

Radio Test Report: EDCS - 1206159

CP-DX650

Next Generation Video Endpoint

5470-5725 MHz

Against the following Specifications: CFR47 Part 15.407 RSS210

Cisco Systems

EMC Laboratory 170 West Tasman Drive San Jose, CA 95134

> Author: Phillip Carranco Approved By: Dilip Patel Title: Regulatory Compliance Manager

This report replaces any previously entered test report under EDCS - 1206159

Page No: 1 of 87



This test report has been electronically authorized and archived using the CISCO Engineering Document Control system.

SECTION 1: OVERVIEW	3
1.1 Test Summary	3
SECTION 2: ASSESSMENT INFORMATION	4
2.1 GENERAL 2.6 EUT DESCRIPTION	
SECTION 3: RESULT SUMMARY	7
SECTION 4: SAMPLE DETAILS	8
APPENDIX A: EMISSION TEST RESULTS	9
Target Maximum Channel Power 99% and 26dB Bandwidth Peak Output Power Power Spectral Density Conducted Spurious Emissions Conducted Bandedge	10 16 16 19 21 24 31 41
APPENDIX B: EMISSION TEST RESULTS	50
RADIATED SPURIOUS EMISSIONS CO-LOCATOR RADIATED SPURIOUS EMISSIONS RADIATED EMISSIONS MAXIMUM PERMISSIBLE EXPOSURE (MPE) CALCULATIONS	
APPENDIX C: TEST EQUIPMENT USED TO PERFORM THE TEST	

Page No: 2 of 87

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.

Page No: 3 of 87

Section 2: Assessment Information

2.1 General

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

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

- a) The results contained in this report relate only to the items tested and were obtained in the period between the date of the initial assessment and the date of issue of the report. Manufactured products will not necessarily give identical results due to production and measurement tolerances.
- b) The apparatus was set up and exercised using the configuration and modes of operation defined in this report only.
- c) Where relevant, the apparatus was only assessed using the susceptibility criteria defined in this report and the Test Assessment Plan (TAP).
- d) All testing was performed under the following environmental conditions:

Temperature	15°C to 35°C (54°F to 95°F)
Atmospheric Pressure	860mbar to 1060mbar (25.4" to 31.3")
Humidity	10% to 75*%

*[Where applicable] For ESD testing the humidity limits used were 30% to 60% and for EFT/B tests the humidity limits used were 25% to 75%.

e) All AC testing was performed at one or more of the following supply voltages:

110V 60 Hz (+/-20%) 220V 50 Hz (+/-20%)

This report must not be reproduced except in full, without written approval of Cisco Systems.

Page No: 4 of 87



2.2 Start Date of Testing

15-Oct-2012

2.3 Report Issue Date

Cisco Systems, Inc. uses an electronic system to issue, store and control the revision of test reports. This system is called the Engineering Document Control System (EDCS). The actual report issue date is embedded into the original file on EDCS. Any copies of this report, either electronic or paper, that are not on EDCS must be considered uncontrolled

2.4 Testing facilities

This assessment was performed by:

Testing Laboratory

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

Registration Numbers for Industry Canada			
Cisco System Site	Site Identifier		
Building P, 10m Chamber	Company #: 4624-2		
Building P, 5m Chamber	Company #: 4624-1		
Building N, 5m Chamber	Company #: 6111		
Building I, 5m Chamber	Company #: 6112		

Registration Numbers for Industry Canada

Test Engineers

Phillip Carranco

2.5 Equipment Assessed (EUT)

CP-DX650

Page No: 5 of 87



The CP-DX650 is the next generation 1080p Video Endpoint with key expansion module support. This new generation of desktop phone incorporates an Android based operating system. Three USB ports, one micro OTG USB port, one higher powered USB-proprietary connector combination (AUX) and one standard USB Port. Support HDMI with a maximum external resolution of 1920 x 1200, also includes a single 3.5mm headset jack.

WiFi (802.11 A/B/G/N) & Bluetooth 3.0 capabilities.
Murata module, LBEH1ZNSXC-526, supports for 802.11/a/b/g/n + Bluetooth 3.0 module
SDIO interface to WLAN – Omap4 SD host controller port 5
PCM (McBSP1) interface to Bluetooth
WiFi + BT chip - Marvell 88W8787
Clocks – 38.4MHz 20ppm for main clock, 32.768KHz sleep clock
Supports 802.11i security standard
Coexistence between WiFi and BT with one antenna to both connected to the 2.4GHz radios
Single antenna for 2.4 and 5GHz bands with diplex inside the module
Up to 72Mbps (20 MHz channel)

2.7 Scope of Assessment

Tests have been performed in accordance with the relevant Test and Assessment Plan (TAP), a copy of which is contained in Appendix F of this report, and the relevant Cisco Systems, Inc. radio test procedures (EDCS-420238). This test report may not cover all of the tests highlighted in the test plan.

2.8 Units of Measurement

The units of measurements defined in the appendices are reported in specific terms, which are test dependent. Where radiated measurements are concerned these are defined at a particular distance. Basic voltage measurements are defined in units of [dBuV]

As an example, the basic calculation for all measurements is as follows:

Emission level [dBuV] = Indicated voltage level [dBuV] + Cable Loss [dB] + Other correction factors [dB]

The combinations of correction factors are dependent upon the exact test configurations [see test equipment lists for further details] and may include:-

Antenna Factors, Pre Amplifier Gain, LISN Loss, Pulse Limiter Loss and Filter Insertion Loss..

Note: to convert the results from dBuV/m to uV/m use the following formula:-

Level in uV/m = Common Antilogarithm [(X dBuV/m)/20] = Y uV/m

Page No: 6 of 87

Section 3: Result Summary

Conducted emissions

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

Radiated emissions

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

Page No: 7 of 87

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 Number	Equipment Details	Serial Number	Part Number
S01	CP-DX650-K9	FCH1627A5AU	73-15144-01

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

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

5150 – 5250MHz: 2.4 dBi 5250 – 5350MHz: 3.9 dBi 5500 – 5700MHz: 3.8 dBi 5745 – 5805MHz: 3.3 dBi

4.2 System Details

System # Description		Samples	
1	Radio Test Sample	S01	

4.3 Mode of Operation Details

Mode#	Description	Comments	
1	802.11AN Test Mode	System is placed in a continuous Tx State at various channels per Test Requirements. 802.11A running at 6Mbps , HT20 running at 6.5Mbps and HT40 running 13.5Mbps.	

Section 5: Modifications

5.1 Sample Modifications Performed During Assessment

No modifications were performed during assessment.

Page No: 8 of 87

Appendix A: Emission Test Results

Target Maximum Channel Power

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

..........

	Maximum Channel Power (dBm) Frequency (MHz)		
Operating Mode	5500	5580	5700
Non HT-20, 6 to 54 Mbps	16	16	16
HT-20, M0 to M23	16	16	16
	5510	5590	5670
HT-40, M0 to M23	16	16	16

Page No: 9 of 87

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	
Detector:	Peak
Trace:	Single

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

99% and 26dB Bandwidth for 802.11A

Frequency (MHz)	Data Rate (Mbps)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)
5500	6	17.042	20.279
5580	6	17.120	20.385
5700	6	17.108	20.309

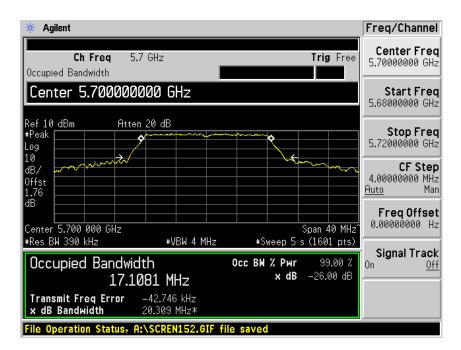
Graphical Test Results for 802.11a:

* Agilent	Freq/Channel
Ch Freq 5.5 GHz Trig Free Occupied Bandwidth	Center Freq 5.50000000 GHz
Center 5.500000000 GHz	Start Freq 5.48000000 GHz
Ref 10 dBm Atten 20 dB #Peak	Stop Freq 5.52000000 GHz
dB/	CF Step 4.00000000 MHz <u>Auto</u> Man
dB Span 40 MHz	FreqOffset 0.00000000 Hz
#Res BW 390 kHz #VBW 4 MHz #Sweep 5 s (1601 pts)	Signal Track
Occupied Bandwidth Occ BW % Pwr 99.00 % 17.0419 MHz × dB -26.00 dB	On <u>Off</u>
Transmit Freq Error-69.092 kHzx dB Bandwidth20.273 MHz*	
File Operation Status, A:\SCREN150.GIF file saved	
Page No: 10 of 87	

🔆 Agilent			Freq/Channel
Ch Freq 5.5 Occupied Bandwidth	8 GHz	Trig Free	Center Freq 5.58000000 GHz
Center 5.580000	000 GHz		Start Freq 5.56000000 GHz
#Peak	1 20 dB	**************************************	Stop Freq 5.60000000 GHz
10 dB/ 0ffst 1.74			CF Step 4.00000000 MHz <u>Auto</u> Man
dB Center 5.580 000 GHz		Span 40 MHz	FreqOffset 0.00000000 Hz
*Res BW 390 kHz Occupied Bandwid		#Sweep 5 s (1601 pts)	Signal Track On <u>Off</u>
17.12 Transmit Freq Error × dB Bandwidth	L 97 MHz -45.436 kHz 20.385 MHz*	× dB -26.00 dB	
File Operation Status, A	:\SCREN151.GIF fi	ile saved	

սիսիս

cisco

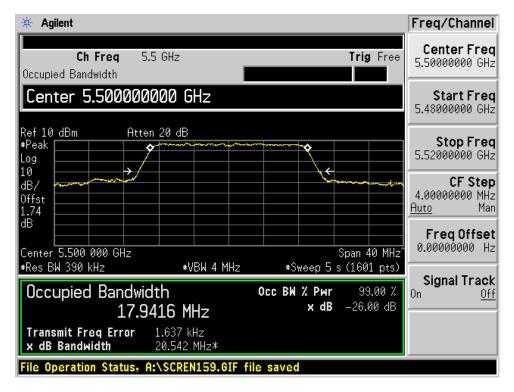


Page No: 11 of 87

Frequency (MHz)	Data Rate (Mbps)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)
5500	M0	17.942	20.542
5580	M0	17.982	20.491
5700	M0	17.969	20.52

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

Graphical Test Results for 802.11A (HT20):



Page No: 12 of 87

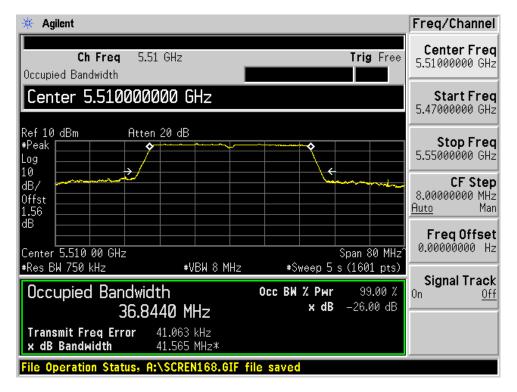
🔆 Agilent Freq/Channel Center Freq Trig Free Ch Freq 5.58 GHz 5.58000000 GHz Occupied Bandwidth Center 5.58000000 GHz Start Freq 5.56000000 GHz Ref 10 dBm Atten 20 dB Stop Freq #Peak 5.60000000 GHz Log 10 **CF** Step dB/ 4.00000000 MHz Offst Man Auto 74 ΉB Freq Offset 0.0000000 Hz Center 5.580 000 GHz Span 40 MHz #Res BW 390 kHz #Sweep 5 s (1601 pts) ₩VBW 4 MHz Signal Track Occupied Bandwidth Occ BW % Pwr 99.00 % 0n Off -26.00 dB x dB 17.9816 MHz Transmit Freq Error 6.291 kHz x dB Bandwidth 20.491 MHz* :\SCREN160.GIF file saved Operation 🔆 Agilent Freq/Channel Center Frea Ch Frea 5.7 GHz Trig Free 5.70000000 GHz Occupied Bandwidth Center 5.700000000 GHz Start Freq 5.68000000 GHz Ref 10 dBm #Peak Atten 20 dB Stop Freq 5.72000000 GHz Log 10 CF Step dB/ 4.00000000 MHz Auto Man Offst Auto 1.76 dB Freq Offset 0.00000000 Hz Center 5.700 000 GHz #Res BW 390 kHz Span 40 MHz #Sweep 5 s (1601 pts) ₩VBW 4 MHz Signal Track Occupied Bandwidth Occ BW % Pwr 99.00 % 0n <u>Off</u> x dB -26.00 dB 17.9694 MHz Transmit Freq Error -4.789 kHz x dB Bandwidth 20.520 MHz* Operation Status, A:\SCREN161.GIF file saved

Page No: 13 of 87

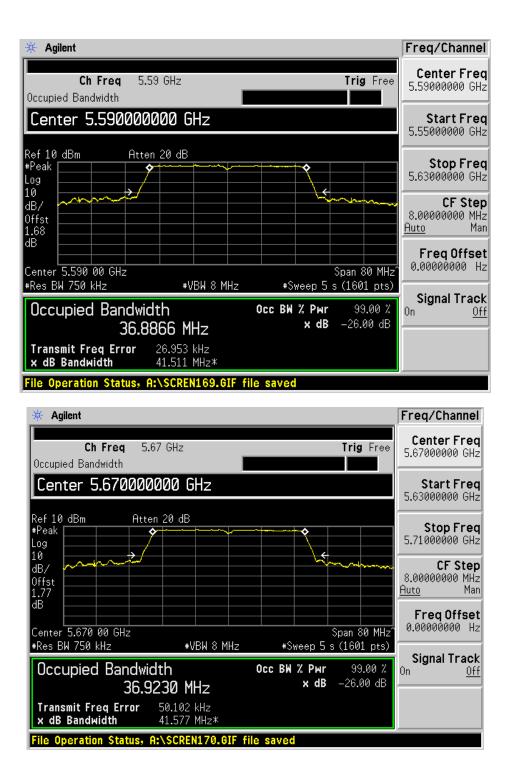
99% and 26dB Bandwidth for 802.11AN (HT40)

Frequency (MHz)	Data Rate (Mbps)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)
5510	MO	36.844	41.565
5590	MO	36.887	41.511
5670	MO	36.923	41.577

Graphical Test Results for 802.11A (HT40):



Page No: 14 of 87



Page No: 15 of 87

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 20.279MHz. The maximum conducted output power is calculated as 11dBm+10*log(20.279 MHz) = 24.07dBm. This is greater than 250mW.

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 is 3.8dBi.

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 Powe	r" 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:	=99% BW from 99% Bandwidth Data

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

Page No: 16 of 87

Peak Output Power for 11a:

Frequency (MHz)	Data Rate (Mbps)	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
5500	6	15.20	24	-8.80
5580	6	15.32	24	-8.68
5700	6	14.95	24	-9.05

Power Spectral Density for 11a:

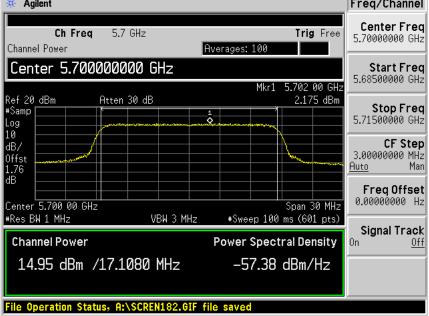
Frequency (MHz)	Data Rate (Mbps)	Peak Power Spectral Density (dBm/MHz)	Limit (dBm)	Margin (dB)
5500	6	2.603	11	-8.397
5580	6	2.854	11	-8.146
5700	6	2.175	11	-8.825

Graphical Test Results for 802.11a:

🔆 Agilent			Freq/Channel
Ch Freq 5.5 G Channel Power		Trig Free Averages: 100	Center Freq 5.50000000 GHz
Center 5.50000000		Mkr1 5.493 65 GHz	Start Freq 5.48500000 GHz
Ref 20 dBm Atten 3 #Samp 1 Log 2 10		2.603 dBm	Stop Freq 5.51500000 GHz
dB/ Offst			CF Step 3.00000000 MHz <u>Auto</u> Man
dB		Span 30 MHz	Freq Offset 0.00000000 Hz
*Res BW 1 MHz Channel Power	VBW 3 MHz	#Sweep 100 ms (601 pts) Power Spectral Density	Signal Track On <u>Off</u>
15.20 dBm /17.04	20 MHz	-57.11 dBm/Hz	
File Operation Status, A:\S	SCREN180.GIF	file saved	

Page No: 17 of 87

🔆 Agilent Freq/Channel Center Freq Ch Freq 5.58 GHz Trig Free 5.58000000 GHz Channel Power Averages: 100 Center 5.580000000 GHz Start Freq 5.56500000 GHz Mkr1 5.578 95 GHz 2.854 dBm Ref 20 dBm Atten 30 dB Stop Freq #Samp ò 5.59500000 GHz Log 10 **CF** Step dB, 3.00000000 MHz Offs Auto Man Freq Offset 0.00000000 Hz Center 5.580 00 GHz Span 30 MHz #Res BW 1 MHz VBW 3 MHz #Sweep 100 ms (601 pts) Signal Track **Channel Power Power Spectral Density** 0n <u>0ff</u> 15.32 dBm /17.1200 MHz -57.02 dBm/Hz File Operation Status, A:\SCREN181.GIF file save 🔆 Agilent Freq/Channel



Page No: 18 of 87

Peak Output Power for HT20:

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 20.491MHz. The maximum conducted output power is calculated as 11dBm+10*log(20.491MHz) = 24.12dBm. This is greater than 250mW.

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 is 3.8dBi.

Peak Output Power for 802.11an (HT20):

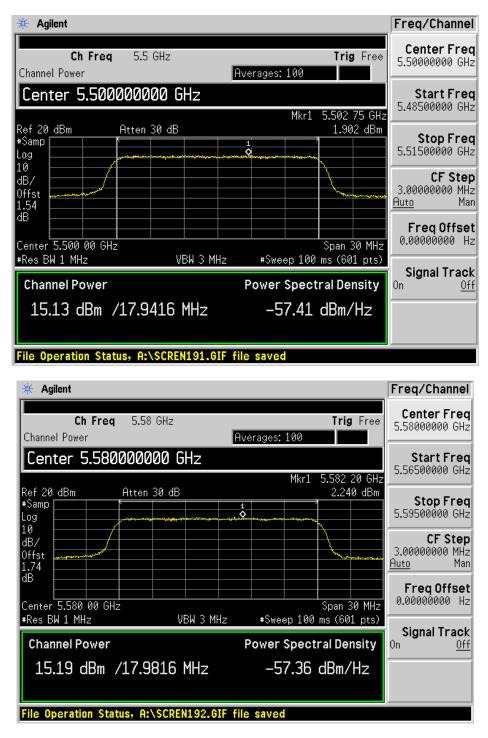
Frequency (MHz)	Data Rate (Mbps)	Peak Output Power (dBm)	• • •	Margin (dB)
5500	MO	15.13	24	-8.87
5580	MO	15.19	24	-8.81
5700	MO	14.81	24	-9.19

Power Spectral Density for 11a:

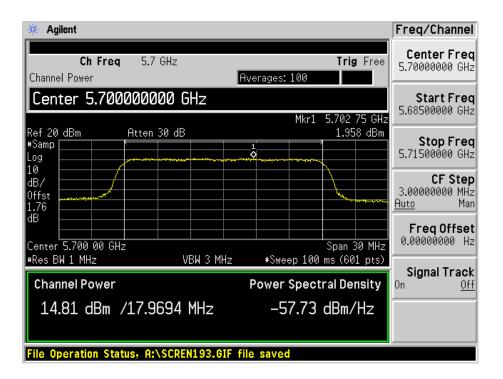
Frequency (MHz)	Data Rate (Mbps)	Peak Power Spectral Density (dBm/MHz)	Limit (dBm)	Margin (dB)
5500	MO	1.902	11	-9.098
5580	MO	2.24	11	-8.76
5700	MO	1.958	11	-9.042

cisco

Graphical Test Results for 802.11an (HT20):



Page No: 20 of 87



Peak Output Power for HT20:

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 41.511MHz. The maximum conducted output power is calculated as 11dBm+10*log(41.511MHz) = 27.18dBm. This is greater than 250mW.

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 is 3.8dBi.

Page No: 21 of 87

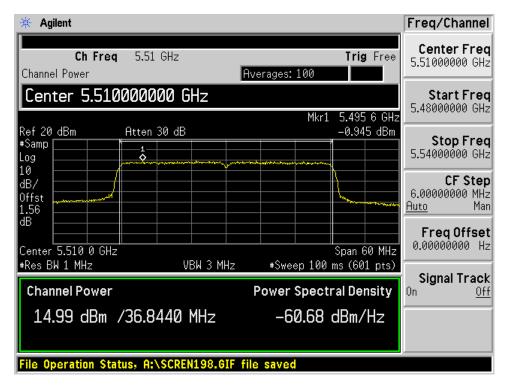
Frequency (MHz)	Data Rate (Mbps)	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
5510	MO	14.99	24	-9.01
5590	MO	15.07	24	-8.93
5670	MO	14.81	24	-9.19

Peak Output Power for 802.11an (HT40):

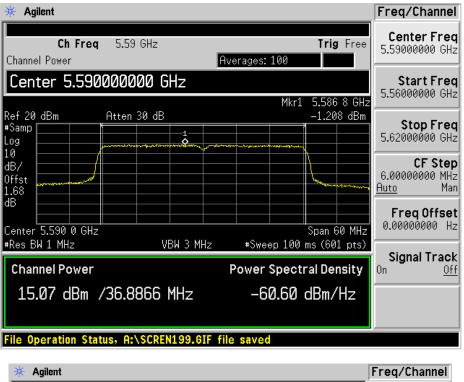
Power Spectral Density for 802.11an (HT40):

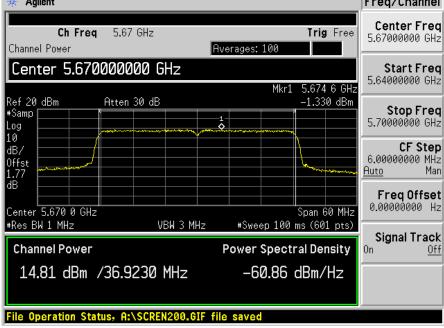
Frequency (MHz)	Data Rate (Mbps)	Peak Power Spectral Density (dBm/MHz)	Limit (dBm)	Margin (dB)
5510	M0	-0.945	11	-11.945
5590	M0	-1.208	11	-12.208
5670	MO	-1.33	11	-12.33

Graphical Test Results for 802.11an (HT40):



Page No: 22 of 87





Page No: 23 of 87

This document is uncontrolled. Please refer to the electronic copy within EDCS for the most up to date version. Cisco Systems, Inc. Company Confidential



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

Results for 802.11a:

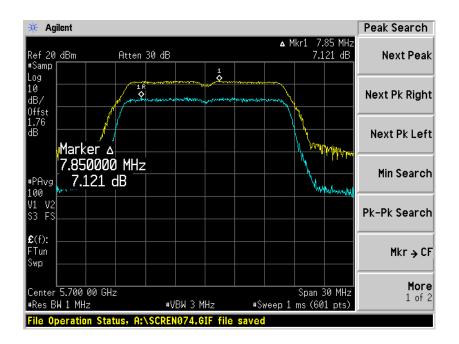
		Peak Excursion		Margin
(MHz)	(Mbps)	(dB)	(dBm)	(dB)
5500	6	7.376	13	-5.624
5580	6	7.31	13	5.69
5700	6	7.121	13	5.879

Peak Search 🔆 Agilent ▲ Mkr1 6.00 MHz Ref 20 dBm Atten 30 dB 7.376 dB Next Peak #Samp 1 Log 10 1R 🔷 Next Pk Right Offst 54 Next Pk Left ٩R Marker ∆ 6.000000 MHz Min Search #PAvg 100 7.376 dB V1 S3 V2 FS Pk-Pk Search £(f): FTun Mkr → CF Swp More Center 5.500 00 GHz Span 30 MHz 1 of 2 ŧRes BW 1 MHz ∗VBW 3 MHz #Sweep 1 ms (601 pts) A:\SCREN069.GIF File Operation Peak Search 🔆 Agilent ▲ Mkr1 3.30 MHz Atten 30 dB 7.310 dB Ref 20 dBm Next Peak #Samp Log 10 1 R Next Pk Right dB7 Offst .74 Next Pk Left Min Search d. de **#**PAvg Whenn 100 V1 V2 Pk-Pk Search ES **£**(f): Marker ∆ 3.300000 MHz-FTun Mkr→CF Swp 7.310 dB More Center 5.580 00 GHz Span 30 MHz 1 of 2 Sweep 1 ms (601 pts) #Res BW 1 MHz ₩VBW 3 MHz

Graphical Test Results for 802.11a:

Page No: 25 of 87

yright 2000–2008 Agilent Technologie



Peak Excursion for HT20:

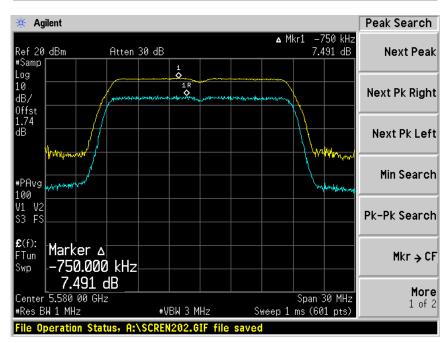
15.407: The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Frequency (MHz)	Data Rate (Mbps)	Peak Excursion (dB)	Limit (dBm)	Margin (dB)
5500	M0	7.387	13	-5.613
5580	M0	7.491	13	5.509
5700	M0	7.527	13	5.473

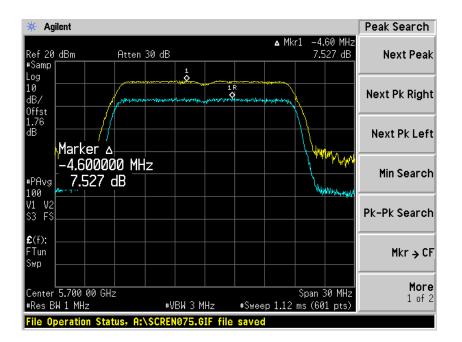
Page No: 26 of 87

🔆 Agilent Peak Search ▲ Mkr1 3.35 MHz 7.387 dB Atten 30 dB Ref 20 dBm Next Peak #Samp 1 .og 10 1 R 🔷 Next Pk Right łR.)ffst Next Pk Left Marker **5** 3.350000 MHz all they Min Search 7.387 dB #PAvg 100 V1 V2 S3 FS Pk-Pk Search £(f): FTun Mkr→CF Swp More Center 5.500 00 GHz Span 30 MHz 1 of 2 #VBW 3 MHz #Sweep 1 ms (601 pts) #Res BW 1 MHz Status, A:\SCREN068.GI

Graphical Test Results for 802.11an (HT20):



Page No: 27 of 87



Peak Excursion for HT40:

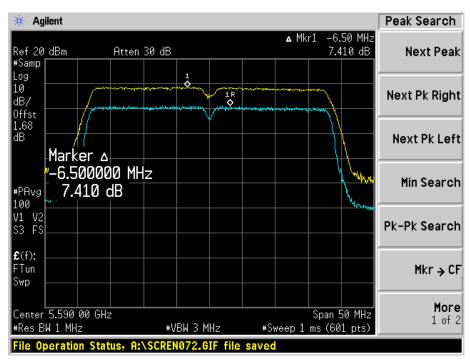
15.407: The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Frequency (MHz)		Peak Excursion (dB)	Limit (dBm)	Margin (dB)
5510	M0	7.369	13	-5.631
5590	M0	7.41	13	-5.59
5670	M0	7.338	13	-5.662

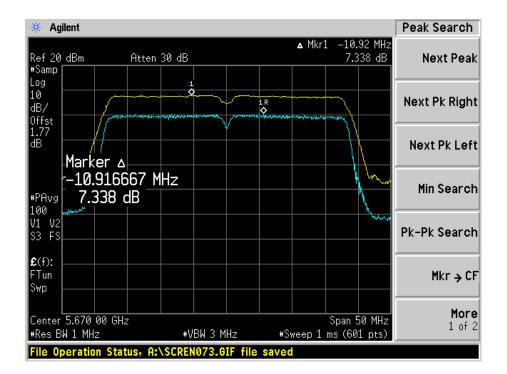
Page No: 28 of 87

Peak Search 🔆 Agilent ▲ Mkr1 9.50 MHz 7.369 dB Ref 20 dBm Atten 30 dB Next Peak #Samp Log 10 dB/ Offst 1.56 dB ¢ Next Pk Right 1R 🔷 Next Pk Left Marker 🛆 9.500000 MHz Min Search 7.369 dB #PAvg 100 V1 V2 S3 FS Pk-Pk Search **£**(f): FTun Mkr→CF Swp More Center 5.510 00 GHz Span 50 MHz 1 of 2 #Sweep 1 ms (601 pts) #Res BW 1 MHz #VBW 3 MHz File Operation Status, A:\SCREN065.GIF file save

Graphical Test Results for 802.11an (HT40):



Page No: 29 of 87



սիսիս

cisco

Page No: 30 of 87

Conducted Spurious Emissions

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

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

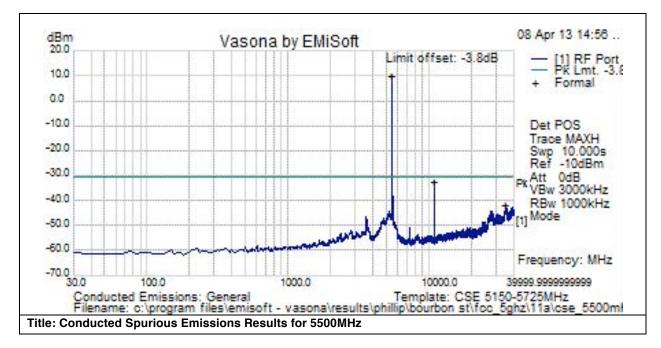
Span:	30 MHz-40 GHz
Reference Level:	20 dBm
Attenuation:	10 dB
Sweep Time:	10 s
Resolution Bandwidth:	1 MHz
Video Bandwidth:	3 MHz
Detector:	Peak
Trace:	Single
Marker:	Peak

Record the marker waveform peak to spur difference

Page No: 31 of 87

802.11A Graphical Test Results at 5500MHz:

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



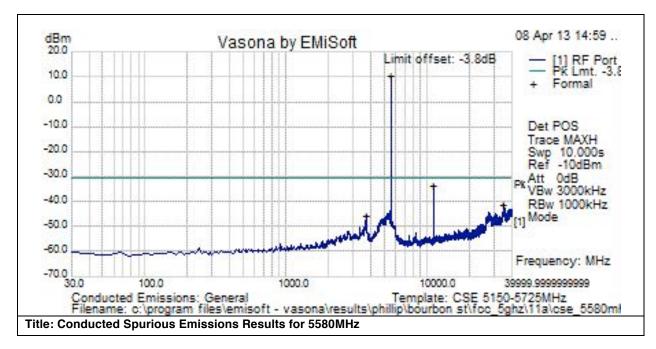
Test Results Table

Frequency MHz	Raw dBm	Cable Loss	Factors dB	Level dBm	Measurement Type	Line	Limit dBm	Margin dB	Pass /Fail	Comments
5492.88	-12	22.1	0	10.1	Pk	RF	-30.8	40.9	Fail	Tx Signal
11000.685	-53.2	20.9	0	-32.2	Pk	RF	-30.8	-1.4	Pass	
35234.5	-64.5	22.8	0	-41.7	Pk	RF	-30.8	-10.9	Pass	

Page No: 32 of 87

802.11A Graphical Test Results at 5580MHz:

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



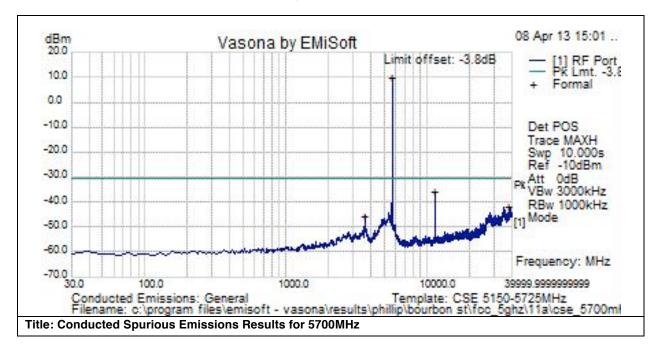
Test Results Table

Frequency MHz	Raw dBm	Cable Loss	Factor s dB	Level dBm	Measurement Type	Line	Limit dBm	Margin dB	Pass /Fail	Comments
5573.745	-11.8	22.1	0	10.3	Pk	RF	-30.8	41.1	Fail	Tx Signal
11153.43	-54.5	20.9	0	-33.6	Pk	RF	-30.8	-2.8	Pass	
35234.5	-64	22.8	0	-41.2	Pk	RF	-30.8	-10.4	Pass	
3713.983	-67.1	21.5	0	-45.6	Pk	RF	-30.8	-14.8	Pass	

Page No: 33 of 87

802.11A Graphical Test Results at 5700MHz:

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



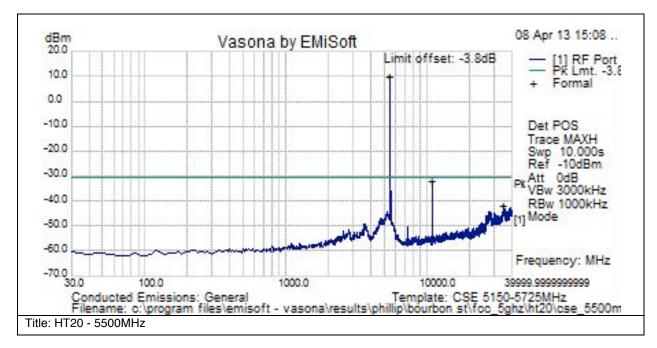
Test Results Table

Frequency MHz	Raw dBm	Cable Loss	Factor s dB	Level dBm	Measurement Type	Line	Limit dBm	Margin dB	Pass /Fail	Comments
5699.535	-12.4	22.3	0	9.9	Pk	RF	-30.8	40.7	Fail	Tx Signal
11405.01	-56.8	21	0	-35.8	Pk	RF	-30.8	-5	Pass	
38535.25	-64.8	22.8	0	-42	Pk	RF	-30.8	-11.2	Pass	
3659.94	-67.2	21.5	0	-45.7	Pk	RF	-30.8	-14.9	Pass	

Page No: 34 of 87

Graphical Test Results for 802.11an (HT-20) 5500MHz:

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



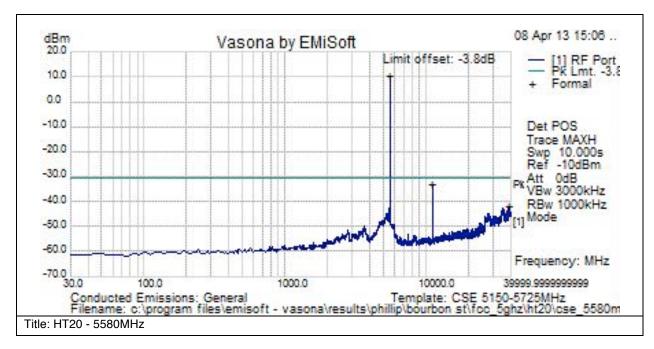
Test Results Table

Frequency MHz	Raw dBm	Cable Loss	Factors dB	Level dBm	Measurement Type	Line	Limit dBm	Margin dB	Pass /Fail	Comments
5501.865	-12.1	22.1	0	10	Pk	RF	-30.8	40.8	Fail	Tx Signal
11009.67	-52.8	20.9	0	-31.9	Pk	RF	-30.8	-1.1	Pass	
35200.75	-64.5	22.8	0	-41.7	Pk	RF	-30.8	-10.9	Pass	

Page No: 35 of 87

Graphical Test Results for 802.11an (HT-20) 5580MHz:

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



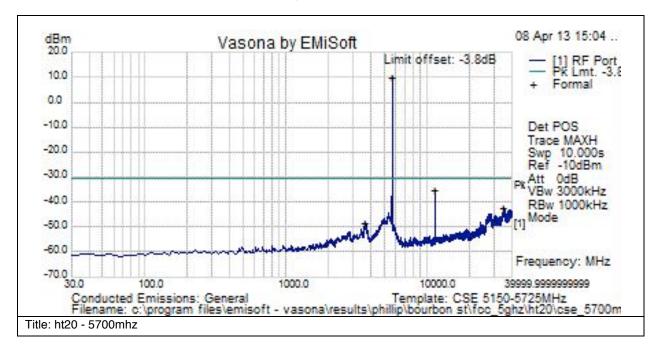
Test Results Table

Frequency MHz	Raw dBm	Cable Loss	Factors dB	Level dBm	Measurement Type	Line	Limit dBm	Margin dB	Pass /Fail	Comments
5573.745	-11.9	22.1	0	10.3	Pk	RF	-30.8	41.1	Fail	Tx Signal
11162.415	-54	20.9	0	-33.1	Pk	RF	-30.8	-2.3	Pass	
39048.25	-64.9	22.8	0	-42.1	Pk	RF	-30.8	-11.3	Pass	

Page No: 36 of 87

Graphical Test Results for 802.11an (HT-20) 5700MHz:

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



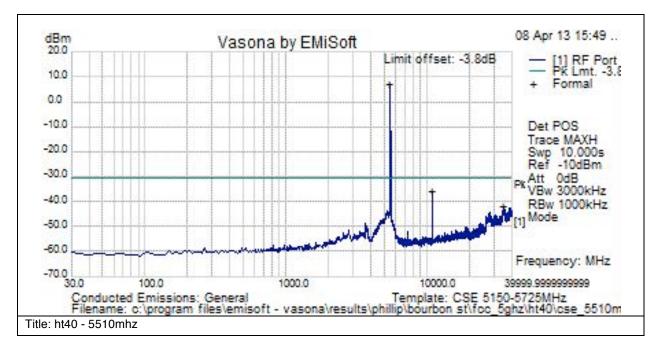
Test Results Table

Frequency MHz	Raw dBm	Cable Loss	Factors dB	Level dBm	Measurement Type	Line	Limit dBm	Margin dB	Pass /Fail	Comments
5699.535	-12.3	22.3	0	10	Pk	RF	-30.8	40.8	Fail	Tx Signal
11396.025	-56.1	21	0	-35.1	Pk	RF	-30.8	-4.3	Pass	
35200.75	-65	22.8	0	-42.2	Pk	RF	-30.8	-11.4	Pass	
3668.925	-69.8	21.5	0	-48.3	Pk	RF	-30.8	-17.5	Pass	

Page No: 37 of 87

Graphical Test Results for 802.11an (HT-40) 5510MHz:

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



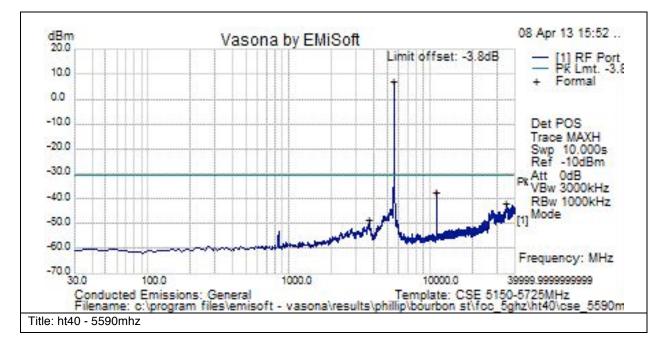
Test Results Table

Frequency MHz	Raw dBm	Cable Loss	Factors dB	Level dBm	Measurement Type	Line	Limit dBm	Margin dB	Pass /Fail	Comments
5501.865	-15.1	22.1	0	7	Pk	RF	-30.8	37.7	Fail	Tx Signal
11018.655	-56.8	20.9	0	-35.9	Pk	RF	-30.8	-5.1	Pass	
35214.25	-64.7	22.8	0	-41.9	Pk	RF	-30.8	-11.1	Pass	

Page No: 38 of 87

Graphical Test Results for 802.11an (HT-40) 5590MHz:

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



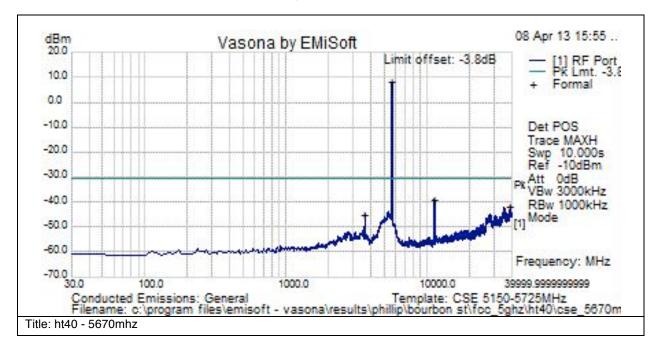
Test Results Table

Frequency MHz	Raw dBm	Cable Loss	Factors dB	Level dBm	Measurement Type	Line	Limit dBm	Margin dB	Pass /Fail	Comments
5591.715	-15	22.2	0	7.2	Pk	RF	-30.8	38	Fail	Tx Signal
11180.385	-58.3	20.9	0	-37.4	Pk	RF	-30.8	-6.6	Pass	
35241.25	-64.7	22.8	0	-41.9	Pk	RF	-30.8	-11.1	Pass	
3758.775	-70.2	21.5	0	-48.7	Pk	RF	-30.8	-17.9	Pass	

Page No: 39 of 87

Graphical Test Results for 802.11an (HT-40) 5670MHz:

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



Test	Results	Table	

Frequency MHz	Raw dBm	Cable Loss	Factors dB	Level dBm	Measurement Type	Line	Limit dBm	Margin dB	Pass /Fail	Comments
5663.595	-14.2	22.3	0	8.1	Pk	RF	-30.8	38.9	Fail	Tx Signal
11342.115	-59.8	21	0	-38.8	Pk	RF	-30.8	-8	Pass	
39257.5	-64.7	22.9	0	-41.8	Pk	RF	-30.8	-11	Pass	
3624	-66.5	21.6	0	-45	Pk	RF	-30.8	-14.2	Pass	

Page No: 40 of 87

Conducted Bandedge

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 sall 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

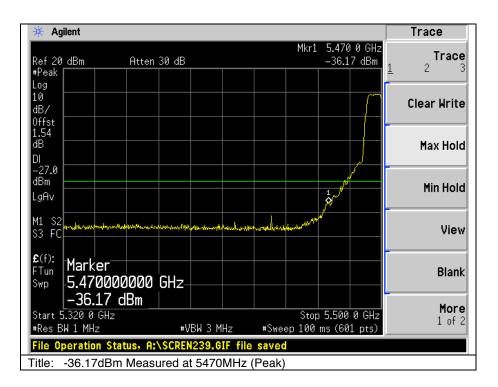
Record the marker waveform peak to spur difference

802.11an (HT-40) Marker-Delta Test Results:

Frequency Tested	Radiated Pk Measurement	Radiated Ave Measurement	Conducted Delta	Limit (dBm)	Margin (dBm)
			Measurement		
5700 (Hortz)	108.55	101.7	-40.08	-74	-33.92
5700 (Vert)	108.42	101.53	-40.08	-54	-13.92

Page No: 41 of 87

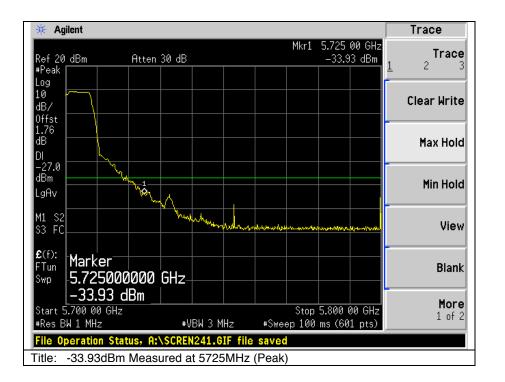
Graphical Test Results for 802.11A:



սիսիս

cisco

Page No: 42 of 87







Radiated Graphical Test Results for 802.11A – HT20 Mode (Peak):

Page No: 43 of 87