop 5.500 0 GHz 1 of 2 #Res BW 1 MHz Sweep 1.069 ms (1604 pts) #VBW 1 MHz Copyright 2000-2006 Agilent Technologies

Radiated Bandedge, 5500 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths, Peak

Radiated Bandedge, 5700 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths, Peak

🔆 Agilent 17:29:41 11 Ju	n 2008		RT	Trace
EMiSoft Vasona: EMi Emission Ref 90.99 dBµV #Atten #Peak		Mkr1	5.725 0 GHz 73.74 dBµV *	<b>Trace</b> <u>1</u> 2 3
Log 10 dB/	Altaticality and a substance with	et hat we dette her in discussion of the	dan man kan man kan	Clear Write
				Max Hold
74.0 dBµV #LgAv				Min Hold
V1 V2 \$3 FC A AA				View
£(f): FTun Swp				Blank
PA Start 5.700 0 GHz #Res BW 1 MHz	#VBW 1 MHz		) 5.800 0 GHz )s (1604 pts)	More 1 of 2
Copyright 2000-2006 Ag	ilent Technologi	es		

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🔆 Agilent 17:31:40 11	1 Jun 2008		RT	Marker
EMiSoft Vasona: EMi Emi Ref 90.99 dBµV #At	ssion Software tten 24 dB	Mkr1	5.350 3 GHz 73.89 dB <b>µ</b> V	Select Marker
#Peak Log			*	<u> </u>
10 dB/		and the second	n, kirdin, nanjelada se	Normal
DI				Delta
74.0 dBµV #LgAv				<b>Delta Pair</b> (Tracking Ref)
V1 V2				Ref Span Pair
S3 FC A AA £(f):				Span <u>Center</u>
FTun Swp				Off
PA Start 5.310 0 GHz #Res BW 1 MHz	#VBW 1 M		5.460 0 GHz	More 1 of 2
Copyright 2000-2006		•	<del>3 (1004</del> pt3)	

### Radiated Bandedge, 5300/5320MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths, Peak

Radiated Bandedge, 5300/5320MHz, M7, HT-40, Dual Transmit Paths, Peak

* Agilent 17:33:08 11 Jun		•	<b>γ</b> Τ Γ	Trace
EMiSoft Vasona: EMi Emission Ref 90.99 dBµV #Atten #Peak		Mkr1 5.35 73.6	<sup>7</sup> dB <b>µ</b> V <u>1</u>	Trace 2 3
Log 10 dB/	hitelenette tensis kirki tationa antikaterria	e er bis solar i de ser an de s		Clear Write
				Max Hold
74.0 dBµV #LgAv				Min Hold
V1 V2 S3 FC A AA				View
£(f): FTun Swp				Blank
PA Start 5.310 0 GHz #Res BW 1 MHz		Stop 5.460 Sweep 1.069 ms (160		<b>More</b> 1 of 2
Copyright 2000-2006 Ag	ilent Technologies			

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Radiated Bandedge, 5500/5520 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths, Peak

Radiated Bandedge, 5500/5520 MHz, M7, HT-40, Dual Transmit Paths, Peak

Marker	Ť	R	-			n 2008	11 Ju	7:37:30	gilent 1	<b>₩ A</b>
Select Marker			_		are		Emissior #Atten		t Vasor ).99 dB	Ref 90
	*	su divi								#Peak Log 1 A
Normal		WWW			ettis <mark>his</mark> to			Heine deide in	alahii milika	10 dB/
- Delta										
									<u> </u>	)  74.0
<b>Delta Pair</b> (Tracking Ref) Ref <u>4</u>	_									¦B <b>µ</b> V ⊧LgAv
<b>Span Pair</b> Span <u>Center</u>									;	1 V2 3 F0
Off										ì Af \$(f): ∵Tun Swp
 More		F F1 A								ΡA
1 of 2		5.510 s (1604	Sweep	IHz	'BW1M	#\			5.350 0 3W 1 MW	
				ogies	echnol	ilent T	006 Ag	2000-2	ight 2	Соруг

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🔆 Agilent 17:39:38	11 Jun 2008				R	2 T	Marker
EMiSoft Vasona: EMi E Ref 90.99 dBµV 4	#Atten 24 dB	are		Mkr1		9 GHz dB <b>µ</b> V	Select Marker
Log 🕴 📊						*	1 2 3 4
10 MA	www.		alidad Jacob Barris				Normal
	A MARKED AND A MARKED						
DI							Delta
74.0 dBµV							<b>Delta Pair</b> (Tracking Ref)
#LgAv							Ref 🛕
V1 V2 \$3 FC A AA							<b>Span Pair</b> Span <u>Center</u>
£(f): FTun							- Off
Swp PA							More
Start 5.670 0 GHz #Res BW 1 MHz	#\	/BW 1 Mł	Hz Swe	Stop ep 1.069 m		0 GHz 4 pts)	1 of 2
Copyright 2000-20	06 Agilent T	echnolo					

Radiated Bandedge, 5660/5680 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths, Peak

Radiated Bandedge, 5660/5680 MHz, M7, HT-40, Dual Transmit Paths, Peak

Agilent 17:41:13	•		.,	RT	Trace
#Peak 🔰 🚻	Emission Softw #Atten 24 dB	are	Mkr1	5.727 1 GHz 72.52 dBµV *	<b>Trace</b> <u>1</u> 2 3
Log 10 dB/		1 Vitelingen of a bit house	uners attal under in the state of the	erstelle strate souther	Clear Write
					Max Hold
74.0 dBµV #LgAv					Min Hold
V1 V2 S3 FC A AA					View
£(f): FTun Swp					Blank
PA Start 5.670 0 GHz #Res BW 1 MHz		/BW 1 MHz	Sweep 1.069 m	) 5.800 0 GHz 1s (1604 pts)	More 1 of 2
Copyright 2000-20	006 Agilent 1	echnologies			

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### **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.

Frequency (MHz)	Mode	Data Rate (Mbps)	(dBuV/m)	Limit (dBuV/m)	Margin (dB)
5260	Non HT-20 Beam Forming	54	44.5	54	9.5
5320	HT-20	M7	38.7	54	15.3
5320	Non HT-20 Beam Forming	54	39.2	54	14.8
5500	Non HT-20 Beam Forming	54	42.7	54	11.3
5580	Non HT-20 Beam Forming	54	46.1	54	7.9
5700	Non HT-20 Beam Forming	54	47.0	54	7.0
5260/5280	Non HT-40 Duplicate	54	45.6	54	8.4
5260/5280	HT-40	M7	39.7	54	14.3
5280/5320	Non HT-40 Duplicate	54	39.7	54	14.3
5280/5320	HT-40	M7	38.3	54	15.7
5500/5520	Non HT-40 Duplicate	54	43.6	54	10.4
5500/5520	HT-40	M7	40.5	54	13.5
5540/5560	Non HT-40 Duplicate	54	46.6	54	7.4
5540/5560	HT-40	M7	43.0	54	11.0
5660/5680	Non HT-40 Duplicate	54	45.5	54	8.5
5660/5680	HT-40	M7	43.4	54	10.6

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#### Radiated Spurious, 5260 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths, Average

Radiated Spurious, 5320 MHz, M7, HT-20, Dual Transmit Path, Average

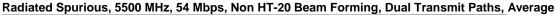


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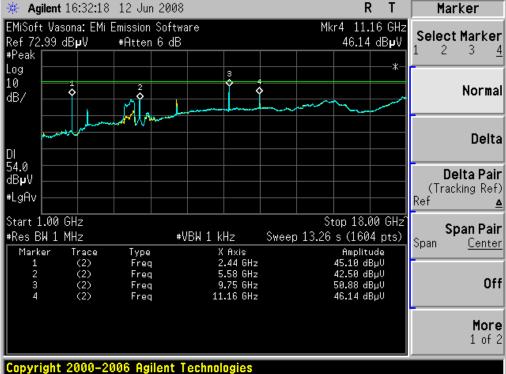
#### Radiated Spurious, 5320 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths, Average

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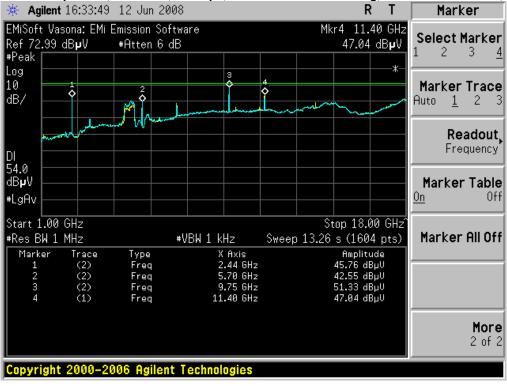


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#### Radiated Spurious, 5580 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths, Average

Radiated Spurious, 5700 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths, Average



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#### Agilent 15:47:58 12 Jun 2008 R Т Marker <u> 166</u> EMiSoft Vasona: EMi Emission Software Mkr2 5.27 GHz Select Marker Ref 72.99 dB**µ**V 32.94 dBµV #Atten 6 dB 3 2 4 #Peak Log 3 10 Normal Ŷ Ŷ dB/ Delta DI 54.0 Delta Pair dB**µ**V (Tracking Ref) #LgAv Ref Δ Start 1.00 GHz Stop 18.00 GHz Span Pair #Res BW 1 MHz #VBW 1 kHz Sweep 13.26 s (1604 pts) Span Center X Axis 2.44 GHz 5.27 GHz 9.75 GHz Amplitude 45.36 dBµU 32.94 dBµU 51.52 dBµU 45.59 dBµU Marker Trace Type (2) (2) Freq Freq (2) (2) Off 3 Freq Freq 10.54 GHz Δ More 1 of 2 Copyright 2000-2006 Agilent Technologies

#### Radiated Spurious, 5260/5300 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths, Average



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#### Radiated Spurious, 5300/5320 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths, Average

Radiated Spurious, 5300/5320 MHz, M7, HT-40, Dual Transmit Paths, Average

<b>★ Agilent</b> 15:55:36		,,,		R T	Trace
EMiSoft Vasona: EMil Ref 72.99 dB <b>µ</b> V #Peak	Emission Softwa #Atten 6 dB			10.60 GHz .34 dBµV	<b>Trace</b> <u>1</u> 2 3
Log 10 <u>+</u> dB/ •	.040 J			*	Clear Write
DI 54.0					Max Hold
dBµV #LgAv					Min Hold
Start 1.00 GHz #Res BW 1 MHz Marker Trace	#V	BW 1 kHz 1 X Axis	Sweep 13.26 s (1	18.00 GHz^ 1604 pts) plitude	View
1 (2) 2 (2) 3 (2) 4 (2)	Freq Freq Freq Freq	2.44 GHz 5.31 GHz 9.75 GHz 10.60 GHz	34.9 53.3	8 dBµV 1 dBµV 3 dBµV 4 dBµV	Blank
					<b>More</b> 1 of 2
Copyright 2000-20	006 Agilent To	echnologies			

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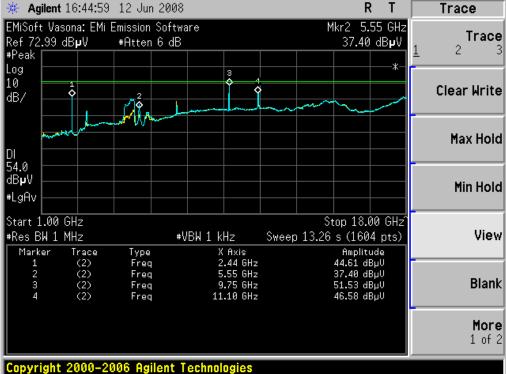
#### 244 Agilent 16:41:36 12 Jun 2008 R Т Marker EMiSoft Vasona: EMi Emission Software Mkr4 11.02 GHz Select Marker Ref 72.99 dB**µ**V #Peak 43.60 dBµV #Atten 6 dB 2 3 4 Log 3 10 Normal Ŷ Ŷ dB/ Delta DI 54.0 dB**µ**V Delta Pair (Tracking Ref) #LgAv Ref Δ Start 1.00 GHz Stop 18.00 GHz Span Pair #Res BW 1 MHz #VBW 1 kHz Sweep 13.26 s (1604 pts) Span <u>Center</u> X Axis 2.44 GHz 5.51 GHz 9.75 GHz 11.02 GHz Amplitude 45.36 dBµV 36.60 dBµV 51.56 dBµV 43.60 dBµV Marker Trace Type (2) (2) (2) (2) (2) Freq Freq Off 3 Freq Δ Freq More 1 of 2 Copyright 2000-2006 Agilent Technologies

### Radiated Spurious, 5500/5520 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths, Average

Padiated Spurious 5500/5520 MHz M7 HT 40 Dual Transmit Paths Average

Radiated Spurious,	5500/5520 MHZ, M	17, HT-40, Dual	Transmit Paths, Ave	rage
🔆 Agilent 16:42:37	12 Jun 2008		RT	Trace
EMiSoft Vasona: EMi E Ref 72.99 dB <b>µ</b> V #Peak	Emission Software #Atten 6 dB		Mkr4 11.02 GHz 40.51 dBµV	<b>Trace</b> <u>1</u> 2 3
Log 10 dB/		3 4 		Clear Write
DI 54.0				Max Hold
54.0 dB <b>µ</b> V #LgAv				Min Hold
Start 1.00 GHz #Res BW 1 MHz Marker Trace	#VBW 1 Type	X Axis	Stop 18.00 GHz^ 13.26 s (1604 pts) Amplitude	View
1 (2) 2 (2) 3 (2) 4 (2)	Freq Freq Freq Freq	2.44 GHz 5.51 GHz 9.75 GHz 11.02 GHz	45.37 dBµV 35.48 dBµV 50.41 dBµV 40.51 dBµV	Blank
				<b>More</b> 1 of 2
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#### Radiated Spurious, 5540/5560 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths, Average

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Dedicted Sourieus EE40/EE60 MUs M7 HT 40 Duel Trenemit Dethe Aug



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#### Radiated Spurious, 5660/5680 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths, Average

Padiated Spurious 5660/5690 MHz M7 HT 40 Dual Transmit Dates Average

	it Paths, Ave	Transmit	40, Dua	<i>и</i> , пт-				16:48:55		
Trace	RT									
<b>Trace</b> 1 <u>2</u> 3	11.34 GHz 43.43 dBµV						Emission #Atten	ona: EMi 6 BµV		Ref 72 #Peak
Clear Write	*		4	3				\$		Log 10 dB/
Max Hold							~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	, we wanted	programsterk	DI
Min Hold										54.0 dB <b>µ</b> V #LgAv
View	o 18.00 GHz^ (1604 pts) Amplitude	13.26 s (		X Axis	VBW 1		Туре	1Hz Trace	3W 1 M	Start ( #Res E Mark
Blank	5.43 dВµV 9.13 dВµV 9.00 dВµV 8.43 dВµV	33.1 49.6	lz Iz	2.44 GH 5.67 GH 9.75 GH 11.34 GH		 	Freq Freq Freq Freq	(2) (2) (2) (2) (2)		1 2 3 4
More 1 of 2										
				ologies	Techi	ilent	06 Ag	2000-20	ight :	Copyr

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### Radiated Spurious, 5260 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths, Peak

Radiated Spurious, 5320 MHz, M7, HT-20, Dual Transmit Path, Peak



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### Radiated Spurious, 5320 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths, Peak

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Radiated Spurious, 5500 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths, Peak



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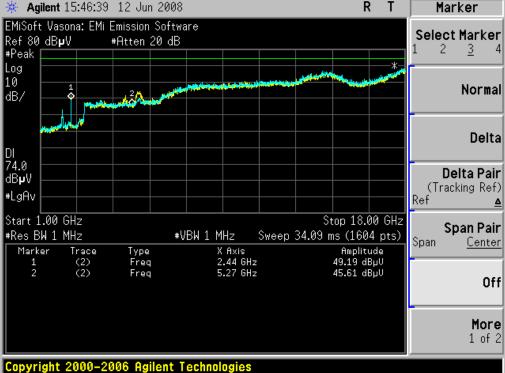


#### Radiated Spurious, 5580 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths, Peak

Radiated Spurious, 5700 MHz, 54 Mbps, Non HT-20 Beam Forming, Dual Transmit Paths, Peak



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### Radiated Spurious, 5260/5300 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths, Peak

Radiated Spurious, 5260/5300 MHz, M7, HT-40, Dual Transmit Paths, Peak



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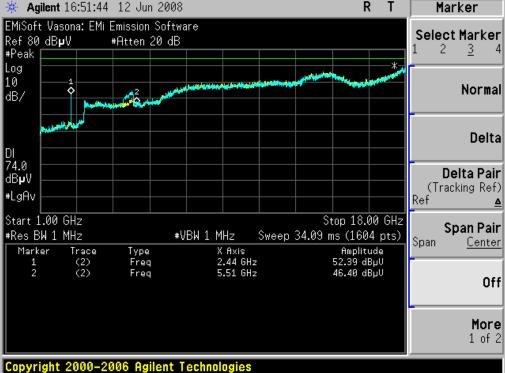
#### Agilent 15:54:10 12 Jun 2008 R Т Marker <u> 260</u> EMiSoft Vasona: EMi Emission Software Mkr2 5.31 GHz Select Marker 48.11 dBµV Ref 80 dBµV #Atten 20 dB 3 2 4 #Peak Log 10 2 Normal Ŷ dB/ Delta DI 74.0 Delta Pair dB**µ**V (Tracking Ref) #LgAv Ref Δ Start 1.00 GHz Stop 18.00 GHz Span Pair #Res BW 1 MHz #VBW 1 MHz Sweep 34.09 ms (1604 pts) Span Center X Axis 2.44 GHz 5.31 GHz Amplitude 52.49 dBµV 48.11 dBµV Marker Trace Type (2) (2) Freq Freq 2 Off More 1 of 2 Copyright 2000-2006 Agilent Technologies

#### Radiated Spurious, 5300/5320 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths, Peak

Radiated Spurious, 5300/5320 MHz, M7, HT-40, Dual Transmit Paths, Peak



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### Radiated Spurious, 5500/5520 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths, Peak

Radiated Spurious, 5500/5520 MHz, M7, HT-40, Dual Transmit Paths, Peak



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#### Radiated Spurious, 5540/5560 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths, Peak

Radiated Spurious, 5540/5560 MHz, M7, HT-40, Dual Transmit Paths, Peak



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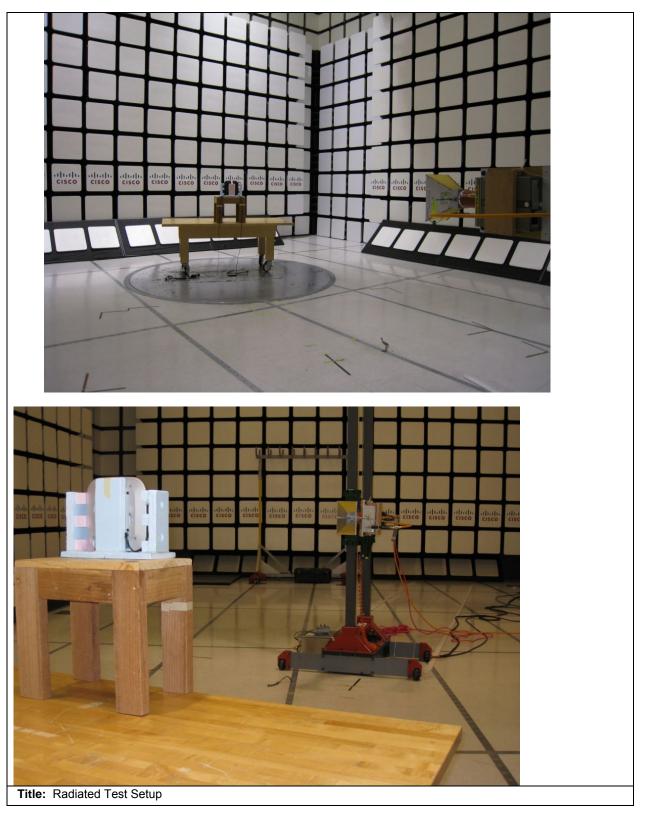
#### Agilent 16:55:06 12 Jun 2008 R Т Marker 244 EMiSoft Vasona: EMi Emission Software Mkr2 5.67 GHz Select Marker 46.34 dBµV Ref 80 dBµV #Atten 20 dB 3 2 4 #Peak Log 10 Normal 2 0 ĉ dB/ Delta DI 74.0 Delta Pair dB**µ**V (Tracking Ref) #LgAv Ref Δ Start 1.00 GHz Stop 18.00 GHz Span Pair #Res BW 1 MHz #VBW 1 MHz Sweep 34.09 ms (1604 pts) Span Center X Axis 2.44 GHz 5.67 GHz Amplitude 51.45 dBµV 46.34 dBµV Marker Trace Type (2) (2) Freq Freq 2 Off More 1 of 2 Copyright 2000-2006 Agilent Technologies

#### Radiated Spurious, 5660/5680 MHz, 54 Mbps, Non HT-40 Duplicate, Dual Transmit Paths, Peak

Radiated Spurious, 5660/5680 MHz, M7, HT-40, Dual Transmit Paths, Peak



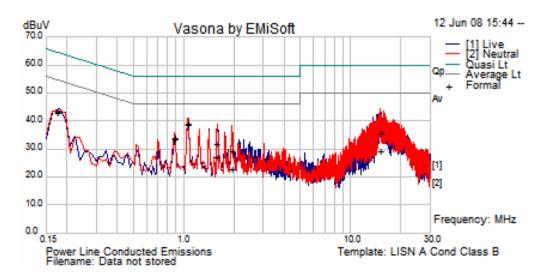
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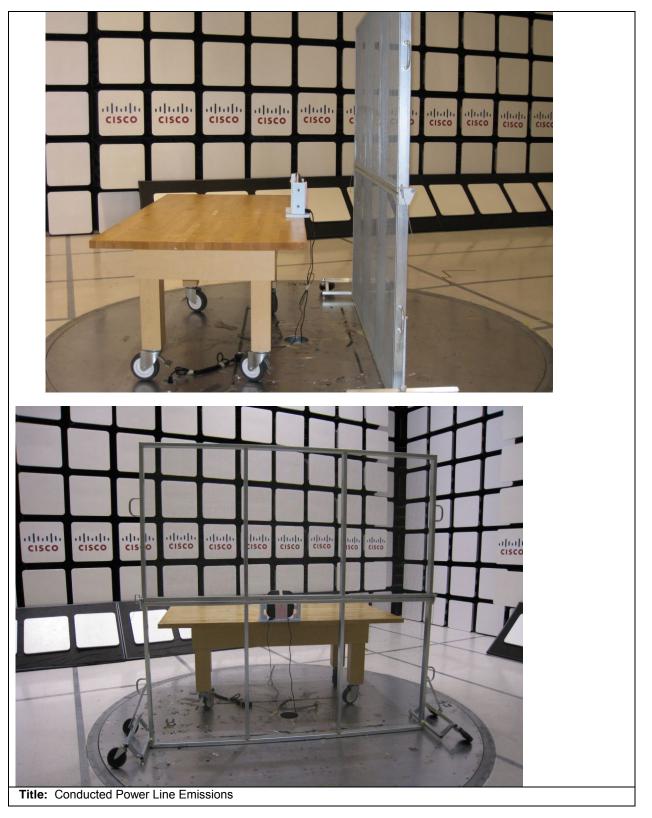
cisco



## Conducted emissions

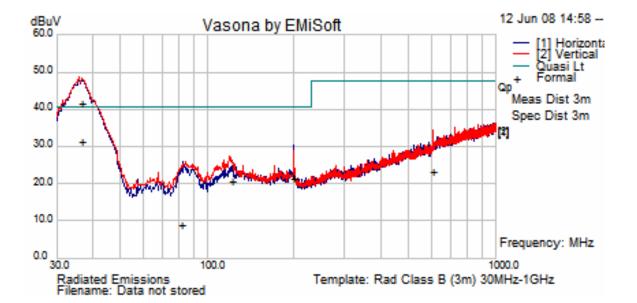
Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail
0.178	20.32	20.41	0.18	40.91	Average	Neutral	54.58	-13.66	Pass
0.178	20.69	20.41	0.18	41.28	Quasi Peak	Neutral	64.58	-23.29	Pass
0.889	11.71	19.96	0.08	31.75	Quasi Peak	Neutral	56	-24.25	Pass
0.889	11.51	19.96	0.08	31.55	Average	Neutral	46	-14.45	Pass
1.068	16.32	19.95	0.09	36.36	Average	Neutral	46	-9.64	Pass
1.068	16.79	19.95	0.09	36.83	Quasi Peak	Neutral	56	-19.17	Pass
1.602	9.74	19.95	0.09	29.78	Quasi Peak	Neutral	56	-26.22	Pass
1.602	4.85	19.95	0.09	24.89	Average	Neutral	46	-21.11	Pass
1.96	0.48	19.95	0.09	20.52	Average	Neutral	46	-25.48	Pass
1.96	7.15	19.95	0.09	27.19	Quasi Peak	Neutral	56	-28.81	Pass
15.163	13.21	20.23	0.14	33.58	Quasi Peak	Neutral	60	-26.42	Pass
15.163	6.59	20.23	0.14	26.96	Average	Neutral	50	-23.04	Pass

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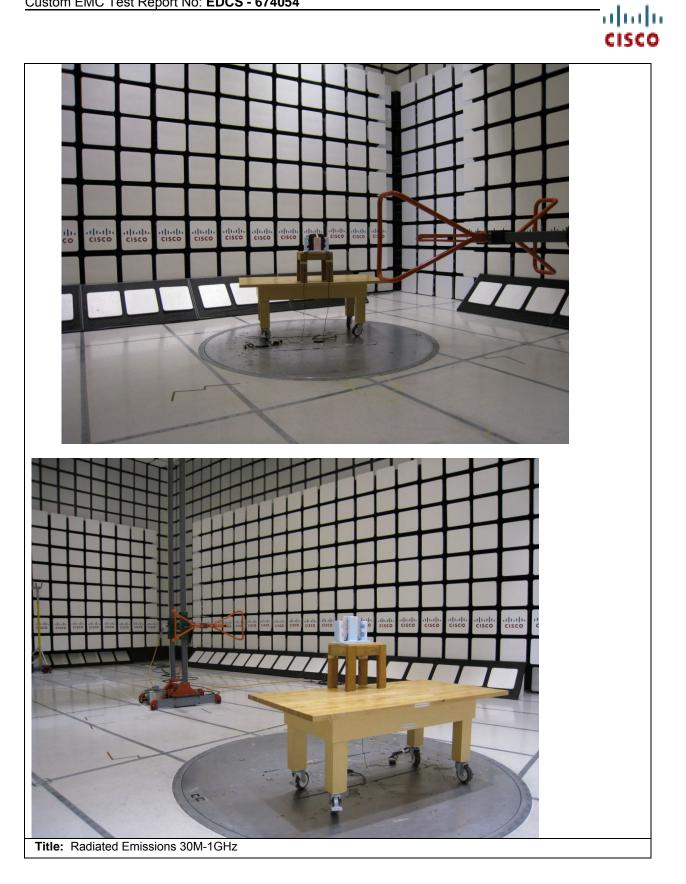


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## **Radiated emissions**

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail
36.913	13.4	0.4	15.7	29.43	Quasi Peak	Н	220	282	40.5	-11.1	Pass
36.915	23.8	0.4	15.7	39.85	Quasi Peak	V	180	282	40.5	-0.7	Pass
82.382	-1.1	0.7	7.4	6.88	Quasi Peak	V	240	4	40.5	-33.6	Pass
199.992	5.8	1	12.7	19.54	Quasi Peak	V	105	158	40.5	-21	Pass
122.313	4.23	0.78	13.95	18.95	Quasi Peak	V	125	162	40.5	-21.55	Pass
609.099	0.79	1.74	18.86	21.39	Quasi Peak	V	100	298	47.5	-26.11	Pass

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## Maximum Permissible Exposure (MPE) Calculations

15.407: U-NII devices are subject to the radio frequency radiation exposure requirements specified in Sec. 1.1307(b), Sec. 2.1091 and Sec. 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a ``general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

Given

 $E=\sqrt{(30^{*}P^{*}G)/d}$  and  $S=E^{2}/3770$ 

where

E=Field Strength in Volts/meter P=Power in Watts G=Numeric Antenna Gain d=Distance in meters S=Power Density in mW/cm<sup>2</sup>

Combine equations and rearrange the terms to express the distance as a function of the remaining variables:

```
d=√((30*P*G)/(3770*S))
```

P(mW)=P(W)/1000

Changing to units of power in mW and distance in cm, using:

d(cm)=100\*d(m)

yields

d=100\*√((30\*(P/1000)\*G)/(3770\*S)) d=0.282\*√(P\*G/S)

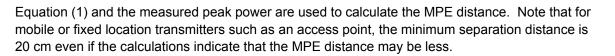
where

d=Distance in cm P=Power in mW G=Numerica Antenna Gain S=Power Density in mW/cm^2

#### Substituting the logarithmic form of power and gain using: P(mW)=10^(P(dBm)/10) G(numeric)=10^(G(dBi)/10)

yields  $d=0.282*10^{((P+G)/20)/\sqrt{S}}$ Equation (1) and  $s=((0.282*10^{((P+G)/20))/d})^{2}$ Equation (2) where d=MPE distance in cm P=Power in dBm G=Antenna Gain in dBi  $S=Power \text{ Density in mW/cm}^{2}$ 

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S=1mW/cm<sup>2</sup> maximum. The highest supported antenna gain is 6 dBi (9dBi with beamforming). Using the peak power levels recorded in the test report along with Equation 1 above, the MPE distances are calculated as follows.

Frequency (MHz)	Bit Rate (Mbps)	Power Density (mW/cm^2)	Peak Transmit Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)	Limit (cm)	Margin (cm)
5260	54	1	20.4	3	4.17	20	15.83
5320	54	1	19.1	3	3.59	20	16.41
5500	54	1	20.8	3	4.37	20	15.63
5580	54	1	20.9	3	4.42	20	15.58
5700	54	1	20.8	3	4.37	20	15.63

MPE Calculations

To maintain compliance, installations will assure a separation distance of at least 20cm.

Using Equation 2, the MPE levels (s) at 20 cm are calculated as follows:

Frequency (MHz)	Bit Rate (Mbps)	MPE Distance (cm)	Peak Transmit Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Margin (mW/cm^2)
5260	54	20	20.4	3	0.04	1	0.96
5320	54	20	19.1	3	0.03	1	0.97
5500	54	20	20.8	3	0.05	1	0.95
5580	54	20	20.9	3	0.05	1	0.95
5700	54	20	20.8	3	0.05	1	0.95

#### Manufacturer Last Cal Next Due Equip # Model Description CIS040503 E4440A Precision Spectrum Analyzer 20-Mar-08 20-Mar-09 Agilent ΗP CIS005568 8449B PreAmplifier (1-26.5GHz) 6-Sep-07 6-Sep-08 RF Coaxial Cable, to 18GHz, 134.4 CIS020975 Micro-Coax UFB311A-0-1344-520520 15-Mar-09 15-Mar-08 in CIS030559 UFB311A-1-0950-504504 12-Mar-08 12-Mar-09 Micro-Coax RF Coaxial Cable, to 18GHz, 95 in 11-Mar-09 CIS004883 EMC Test Systems 3115 Double Ridged Guide Horn Antenna 11-Mar-08 Notch Filter, SB:5.150-5.350GHz, to CIS034188 Micro-Tronics BRC50703-02 11GHz 16-Jul-07 16-Jul-08 Notch Filter, SB:5.470-5.725GHz, to CIS035605 16-Jul-07 16-Jul-08 **Micro-Tronics** BRC50704-02 12GHz Notch Filter, SB:5.725-5.875GHz, to CIS037228 **Micro-Tronics** BRC50705 12 GHz 10-Mar-08 10-Mar-09 Notch Filter, SB:2.4-2.5GHz, to CIS034304 **Micro-Tronics** BRM50702-02 18GHz 16-Jul-07 16-Jul-08 CIS034975 Midwest Microwave ATT-0640-20-29M-02 Attenuator, 20dB, DC-40GHz 15-May-08 15-May-09 16-Jul-08 CIS030652 Sunol Sciences Combination Antenna, 30MHz-2GHz 16-Jul-07 JB1 9-Oct-08 CIS005691 Miteq NSP1800-25-S1 Broadband Preamplifier (1-18GHz) 9-Oct-07 CIS008375 Andrew F4A-PNMNM 49 ft Heliax Cable 15-Mar-08 15-Mar-09 12-Mar-08 CIS030559 Micro-Coax RF Coaxial Cable, to 18GHz, 95 in 12-Mar-09 UFB311A-1-0950-504504 CIS008195 TTE H613-150K-50-21378 Hi Pass Filter - 150KHz cutoff 31-Dec-07 31-Dec-08 CIS008588 Fischer FCC-RFM2F-520R LISN AC Adaptor - Std 120V outlet 15-Mar-08 15-Mar-09 2-Feb-07 COM000590 Agilent E4448A Spectrum Analyzer 2-Feb-05 5-Mar-09 COM000601 Agilent E4417A **EPM-P Series Power Meter** 5-Mar-08 6-Mar-09 COM000602 E9327A Agilent Peak and Average Power Sensor 6-Mar-08

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#### Appendix C: Test Equipment/Software Used to perform the test

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