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MEASUREMENT REPORT
FCC PART 15.247 / IC RSS-210 WLAN 802.11a/b/g/n

Applicant Name:
Panasonic Corporation of North America
One Panasonic Way, 4B-8
Secaucus, NJ 07094
United States

Date of Testing:
June 21-July 12, 2010
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
0Y1006151047.ACJ

FCC ID:	**ACJ9TGCF-S91**
IC CERTIFICATION NO.:	**216A-CFS91**
APPLICANT:	**Panasonic Corporation of North America**

Application Type:	Certification
Model(s):	CF-S9
IC Model(s):	CF-S91
EUT Type:	Toughbook Model: CF-S9
Max. RF Output Power:	41.495 mW (16.18 dBm) Peak Conducted (b)
	264.102 mW (24.22 dBm) Peak Aggregate Conducted (g)
	143.259 mW (21.56 dBm) Peak Aggregate Conducted (a)
	255.867 mW (24.08 dBm) Peak Aggregate Conducted (n) - 2.4GHz
	161.55 mW (22.08 dBm) Peak Aggregate Conducted (n) - 5.8GHz
Frequency Range:	2412 - 2462 MHz (DSSS/OFDM), 5745 – 5825 MHz (OFDM)
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part 15.247
Test Device Serial No.:	0DKSA00513

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C-63.4-2003. Test results reported herein relate only to the item(s) tested. Conducted data contained in this report from 2009 is applicable for the module installed in this device.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Grant Conditions: Listed output power is conducted.

PCTEST certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.

Randy Ortanez
President

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TABLE OF CONTENTS

FCC PART 15.247 MEASUREMENT REPORT 3

1.0 INTRODUCTION 4

1.1 SCOPE 4

1.2 PCTEST TEST LOCATION 4

2.0 PRODUCT INFORMATION 5

2.1 EQUIPMENT DESCRIPTION 5

2.2 EMI SUPPRESSION DEVICE(S)/MODIFICATIONS 5

2.3 LABELING REQUIREMENTS 5

3.0 DESCRIPTION OF TEST 6

3.1 EVALUATION PROCEDURE 6

3.2 CONDUCTED EMISSIONS 6

3.3 RADIATED EMISSIONS 7

4.0 ANTENNA REQUIREMENTS 8

5.0 TEST EQUIPMENT CALIBRATION DATA 9

6.0 TEST RESULTS 10

6.1 SUMMARY 10

6.2 6DB BANDWIDTH MEASUREMENT – 802.11A/B/G/N 11

6.3 OUTPUT POWER MEASUREMENT – 802.11B/G 18

6.4 OUTPUT POWER MEASUREMENT – 802.11A (5.8GHZ) 21

6.5 OUTPUT POWER MEASUREMENT – 802.11N (2.4GHZ) 23

6.6 OUTPUT POWER MEASUREMENT – 802.11N (5.8GHZ) 25

6.7 POWER SPECTRAL DENSITY (802.11A/B/G/N) 27

6.8 OUT OF BAND EMISSIONS AT THE BAND EDGE 39

6.9 OUT OF BAND EMISSIONS 49

6.10 RADIATED SPURIOUS EMISSION MEASUREMENTS 63

6.11 RADIATED RESTRICTED BAND EDGE MEASUREMENTS 76

6.12 LINE-CONDUCTED TEST DATA 80

7.0 CONCLUSION 88

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MEASUREMENT REPORT
FCC Part 15.247

§ 2.1033 General Information

APPLICANT:	Panasonic Corporation of North America
APPLICANT ADDRESS:	One Panasonic Way, 4B-8
	Secaucus, NJ 07094, United States
TEST SITE:	PCTEST ENGINEERING LABORATORY, INC.
TEST SITE ADDRESS:	6660-B Dobbin Road, Columbia, MD 21045 USA
FCC RULE PART(S):	Part 15.247
IC SPECIFICATION(S):	RSS-210 Issue 7
MODEL NAME:	CF-S9
FCC ID:	ACJ9TGCF-S91
Test Device Serial No.:	0DKSA00513 ☐ Production ☒ Pre-Production ☐ Engineering
FCC CLASSIFICATION:	Digital Transmission System (DTS)
DATE(S) OF TEST:	June 21-July 12, 2010
TEST REPORT S/N:	0Y1006151047.ACJ

Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21045, U.S.A.

- PCTEST facility is an FCC registered (PCTEST Reg. No. 90864) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (2451A-1).
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).

- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (2451A-1) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2 PCTEST Test Location

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity are, the Baltimore-Washington Internt'l (BWI) airport, the city of Baltimore and the Washington, DC area. (*see Figure 1-1*).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49'38" W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2003 on January 28, 2009.

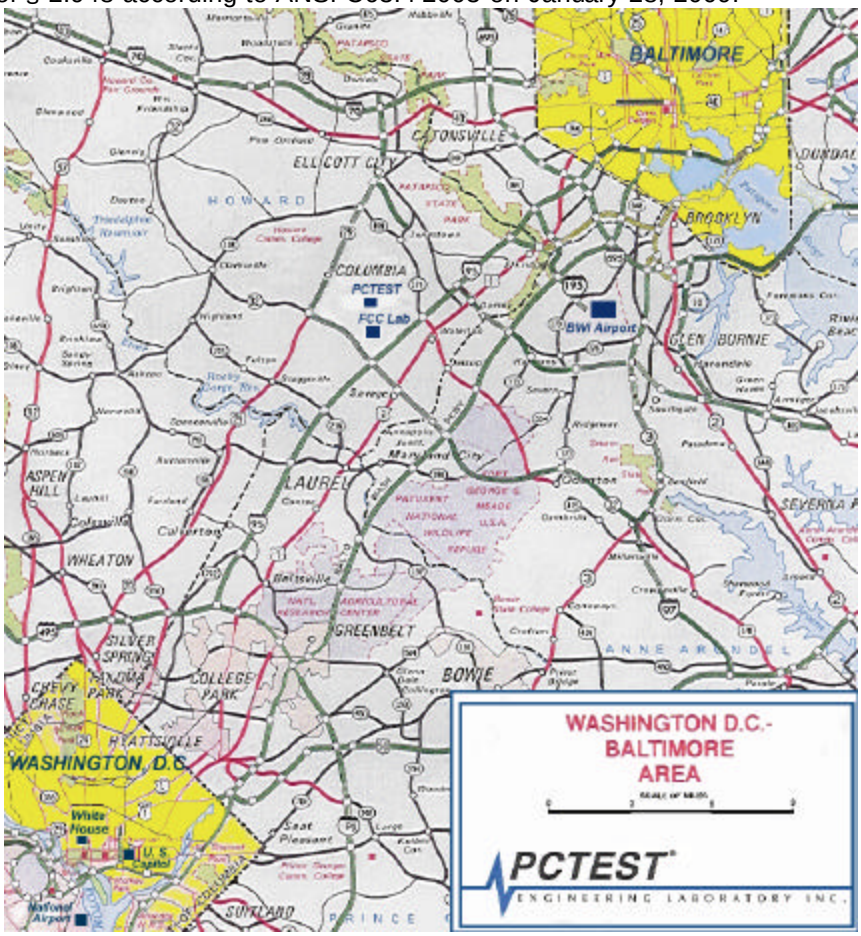

Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Panasonic Toughbook Model: CF-S9 FCC ID: ACJ9TGCF-S91**. The EUT consisted of the following component(s):

Manufacturer / Base Model	FCC ID	Description
Panasonic / Model: CF-S9	ACJ9TGCF-S91	Toughbook Model: CF-S9
Intel / Model: 622ANHMW	PD9622ANH, PD9622BGH	WLAN Module
Alps / Model: UGNZ4	N/A	Bluetooth Module
Sierra Wireless / Model: GOBI2000	N7NGOBI2	GSM/EDGE/WCDMA/CDMA Module

Table 2-1. EUT Equipment Description

Note: The testing in this report covers one additional model of the 622ANHMW. The additional model is the 622BGHMW (802.11b/g) which has both 11n and 11a function disabled by EEPROM setting. There are no electrical differences between the modules.

2.2 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.3 Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the trade name and FCC ID must be displayed on the device per Section 15.19(b)(2).

Please see attachment for FCC ID label and label location.

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3.0 DESCRIPTION OF TEST

3.1 Evaluation Procedure

The measurement procedure described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-2003) and FCC procedure dated March 23, 2005 entitled "Measurements of Digital Transmission Systems Operating Under Section 15.247" were used in the measurement of **Panasonic Toughbook Model: CF-S9 FCC ID: ACJ9TGCF-S91.**

Deviation from measurement procedure……None

3.2 Conducted Emissions

Figure 3-1. Shielded Enclosure Line-Conducted Test Facility

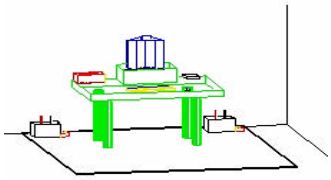

Figure 3-2. Line Conducted Emission Test Set-Up

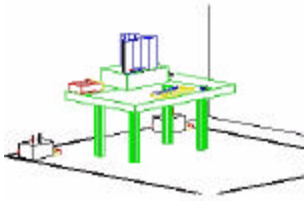

Figure 3-3. Wooden Table & Bonded LISNs

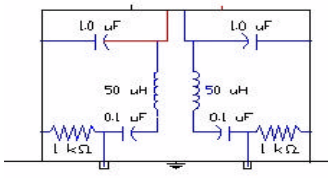

Figure 3-4. LISN Schematic Diagram

The line-conducted facility is located inside a 16'x20'x10' shielded enclosure, manufactured by Ray Proof Series 81 (*see Figure 3-1*). The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 1.5m away from the sidewall of the shielded room (*see Figure 3-2*). Solar Electronics and EMCO Model 3725/2 (10kHz-30MHz) 50Ω/50µH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room (*see Figure 3-3).* The EUT is powered from the Solar LISN and the support equipment is powered from the EMCO LISN. Power to the LISNs are filtered by a high-current high-insertion loss Ray Proof power line filter (100dB 14Hz-10GHz). The purpose of the filter is to attenuate ambient signal interference and this filter is also bonded to the shielded enclosure. All electrical cables are shielded by braided tinned copper zipper tubing with an inner diameter of ½". If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the Solar LISN. The LISN schematic diagram is shown (*see Figure 3-4*). All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion). Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT.

The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to CISPR quasi-peak and average mode. The bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission. Each emission was maximized by: switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/or support equipment, and powering the monitor from the floor mounted outlet box and the computer aux AC outlet, if applicable; whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in the test setup photographs. Each EME reported was calibrated using the Agilent E8257D (250kHz – 20GHz) PSG Signal Generator.

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3.3 Radiated Emissions

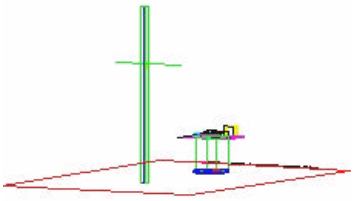

Figure 3-5. 3-Meter Test Site

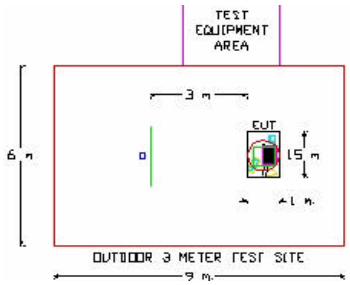

Figure 3-6. Dimensions of Outdoor Test Site

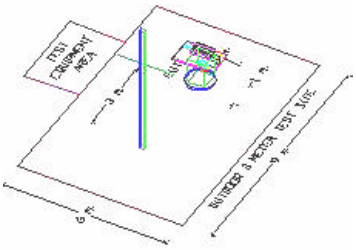

Figure 3-7. Turntable and System Setup

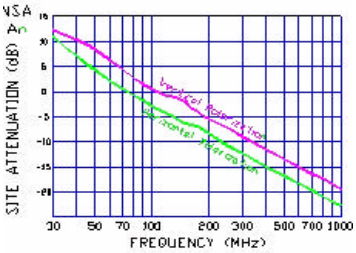

Figure 3-8. Normalized Site Attenuation Curves (H&V)

Preliminary measurements were made indoors at 1-meter using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, and turntable azimuth with respect to the antenna was noted for each frequency found. The spectrum was scanned from 30 to 200 MHz using a bi-conical antenna and from 200 to 1000 MHz using a log-spiral antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used.

Final measurements were made outdoors at 3-meter test range using Roberts™ Dipole antennas or horn antennas (*see Figure 3-5*). The test equipment was placed on a wooden and plastic bench situated on a 1.5m x 2m area adjacent to the measurement area (*see Figure 3-6*). Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The detector function was set to CISPR quasi-peak mode and the bandwidth of the spectrum analyzer was set to 100kHz for frequencies below 1GHz or 1MHz for frequencies above 1GHz. Above 1GHz the detector function was set to average mode (RBW = 1MHz, VBW = 10Hz).

The half-wave dipole antenna was tuned to the frequency found during preliminary radiated measurements. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8-meter high non-metallic 1 x 1.5 meter table (*see Figure 3-7*). The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each EME emission. The turntable containing the system was rotated and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by: varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/or support equipment, and powering the monitor from the floor mounted outlet box and the computer aux AC outlet, if applicable; and changing the polarity of the antenna, whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in test setup photographs. Each EME reported was calibrated using the Agilent E8257D (250kHz – 20GHz) PSG Signal Generator. The Theoretical Normalized Site Attenuation Curves for both horizontal and vertical polarization are shown in Figure 3-8.

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4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:
"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

- The antennas of the Toughbook Model: CF-S9 are **permanently attached.**

Conclusion:

The **Panasonic Toughbook Model: CF-S9 FCC ID: ACJ9TGCF-S91** unit complies with the requirement of §15.203.

Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
1	a 2412	7	a/n 2442
2	a 2417	8	a/n 2447
3	a/n 2422	9	a/n 2452
4	a/n 2427	10	a 2457
5	a/n 2432	11	a 2462
6	a/n 2437		

Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
149	a 5745	159	a/n 5795
151	a/n 5755	161	a 5805
153	a 5765	163	a 5815
155	a 5775	165	a 5825
157	a 5785		

Table 4-1. Frequency/ Channel Operations

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5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	No.165	(30MHz - 1000MHz) RG58 Coax Cable	N/A		N/A	N/A
-	No.166	(1000-26500MHz) Microwave RF Cable	N/A		N/A	N/A
-	No.167	(100kHz - 100MHz) RG58 Coax Cable	N/A		N/A	N/A
Agilent	11713A	Attenuation/Switch Driver	12/2/2009	Annual	12/2/2010	3439A02645
Agilent	8447D	Broadband Amplifier	3/18/2010	Annual	3/18/2011	1937A03348
Agilent	8447D	Broadband Amplifier	3/18/2010	Annual	3/18/2011	2443A01900
Agilent	8449B	(1-26.5GHz) Pre-Amplifier	12/2/2009	Annual	12/2/2010	3008A00985
Agilent	85650A	Quasi-Peak Adapter	12/2/2009	Annual	12/2/2010	3303A01872
Agilent	85650A	Quasi-Peak Adapter	3/30/2010	Annual	3/30/2011	2043A00301
Agilent	8566B	(100Hz-22GHz) Spectrum Analyzer	3/30/2010	Annual	3/30/2011	2618A02866
Agilent	8566B	(100Hz-22GHz) Spectrum Analyzer	3/30/2010	Annual	3/30/2011	2542A11898
Agilent	8566B	(100Hz-22GHz) Spectrum Analyzer	12/2/2009	Annual	12/2/2010	3638A08713
Agilent	E4407B	ESA Spectrum Analyzer	3/30/2010	Annual	3/30/2011	US39210313
Agilent	E4448A	PSA (3Hz-50GHz) Spectrum Analyzer	10/1/2009	Annual	10/1/2010	US42510244
Agilent	E8257D	(250kHz-20GHz) Signal Generator	3/30/2010	Annual	3/30/2011	MY45470194
Agilent	N9020A	MXA Signal Analyzer	10/22/2009	Annual	10/22/2010	US46470561
Emco	3115	Horn Antenna (1-18GHz)	10/14/2009	Biennial	10/14/2011	9704-5182
Emco	3115	Horn Antenna (1-18GHz)	4/8/2010	Biennial	4/8/2012	9205-3874
Emco	3116	Horn Antenna (18 - 40GHz)	9/9/2008	Triennial	9/9/2011	9203-2178
Emco	3816/2	LISN	9/8/2008	Biennial	9/8/2010	9707-1077
Emco	3816/2	LISN	9/8/2008	Biennial	9/8/2010	9707-1079
Gigatronics	80701A	(0.05-18GHz) Power Sensor	9/9/2009	Annual	9/9/2010	1833460
Gigatronics	8651A	Universal Power Meter	9/9/2009	Annual	9/9/2010	8650319
MiniCircuits	VHF-3100+	High Pass Filter	N/A		N/A	30721
Sunol	DRH-118	Horn Antenna (1 - 18GHz)	5/14/2009	Biennial	5/14/2011	A050307
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	7/17/2009	Biennial	7/17/2011	A051107
Rohde & Schwarz	FSQ 26	Spectrum Analyzer	9/19/2009	Annual	9/19/2010	200452
Anritsu	ML2495A	Power Meter	10/12/2009	Annual	10/12/2010	941001

Table 5-1. Annual Test Equipment Calibration Schedule

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6.0 TEST RESULTS

6.1 Summary

Company Name: Panasonic Corporation of North America

FCC ID: ACJ9TGCF-S91

FCC Classification: Digital Transmission System (DTS)

Data Rate(s) Tested: 1Mbps, 2Mbps, 5.5Mbps, 11Mbps (b)

6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps (a/g)

13.5/15Mbps, 27/30Mbps, 40/45Mbps, 54/60Mbps, 81/90Mbps, 108/120Mbps, 121.5/135Mbps, 135/150Mbps (n)

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
TRANSMITTER MODE (TX)						
15.247(a)(2)	RSS-210 [A8.2]	6dB Bandwidth	> 500kHz	CONDUCTED	PASS	Section 6.2
15.247(b)(3)	RSS-210 [A8.4]	Transmitter Output Power	< 1 Watt		PASS	Sections 6.3, 6.4, 6.5, 6.6
15.247(e)	RSS-210 [A8.2]	Transmitter Power Spectral Density	< 8dBm / 3kHz Band		PASS	Section 6.7
15.247(d)	RSS-210 [A8.5]	Band Edge / Out-of-Band Emissions (*)	Conducted < 20dBc		PASS	Sections 6.8, 6.9
15.205 15.209	RSS-210 [A8.5]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209	RADIATED	PASS	Sections 6.10, 6.11
15.207	RSS-Gen [7.2.2]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits	LINE CONDUCTED	PASS	Section 6.12
RECEIVER MODE (RX) / DIGITAL EMISSIONS						
15.107	RSS-Gen [7.2.2]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.107 limits	LINE CONDUCTED	PASS	Part 15B Test Report
15.109	RSS-Gen [7.2.3.2]	General Field Strength Limits (Restricted Bands and Radiated Emissions Limits)	< FCC 15.109 limits	RADIATED (30MHz-1GHz) (1-25 GHz)	PASS	Part 15B Test Report

Table 6-1. Summary of Test Results

Notes:

The conducted plots shown in this test report shows test dates prior to the date listed on this test report. The conducted plots remain applicable to the device evaluated for this test report.

Out of band conducted spurious emissions plots are shown for 802.11g for the 2.4GHz operation for both Chains A and B as the conducted power in this mode is higher than the conducted power in the b and n modes therefore representing the worst case. The conducted spurious emissions of 802.11a mode were also investigated as the worst case since the powers for Chain A and B are higher than in the 5.8GHz n mode.

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6.2 6dB Bandwidth Measurement – 802.11a/b/g/n

§15.247(a)(2); RSS-210 [A8.2]

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies. ***The minimum permissible 6dB bandwidth is 500 kHz.***

Frequency [MHz]	Channel No.	802.11 Mode	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
2412	1	b	10.36	0.500	Pass
2437	6	b	10.32	0.500	Pass
2462	11	b	10.36	0.500	Pass
2412	1	g	16.32	0.500	Pass
2437	6	g	15.96	0.500	Pass
2462	11	g	16.28	0.500	Pass
5745	149	a	34.96	0.500	Pass
5785	157	a	34.96	0.500	Pass
5825	165	a	34.96	0.500	Pass
2422	3	n	16.16	0.500	Pass
2437	6	n	16.44	0.500	Pass
2452	9	n	16.28	0.500	Pass
5755	151	n	33.08	0.500	Pass
5795	159	n	34.08	0.500	Pass

Table 6-2. Conducted Bandwidth Measurements – Chain A

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Frequency [MHz]	Channel No.	802.11 Mode	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
2412	1	b	12.10	0.500	Pass
2437	6	b	12.10	0.500	Pass
2462	11	b	12.10	0.500	Pass
2412	1	g	15.14	0.500	Pass
2437	6	g	15.14	0.500	Pass
2462	11	g	15.12	0.500	Pass
5745	149	a	16.36	0.500	Pass
5785	157	a	16.32	0.500	Pass
5825	165	a	16.32	0.500	Pass
2422	3	n	32.61	0.500	Pass
2437	6	n	32.60	0.500	Pass
2452	9	n	32.62	0.500	Pass
5755	151	n	32.60	0.500	Pass
5795	159	n	32.61	0.500	Pass

Table 6-3. Conducted Bandwidth Measurements – Chain B

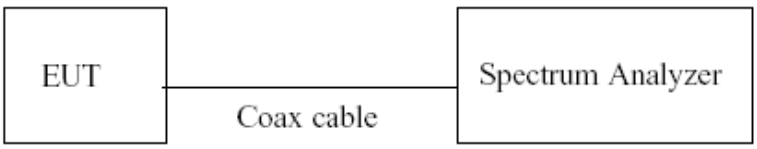

Figure 6-1. Test Instrument & Measurement Setup

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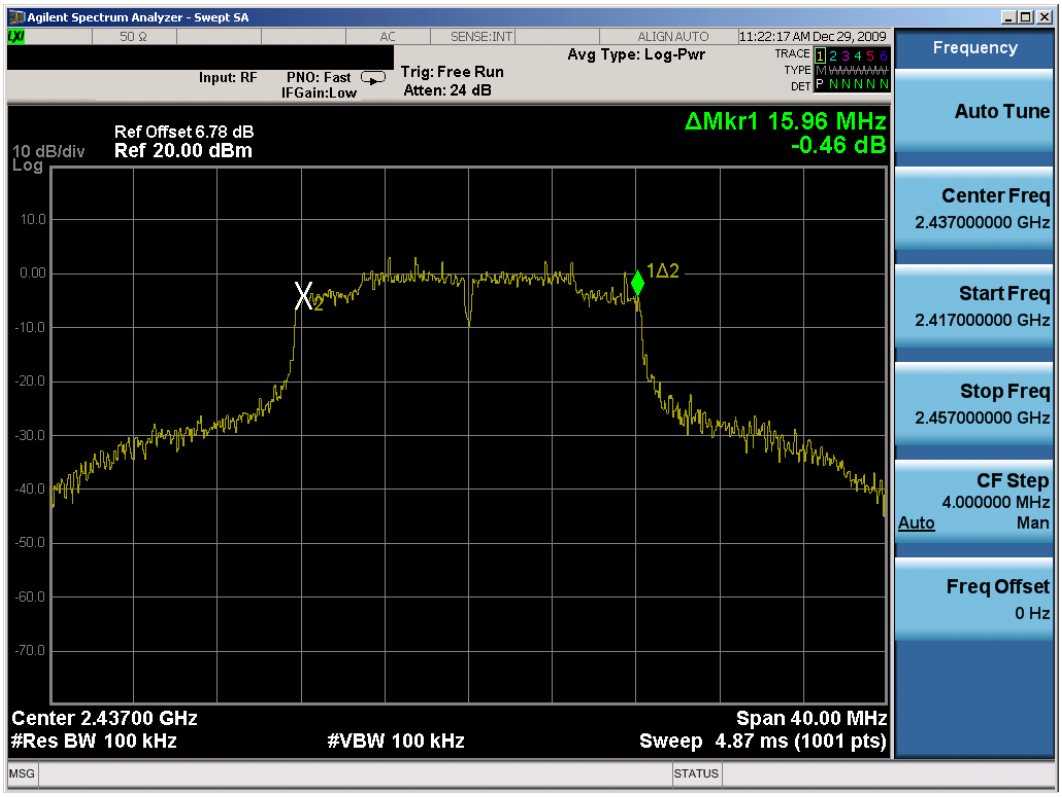
Plot 6-1. 6dB Bandwidth Plot (802.11b – Ch. 6) – Chain A



Plot 6-2. 6dB Bandwidth Plot (802.11g – Ch. 6) – Chain A

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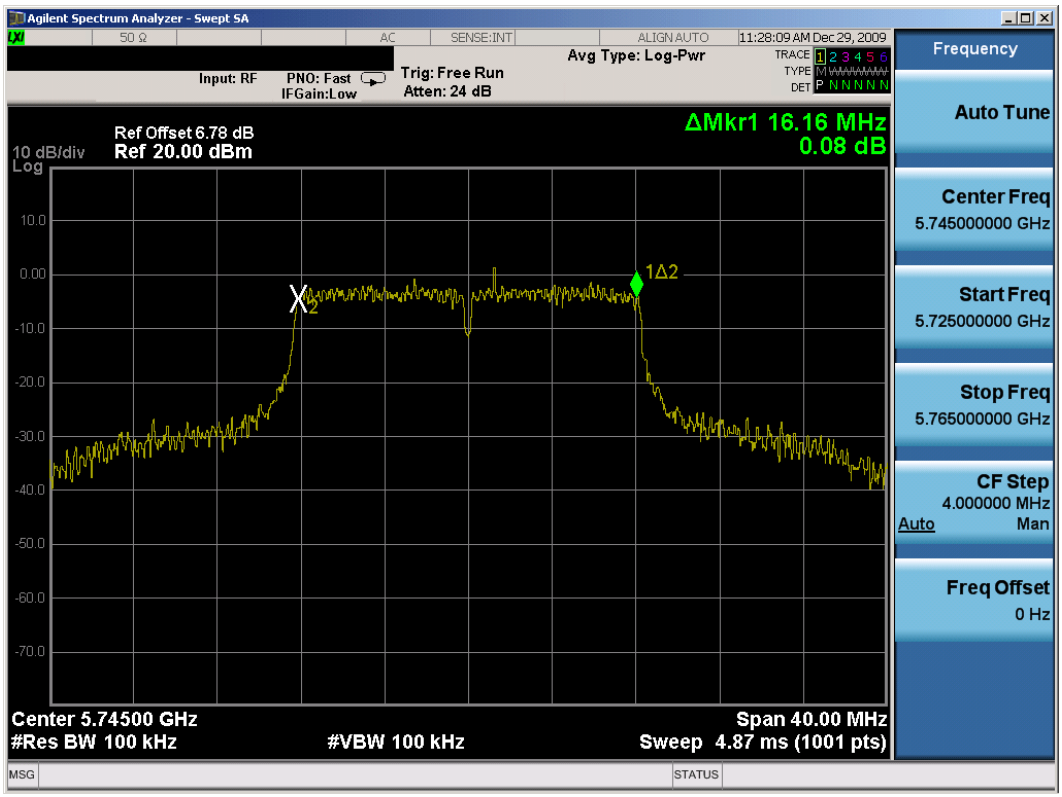
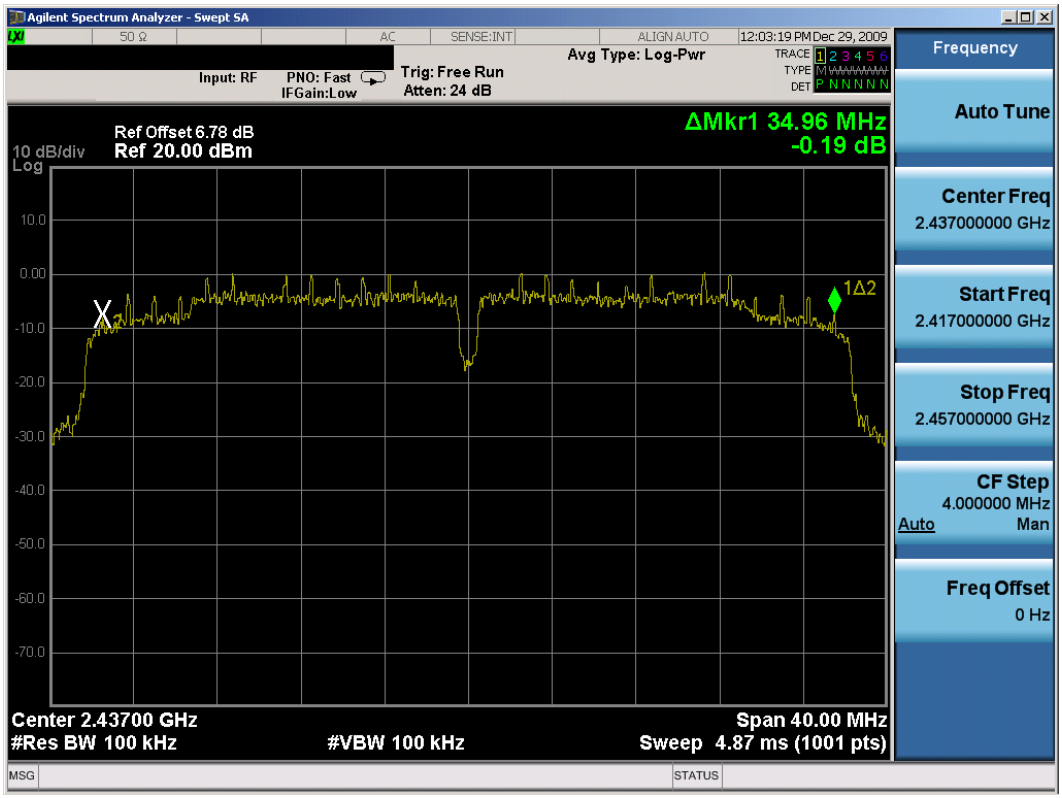


Plot 6-3. 6dB Bandwidth Plot (802.11a – Ch. 149) – Chain A



Plot 6-4. 6dB Bandwidth Plot (802.11n (2.4GHz) – Ch. 6) – Chain A

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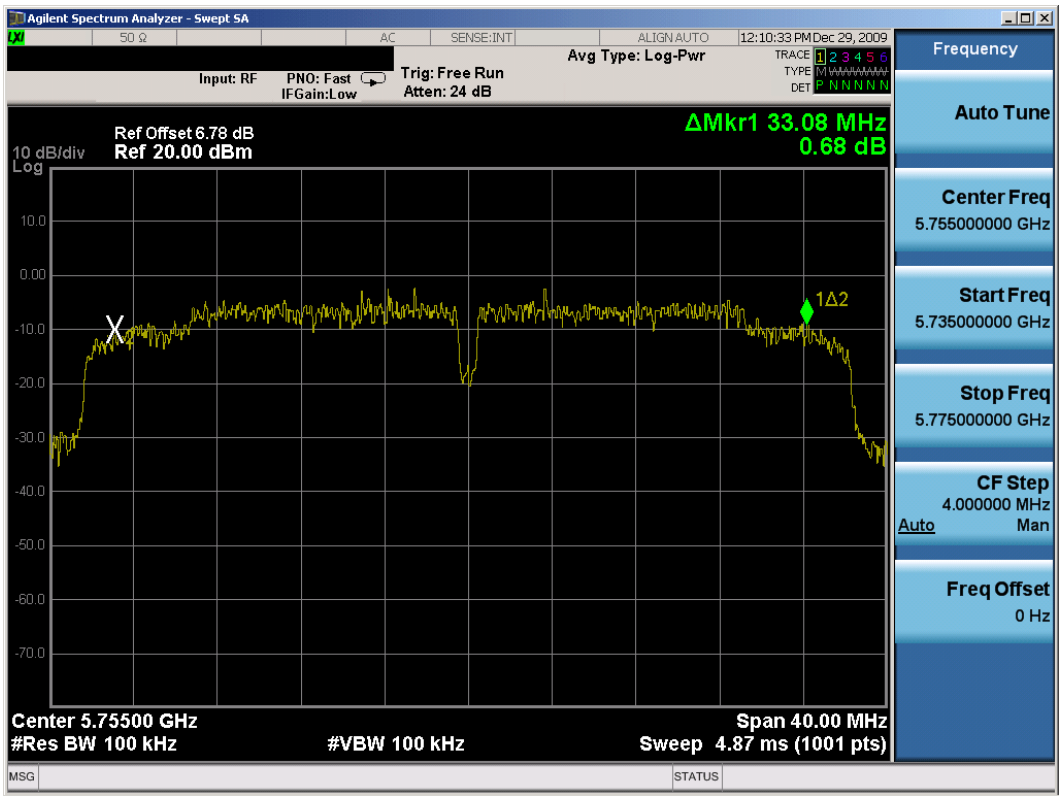
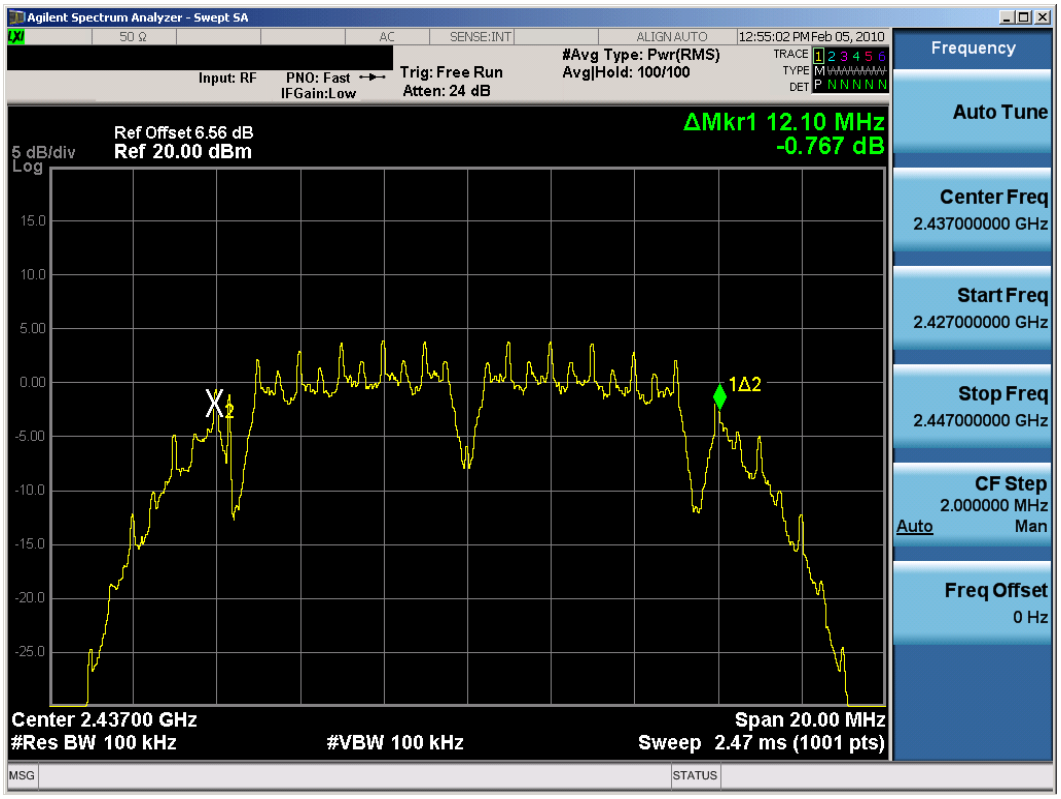


Plot 6-5. 6dB Bandwidth Plot (802.11n (5.8GHz) – Ch. 151) – Chain A



Plot 6-6. 6dB Bandwidth Plot (802.11b – Ch. 6) – Chain B

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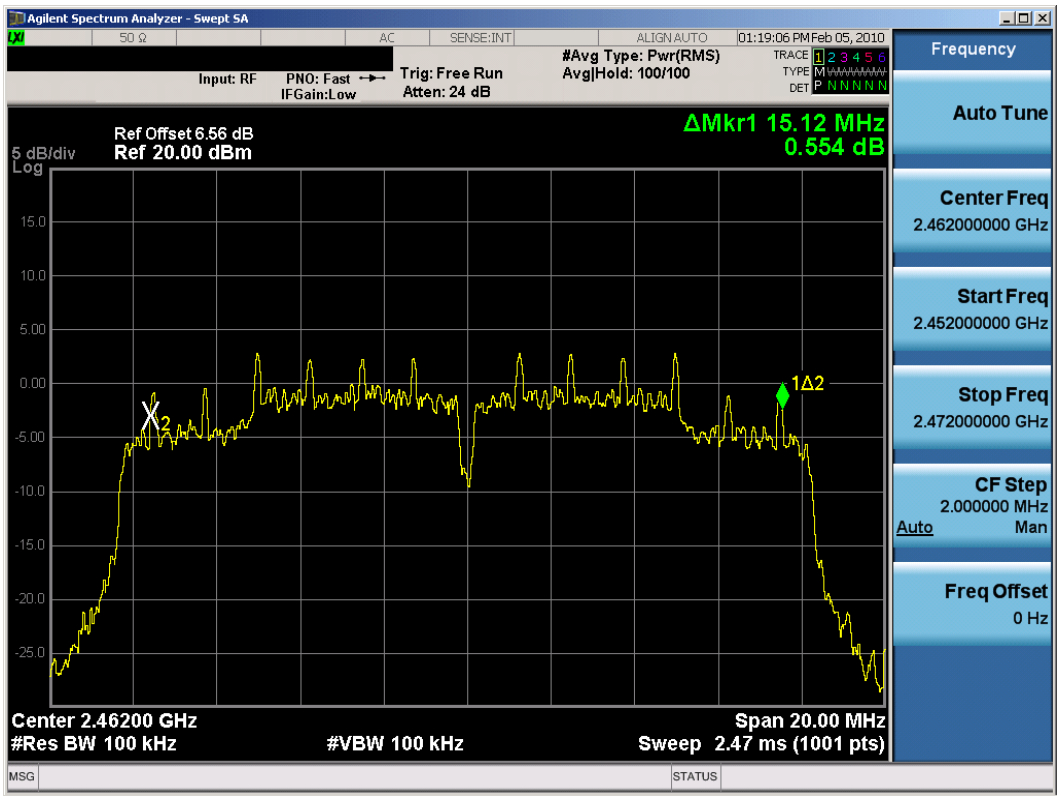
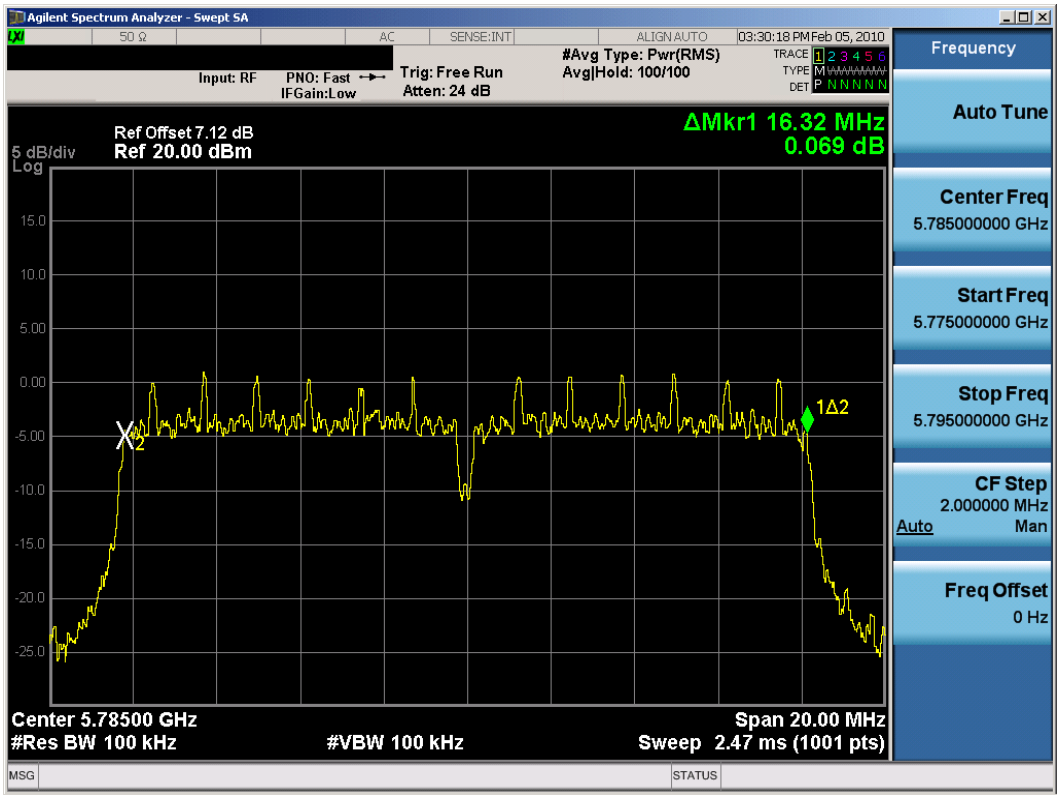


Plot 6-7. 6dB Bandwidth Plot (802.11g – Ch. 11) – Chain B



Plot 6-8. 6dB Bandwidth Plot (802.11a – Ch. 157) – Chain B

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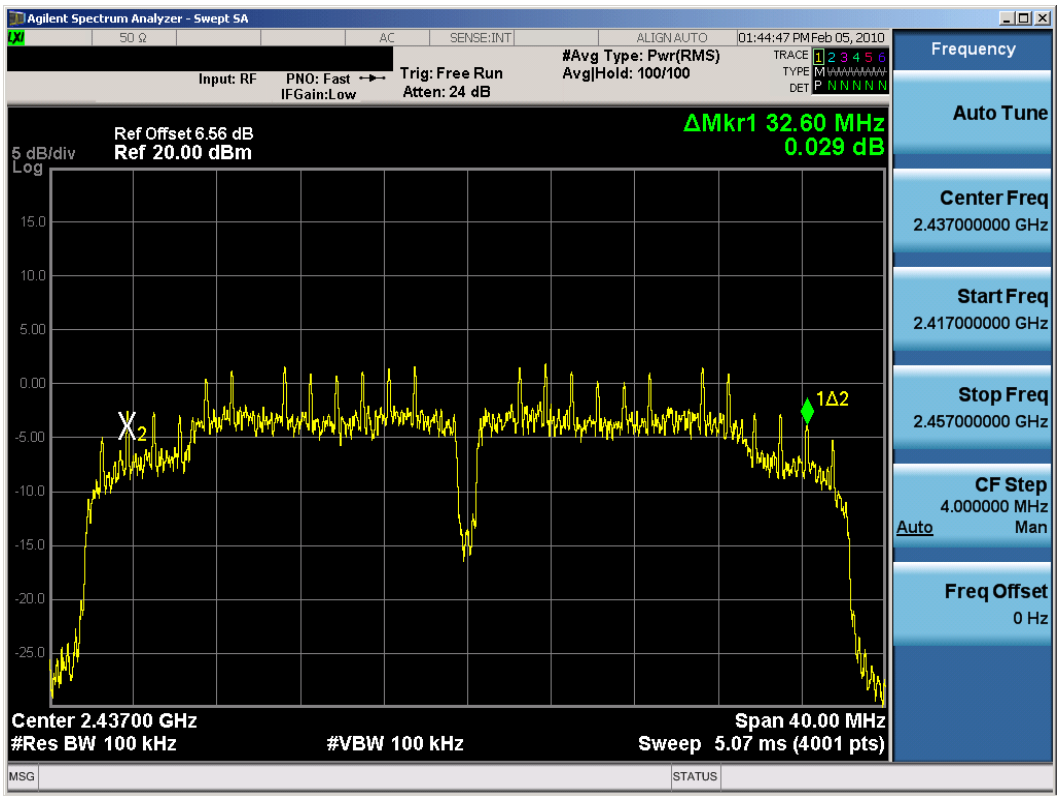
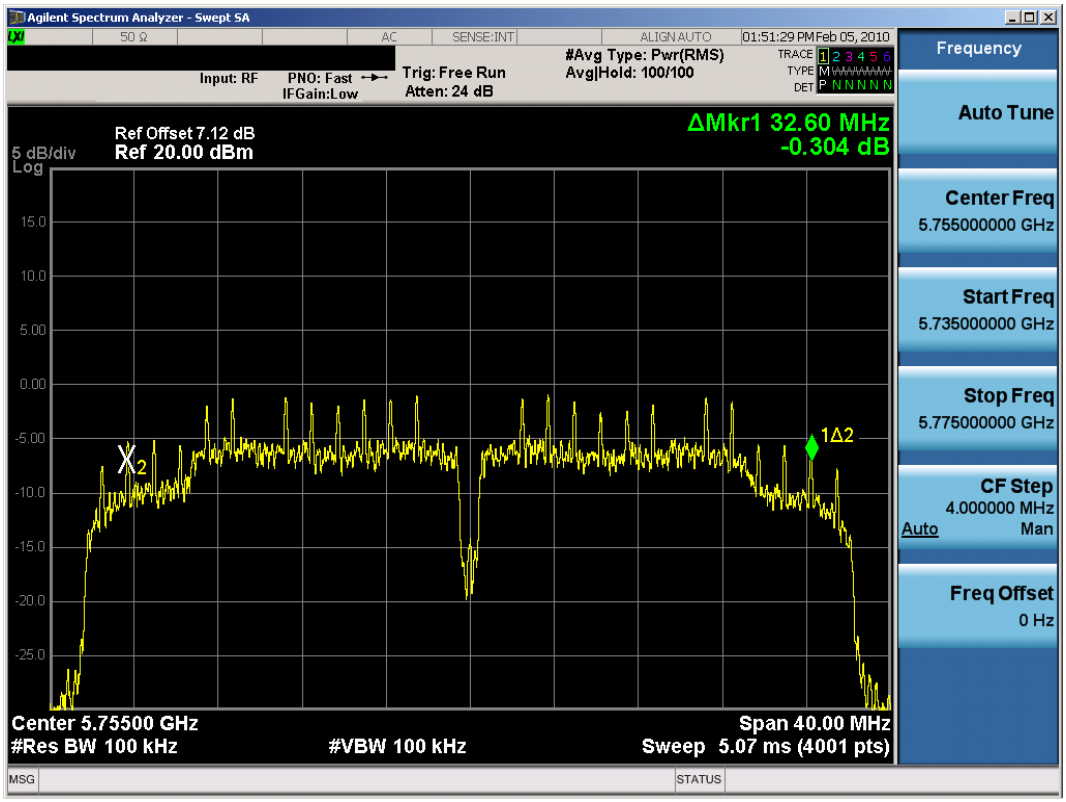


Plot 6-9. 6dB Bandwidth Plot (802.11n (2.4GHz) – Ch. 6) – Chain B



Plot 6-10. 6dB Bandwidth Plot (802.11n (5.8GHz) – Ch. 151) – Chain B

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6.3 Output Power Measurement – 802.11b/g

§15.247(b)(3); RSS-210 [A8.4]

A transmitter antenna terminal of EUT is connected to the input of a RF power sensor. Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies. ***The maximum permissible conducted output power is 1 Watt.***

Chain A

Freq [MHz]	Channel	Data Rate [Mbps]	Main Ant Measured Avg Power [dBm]	Main Ant Measured Peak Power [dBm]
2412	1	1	13.44	16.01
		2	13.48	15.98
		5.5	13.44	16.03
		11	13.45	16.11
2437	6	1	13.51	16.10
		2	13.57	16.07
		5.5	13.61	16.08
		11	13.51	16.18
2462	11	1	13.30	16.00
		2	13.39	15.97
		5.5	13.44	16.01
		11	13.42	16.05

Table 6-4. 802.11b Conducted Output Power Measurements

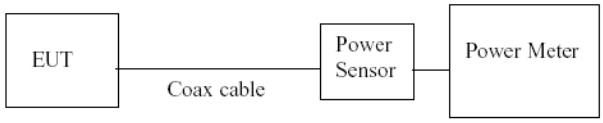

Figure 6-2. Test Instrument & Measurement Setup

Freq [MHz]	Channel	Data Rate [Mbps]	20MHz BW Measured Average Power [dBm]	20MHz BW Measured Peak Power [dBm]
2412	1	6	12.61	21.41
		9	12.59	21.39
		12	12.60	21.40
		18	12.61	21.38
		24	12.57	21.45
		36	12.44	21.33
		48	12.55	21.38
		54	11.19	19.95
2437	6	6	14.20	21.77
		9	14.39	21.66
		12	14.47	21.67
		18	14.15	21.70
		24	14.25	21.80
		36	13.13	20.75
		48	13.19	21.02
		54	11.23	18.65
2462	11	6	14.41	21.26
		9	14.08	20.85
		12	14.45	21.26
		18	13.08	19.95
		24	14.35	21.20
		36	14.33	21.05
		48	12.72	19.50
		54	10.42	18.38

Table 6-5. 802.11g Conducted Output Power Measurements

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Chain B

Freq [MHz]	Channel	Data Rate [Mbps]	Main Ant Measured Power [dBm]	Main Ant Measured Peak Power [dBm]
2412	1	1	13.54	16.18
		2	13.00	15.75
		5.5	13.50	16.17
		11	13.05	15.68
2437	6	1	13.54	15.88
		2	13.52	15.89
		5.5	13.55	15.87
		11	13.25	15.62
2462	11	1	12.84	15.78
		2	13.25	15.92
		5.5	13.23	15.85
		11	13.10	15.74

Table 6-6. 802.11b Conducted Output Power Measurements

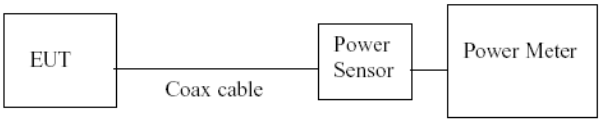

Figure 6-3. Test Instrument & Measurement Setup

Freq [MHz]	Channel	Data Rate [Mbps]	20MHz BW Measured Average Power [dBm]	20MHz BW Measured Peak Power [dBm]
2412	1	6	11.91	20.89
		9	11.78	20.80
		12	11.77	20.68
		18	11.78	20.64
		24	11.68	20.56
		36	11.00	20.11
		48	11.54	20.16
		54	10.30	18.56
2437	6	6	14.22	21.60
		9	14.16	21.43
		12	14.03	21.23
		18	14.01	21.20
		24	13.84	20.90
		36	13.80	20.76
		48	12.50	19.95
		54	10.70	18.82
2462	11	6	12.56	21.22
		9	12.50	20.86
		12	12.45	20.74
		18	12.44	20.76
		24	12.28	20.65
		36	12.20	20.59
		48	12.22	20.57
		54	11.15	19.46

Table 6-7. 802.11g Conducted Output Power Measurements

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Chain AB – 2.4GHz 802.11g (20MHz Bandwidth)

Freq [MHz]	Channel	MCS Index	Data Rate [Mbps]	Chain A Average Power [dBm]	Chain A Peak Power [dBm]	Chain B Average Power [dBm]	Chain B Peak Power [dBm]	20MHz BW Average Aggregate Power [dBm]	20MHz BW Peak Aggregate Power [dBm]
2412	1	HT8	13/14.4	12.43	20.18	13.07	20.49	15.77	23.35
		HT9	26/28.9	12.51	20.23	13.02	20.63	15.78	23.44
		HT10	39/43.3	12.52	20.15	13.06	20.40	15.81	23.29
		HT11	52/57.8	12.49	20.25	13.09	20.54	15.81	23.41
		HT12	78/86.7	12.38	20.43	13.01	20.39	15.72	23.42
		HT13	104/115.6	12.46	20.42	13.12	21.26	15.81	23.87
		HT14	117/130	12.47	20.37	13.18	20.27	15.85	23.33
		HT15	130/144.4	11.41	18.83	11.74	18.86	14.59	21.86
2437	6	HT8	13/14.4	12.76	20.32	13.85	21.03	16.35	23.70
		HT9	26/28.9	13.11	20.87	13.98	21.31	16.58	24.11
		HT10	39/43.3	12.85	20.34	14.03	20.99	16.49	23.69
		HT11	52/57.8	12.82	20.09	14.43	21.32	16.71	23.76
		HT12	78/86.7	12.86	20.64	14.30	21.28	16.65	23.98
		HT13	104/115.6	12.92	21.06	13.58	21.35	16.27	**24.22**
		HT14	117/130	12.42	20.21	13.23	20.32	15.85	23.28
		HT15	130/144.4	11.61	19.01	12.23	19.29	14.94	22.16
2462	11	HT8	13/14.4	12.74	20.40	13.33	20.69	16.06	23.56
		HT9	26/28.9	12.78	20.55	13.55	20.93	16.19	23.75
		HT10	39/43.3	12.75	20.47	13.25	20.52	16.02	23.51
		HT11	52/57.8	12.71	20.92	13.40	20.73	16.08	23.84
		HT12	78/86.7	12.79	20.38	13.64	20.85	16.25	23.63
		HT13	104/115.6	12.76	20.52	13.47	21.49	16.14	24.04
		HT14	117/130	12.68	20.48	13.42	20.43	16.08	23.47
		HT15	130/144.4	11.63	19.11	12.08	19.23	14.87	22.18

Table 6-8. 802.11g (20MHz Bandwidth) Conducted Output Power Measurements

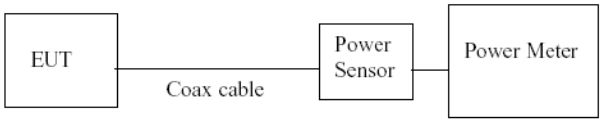

Figure 6-4. Test Instrument & Measurement Setup

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6.4 Output Power Measurement – 802.11a (5.8GHz)

§15.247(b)(3); RSS-210 [A8.4]

A transmitter antenna terminal of EUT is connected to the input of a RF power sensor. Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies. ***The maximum permissible conducted output power is 1 Watt.***

Chain A

Freq [MHz]	Channel	Data Rate [Mbps]	20MHz BW Measured Average Power [dBm]	20MHz BW Measured Peak Power [dBm]
5745	149	6	14.12	20.66
		9	14.01	20.60
		12	14.00	20.58
		18	14.04	20.54
		24	13.85	20.33
		36	13.82	20.29
		48	12.98	20.04
		54	10.81	18.11
5785	157	6	14.08	20.61
		9	14.35	20.60
		12	13.89	20.59
		18	13.92	20.57
		24	13.74	20.35
		36	13.70	20.33
		48	13.17	19.82
		54	11.43	17.03
5825	165	6	13.99	20.57
		9	13.88	20.54
		12	13.98	20.58
		18	14.19	20.59
		24	14.04	20.60
		36	14.02	20.53
		48	13.55	20.14
		54	11.05	17.54

Table 6-9. 802.11a (5.8GHz) Conducted Output Power Measurements

Chain B

Freq [MHz]	Channel	Data Rate [Mbps]	20MHz BW Measured Power [dBm]	20MHz BW Measured Peak Power [dBm]
5745	149	6	11.82	18.80
		9	12.04	19.10
		12	12.00	18.21
		18	12.03	18.30
		24	11.84	17.95
		36	11.76	17.92
		48	10.85	17.05
		54	8.50	15.01
5785	157	6	12.31	18.92
		9	12.35	18.81
		12	12.10	18.34
		18	12.20	18.55
		24	12.03	18.35
		36	11.95	18.29
		48	11.10	17.58
		54	8.76	15.26
5825	165	6	12.92	19.00
		9	12.80	18.84
		12	12.40	18.40
		18	12.62	18.61
		24	12.10	18.11
		36	12.10	18.13
		48	11.25	17.10
		54	8.85	15.29

Table 6-10. 802.11a (5.8GHz) Conducted Output Power Measurements

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Chain AB – 5.8GHz 802.11a (20MHz Bandwidth)

Freq [MHz]	Channel	MCS Index	Data Rate [Mbps]	Chain A Average Power [dBm]	Chain A Peak Power [dBm]	Chain B Average Power [dBm]	Chain B Peak Power [dBm]	20MHz BW Average Aggregate Power [dBm]	20MHz BW Peak Aggregate Power [dBm]
5745	149	HT8	13/14.4	11.83	18.71	10.57	18.02	14.26	21.39
		HT9	26/28.9	12.05	18.61	10.74	18.21	14.45	21.42
		HT10	39/43.3	12.02	18.60	10.69	18.02	14.42	21.33
		HT11	52/57.8	12.05	18.41	10.67	17.84	14.42	21.14
		HT12	78/86.7	12.01	18.56	10.74	18.13	14.43	21.36
		HT13	104/115.6	12.03	18.64	10.79	18.46	14.46	**21.56**
		HT14	117/130	12.03	18.66	10.32	17.51	14.27	21.13
		HT15	130/144.4	8.62	16.31	7.78	15.51	11.23	18.94
5785	157	HT8	13/14.4	11.81	18.41	10.61	17.72	14.26	21.09
		HT9	26/28.9	12.05	18.67	10.70	17.95	14.44	21.34
		HT10	39/43.3	12.01	18.72	10.58	17.97	14.36	21.37
		HT11	52/57.8	12.03	18.77	10.57	18.11	14.37	21.46
		HT12	78/86.7	12.02	18.94	10.45	18.05	14.32	21.53
		HT13	104/115.6	12.05	18.85	10.73	18.01	14.45	21.46
		HT14	117/130	12.01	18.91	10.36	17.87	14.27	21.43
		HT15	130/144.4	8.96	16.51	8.23	15.82	11.62	19.19
5825	165	HT8	13/14.4	12.11	18.37	10.70	17.76	14.47	21.09
		HT9	26/28.9	12.04	18.74	10.65	18.12	14.41	21.45
		HT10	39/43.3	12.05	18.62	10.66	17.95	14.42	21.31
		HT11	52/57.8	12.01	18.58	10.59	17.91	14.37	21.27
		HT12	78/86.7	12.08	18.54	10.73	18.04	14.47	21.31
		HT13	104/115.6	12.03	18.67	10.70	18.20	14.43	21.45
		HT14	117/130	12.06	18.62	10.42	18.17	14.33	21.41
		HT15	130/144.4	9.56	17.05	9.15	16.53	12.37	19.81

Table 6-11. 802.11a (20MHz Bandwidth) Conducted Output Power Measurements

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6.5 Output Power Measurement – 802.11n (2.4GHz)

§15.247(b)(3); RSS-210 [A8.4]

A transmitter antenna terminal of EUT is connected to the input of a RF power sensor. Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies. ***The maximum permissible conducted output power is 1 Watt.***

Chain A

Freq [MHz]	Channel	MCS Index	Data Rate [Mbps]	40MHz BW Measured Avg Power [dBm]	40MHz BW Measured Peak Power [dBm]
2422	3	HT0	13.5/15	7.31	16.43
		HT1	27/30	7.42	16.50
		HT2	40/45	5.93	15.18
		HT3	54/60	6.90	16.22
		HT4	81/90	6.93	16.18
		HT5	108/120	7.03	16.33
		HT6	121.5/135	6.71	15.95
		HT7	135/150	6.86	16.10
2437	6	HT0	13.5/15	14.40	21.70
		HT1	27/30	14.02	21.68
		HT2	40/45	14.72	21.60
		HT3	54/60	14.25	21.59
		HT4	81/90	14.16	21.55
		HT5	108/120	12.95	20.20
		HT6	121.5/135	11.23	18.50
		HT7	135/150	9.56	16.71
2452	9	HT0	13.5/15	8.16	18.10
		HT1	27/30	7.81	17.90
		HT2	40/45	7.52	17.66
		HT3	54/60	8.08	18.16
		HT4	81/90	8.08	18.14
		HT5	108/120	8.18	18.12
		HT6	121.5/135	8.00	17.95
		HT7	135/150	7.81	17.85

Table 6-12. 802.11n (40MHz Bandwidth) Conducted Output Power Measurements

Chain B

Freq [MHz]	Channel	MCS Index	Data Rate [Mbps]	40MHz BW Measured Average Power [dBm]	40MHz BW Measured Peak Power [dBm]
2422	3	HT0	13.5/15	7.42	17.40
		HT1	27/30	7.43	17.38
		HT2	40/45	7.77	17.25
		HT3	54/60	7.15	16.80
		HT4	81/90	7.08	16.90
		HT5	108/120	7.00	17.00
		HT6	121.5/135	7.01	17.02
		HT7	135/150	6.90	16.95
2437	6	HT0	13.5/15	14.05	21.62
		HT1	27/30	14.00	21.58
		HT2	40/45	13.93	21.52
		HT3	54/60	13.68	21.16
		HT4	81/90	13.61	21.11
		HT5	108/120	12.20	19.85
		HT6	121.5/135	10.49	17.05
		HT7	135/150	8.80	15.06
2452	9	HT0	13.5/15	7.73	17.16
		HT1	27/30	7.78	17.10
		HT2	40/45	8.14	17.15
		HT3	54/60	7.50	16.50
		HT4	81/90	7.46	16.54
		HT5	108/120	7.84	16.84
		HT6	121.5/135	7.38	16.35
		HT7	135/150	7.31	16.29

Table 6-13. 802.11n (40MHz Bandwidth) Conducted Output Power Measurements

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Chain AB – 2.4GHz 802.11n (40MHz Bandwidth)

Freq [MHz]	Channel	MCS Index	Data Rate [Mbps]	Chain A Average Power [dBm]	Chain A Peak Power [dBm]	Chain B Average Power [dBm]	Chain B Peak Power [dBm]	40MHz BW Average Aggregate Power [dBm]	40MHz BW Peak Aggregate Power [dBm]
2422	3	HT8	27/30	6.55	15.95	8.97	17.80	10.94	19.98
		HT9	54/60	6.44	15.52	9.04	17.49	10.94	19.63
		HT10	80/90	6.38	15.16	9.07	17.29	10.94	19.36
		HT11	108/120	6.45	16.58	9.05	17.35	10.95	19.99
		HT12	162/180	6.52	15.55	9.11	17.42	11.02	19.60
		HT13	216/240	6.55	15.38	9.02	17.55	10.97	19.61
		HT14	243/270	6.61	16.13	8.97	17.28	10.96	19.75
		HT15	270/300	6.65	16.99	8.86	18.40	10.90	20.76
2437	6	HT8	27/30	12.93	20.76	13.47	20.96	16.22	23.87
		HT9	54/60	12.56	20.27	13.48	20.67	16.05	23.48
		HT10	80/90	12.98	20.54	13.42	20.64	16.22	23.60
		HT11	108/120	12.58	20.86	13.53	21.27	16.09	**24.08**
		HT12	162/180	12.65	20.45	14.01	21.11	16.39	23.80
		HT13	216/240	12.71	20.48	13.57	20.81	16.17	23.66
		HT14	243/270	12.27	20.48	13.19	20.84	15.76	23.67
		HT15	270/300	11.31	20.32	11.77	20.40	14.56	23.37
2452	9	HT8	27/30	6.88	16.23	8.86	17.82	10.99	20.11
		HT9	54/60	6.87	15.92	8.91	17.43	11.02	19.75
		HT10	80/90	6.51	15.32	8.95	17.25	10.91	19.40
		HT11	108/120	6.56	16.73	8.64	18.21	10.73	20.54
		HT12	162/180	6.62	15.67	9.01	17.74	10.99	19.84
		HT13	216/240	6.67	15.51	8.68	17.23	10.80	19.46
		HT14	243/270	6.73	16.27	8.69	17.75	10.83	20.08
		HT15	270/300	6.77	17.12	8.70	18.35	10.85	20.79

Table 6-14. 802.11n (40MHz Bandwidth) Conducted Output Power Measurements

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6.6 Output Power Measurement – 802.11n (5.8GHz)

§15.247(b)(3); RSS-210 [A8.4]

A transmitter antenna terminal of EUT is connected to the input of a RF power sensor. Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies. ***The maximum permissible conducted output power is 1 Watt.***

Chain A

Freq [MHz]	Channel	MCS Index	Data Rate [Mbps]	40MHz BW Measured Average Power	40MHz BW Measured Peak Power [dBm]
5755	151	HT0	13.5/15	**14.23**	20.61
		HT1	27/30	14.15	20.60
		HT2	40/45	14.19	20.59
		HT3	54/60	14.09	20.63
		HT4	81/90	14.15	**20.64**
		HT5	108/120	13.71	20.54
		HT6	121.5/135	11.51	18.66
		HT7	135/150	7.34	14.52
5795	159	HT0	13.5/15	14.22	20.62
		HT1	27/30	13.89	20.60
		HT2	40/45	13.89	20.63
		HT3	54/60	13.15	20.64
		HT4	81/90	13.92	19.50
		HT5	108/120	13.50	19.17
		HT6	121.5/135	11.56	17.18
		HT7	135/150	7.56	13.23

Table 6-15. 802.11n (5.8GHz) Conducted Output Power Measurements

Chain B

Freq [MHz]	Channel	MCS Index	Data Rate [Mbps]	40MHz BW Measured Power [dBm]	40MHz BW Measured Peak Power [dBm]
5755	151	HT0	13.5/15	11.35	18.83
		HT1	27/30	11.66	18.96
		HT2	40/45	11.54	18.80
		HT3	54/60	11.35	18.62
		HT4	81/90	11.30	18.59
		HT5	108/120	10.72	17.95
		HT6	121.5/135	8.60	15.94
		HT7	135/150	5.60	12.91
5795	159	HT0	13.5/15	12.00	19.04
		HT1	27/30	11.90	18.98
		HT2	40/45	11.76	18.76
		HT3	54/60	11.56	18.54
		HT4	81/90	11.40	18.49
		HT5	108/120	11.00	18.05
		HT6	121.5/135	8.81	15.36
		HT7	135/150	6.01	13.27

Table 6-16. 802.11n (5.8GHz) Conducted Output Power Measurements

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Chain AB – 5.8GHz 802.11n (40MHz Bandwidth)

Freq [MHz]	Channel	MCS Index	Data Rate [Mbps]	Chain A Average Power [dBm]	Chain A Peak Power [dBm]	Chain B Average Power [dBm]	Chain B Peak Power [dBm]	40MHz BW Average Aggregate Power [dBm]	40MHz BW Peak Aggregate Power [dBm]
5755	151	HT8	27/30	12.58	19.28	10.73	17.94	14.76	21.67
		HT9	54/60	12.67	19.34	10.71	17.82	14.81	21.66
		HT10	80/90	12.54	19.05	10.65	17.99	14.71	21.56
		HT11	108/120	12.59	19.11	10.68	18.03	14.75	21.61
		HT12	162/180	12.65	19.18	10.72	18.12	14.80	21.69
		HT13	216/240	12.63	19.20	10.69	17.97	14.78	21.64
		HT14	243/270	12.61	19.22	10.66	18.03	14.75	21.68
		HT15	270/300	7.52	17.22	7.14	16.72	10.34	19.99
5795	159	HT8	27/30	12.63	19.63	11.02	18.01	14.91	21.91
		HT9	54/60	12.73	19.83	10.62	17.75	14.81	21.92
		HT10	80/90	12.77	19.70	10.63	17.78	14.84	21.86
		HT11	108/120	12.75	19.74	10.78	17.85	14.89	21.91
		HT12	162/180	12.72	19.84	10.73	18.11	14.85	22.07
		HT13	216/240	12.70	19.90	10.65	18.05	14.81	**22.08**
		HT14	243/270	12.62	19.91	10.71	17.92	14.78	22.04
		HT15	270/300	8.27	17.76	7.62	17.06	10.97	20.43

Table 6-17. 802.11n (40MHz Bandwidth) Conducted Output Power Measurements

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6.7 Power Spectral Density (802.11a/b/g/n)

§15.247(e); RSS-210 [A8.2]

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies. ***The maximum permissible power spectral density is 8 dBm in any 3 kHz band.***

Frequency [MHz]	Channel No.	802.11 Mode	Measured Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]
2412	1	b	-13.720	8.0	-21.72
2437	6	b	-14.480	8.0	-22.48
2462	11	b	-14.390	8.0	-22.39
2412	1	g	-12.300	8.0	-20.30
2437	6	g	-10.980	8.0	-18.98
2462	11	g	-13.270	8.0	-21.27
5745	149	a	-12.240	8.0	-20.24
5785	157	a	-13.060	8.0	-21.06
5825	165	a	-13.240	8.0	-21.24
2422	3	n	-21.550	8.0	-29.55
2437	6	n	-13.330	8.0	-21.33
2452	9	n	-20.050	8.0	-28.05
5755	151	n	-15.170	8.0	-23.17
5795	159	n	-15.860	8.0	-23.86

Table 6-18. Conducted Power Density Measurements – Chain A

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Frequency [MHz]	Channel No.	802.11 Mode	Measured Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]
2412	1	b	-13.810	8.0	-21.81
2437	6	b	-13.510	8.0	-21.51
2462	11	b	-7.010	8.0	-15.01
2412	1	g	-12.130	8.0	-20.13
2437	6	g	-10.220	8.0	-18.22
2462	11	g	-12.060	8.0	-20.06
5745	149	a	-12.640	8.0	-20.64
5785	157	a	-13.690	8.0	-21.69
5825	165	a	-13.510	8.0	-21.51
2422	3	n	-19.920	8.0	-27.92
2437	6	n	-12.830	8.0	-20.83
2452	9	n	-19.580	8.0	-27.58
5755	151	n	-16.000	8.0	-24.00
5795	159	n	-16.040	8.0	-24.04

Table 6-19. Conducted Power Density Measurements – Chain B

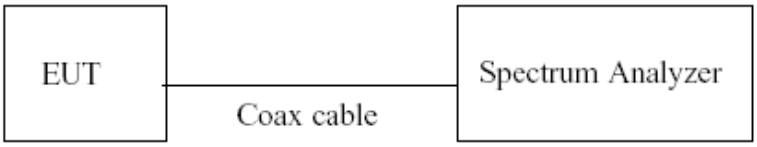

Figure 6-5. Test Instrument & Measurement Setup

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Frequency [MHz]	Channel No.	802.11 Mode	Measured Power Spectral Density Chain A [dBm]	Measured Power Spectral Density Chain B [dBm]	Aggregate PSD Chain AB [dBm]	Maximum Permissible Power Density [dBm/3kHz]	Margin [dB]
2412	1	b	-13.720	-13.810	-10.754	8.0	-18.75
2437	6	b	-14.480	-13.510	-10.958	8.0	-18.96
2462	11	b	-14.390	-7.010	-6.281	8.0	-14.28
2412	1	g	-11.880	-12.330	-9.089	8.0	-17.09
2437	6	g	-11.750	-11.830	-8.780	8.0	-16.78
2462	11	g	-11.650	-10.500	-8.027	8.0	-16.03
5745	149	a	-13.710	-15.740	-11.597	8.0	-19.60
5785	157	a	-15.990	-16.080	-13.024	8.0	-21.02
5825	165	a	-15.980	-14.970	-12.435	8.0	-20.44
2422	3	n	-19.410	-19.580	-16.484	8.0	-24.48
2437	6	n	-14.530	-12.540	-10.412	8.0	-18.41
2452	9	n	-19.730	-17.860	-15.685	8.0	-23.68
5755	151	n	-16.560	-15.900	-13.207	8.0	-21.21
5795	159	n	-16.910	-16.800	-13.844	8.0	-21.84

Table 6-20. Conducted Power Spectral Density Measurements – Chain A/B

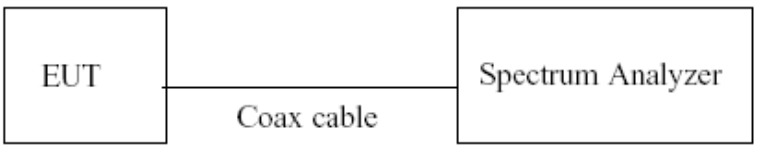

Figure 6-6. Test Instrument & Measurement Setup

Note s:

- MIMO operation is not possible while operating in 802.11b mode, so the aggregate power spectral density shown above in Table 6-20 for 802.11b is the summation of the power spectral density's measured in single chain transmission mode, as shown in Table 6-18 and Table 6-19.

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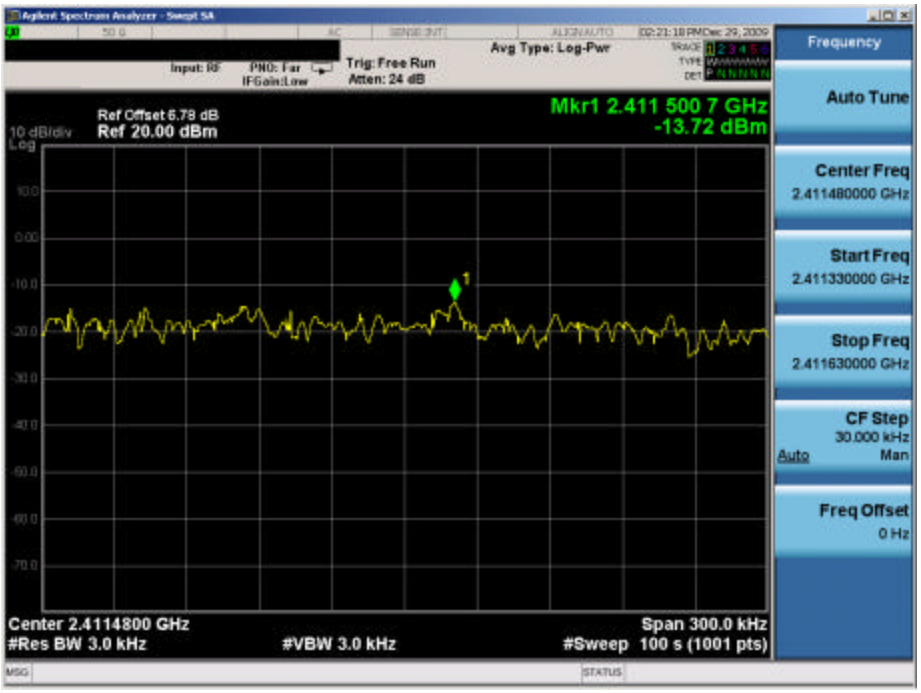
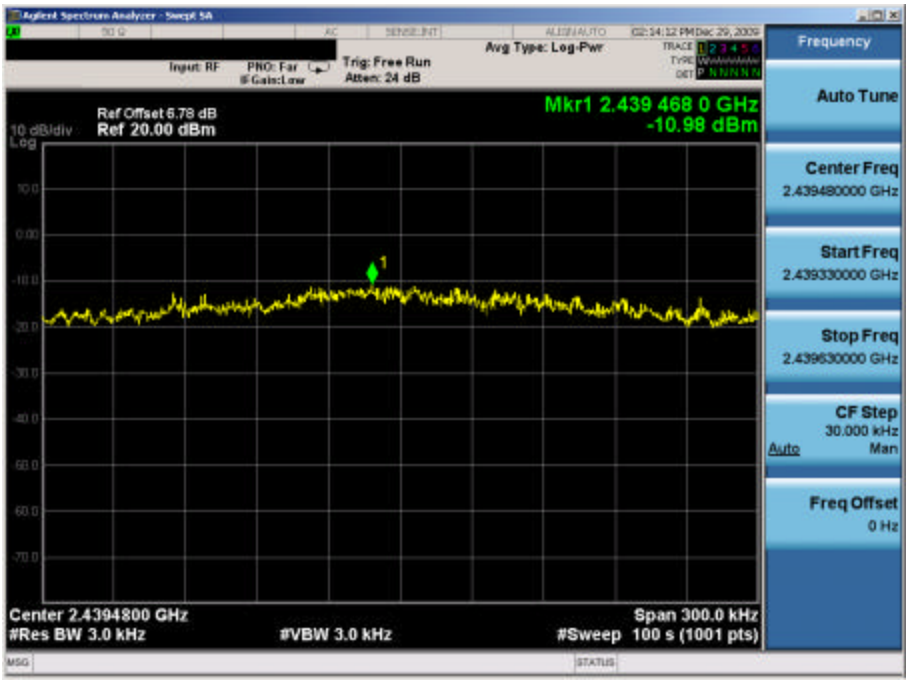
For the following power spectral density plots, the EUT was set at a data rate of 1Mbps for “b” mode, 6 Mbps for “g” mode, 6 Mbps for “a” mode, 13.5/15 for “n (2.4GHz)” mode and “n (5.8GHz)” mode and 6.5/7.2Mbps for “n” mode. These settings produced the worst-case emissions.



Plot 6-11. Power Spectral Density Plot (802.11b – Ch. 1) – Chain A



Plot 6-12. Power Spectral Density Plot (802.11g – Ch. 6) – Chain A

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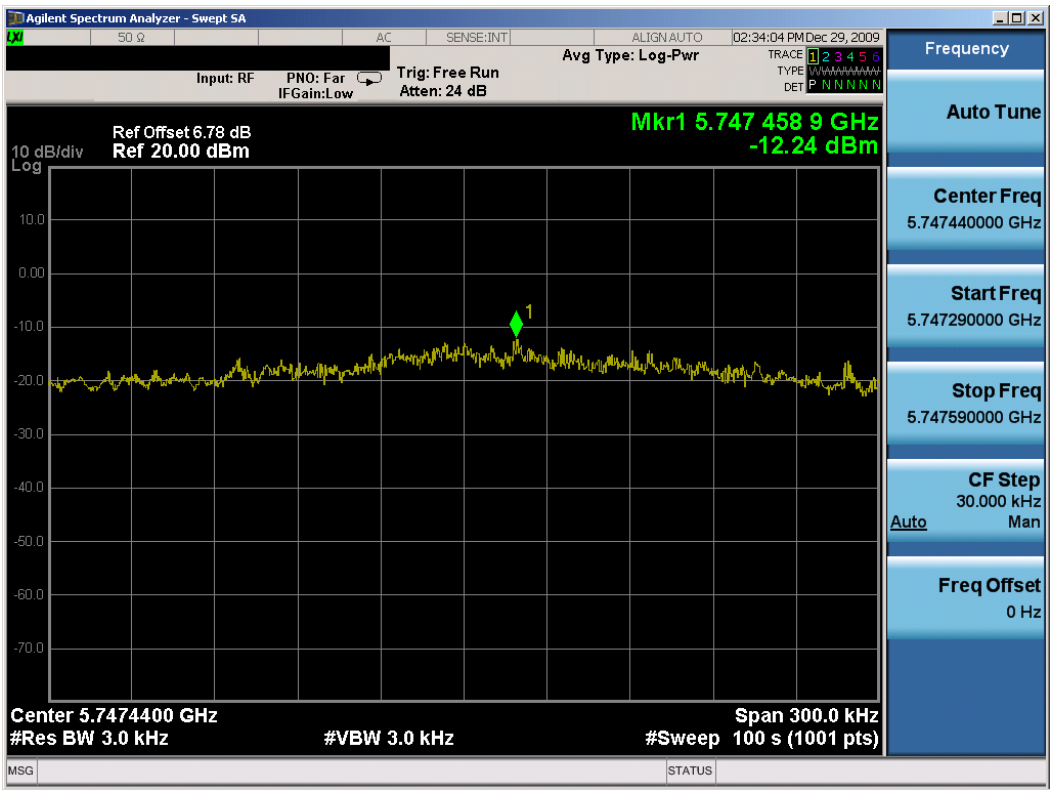
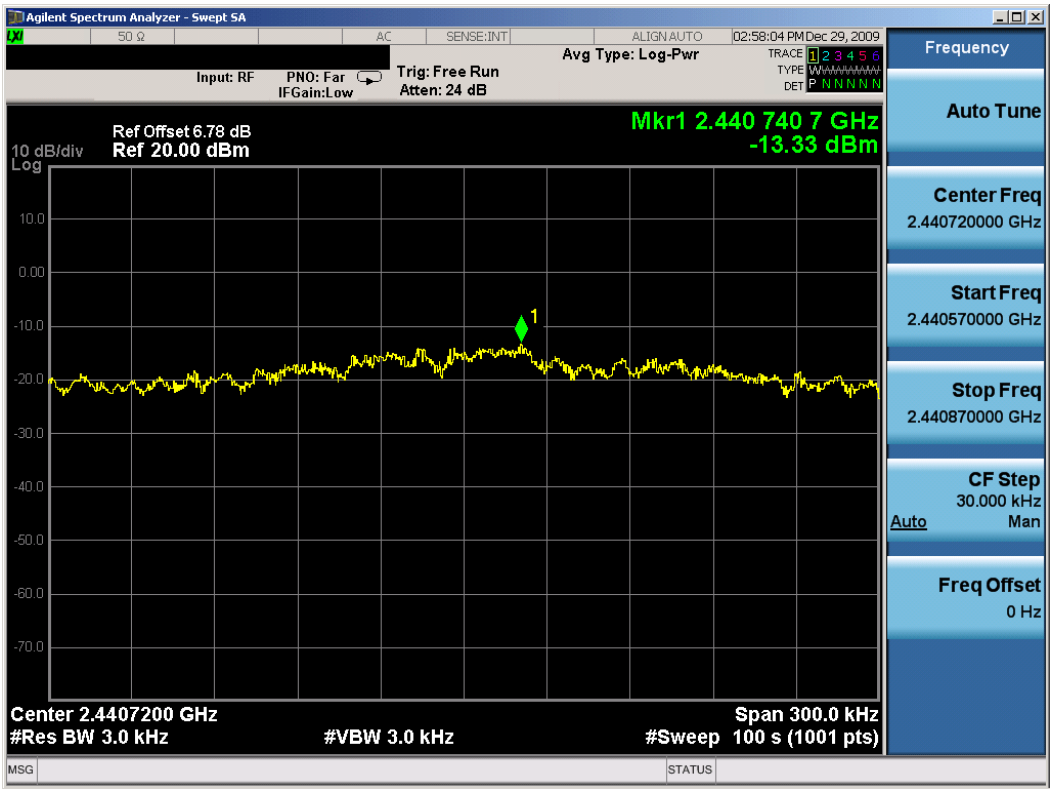


Plot 6-13. Power Spectral Density Plot (802.11a – Ch. 149) – Chain A



Plot 6-14. Power Spectral Density Plot (802.11n (2.4GHz) – Ch. 6) – Chain A

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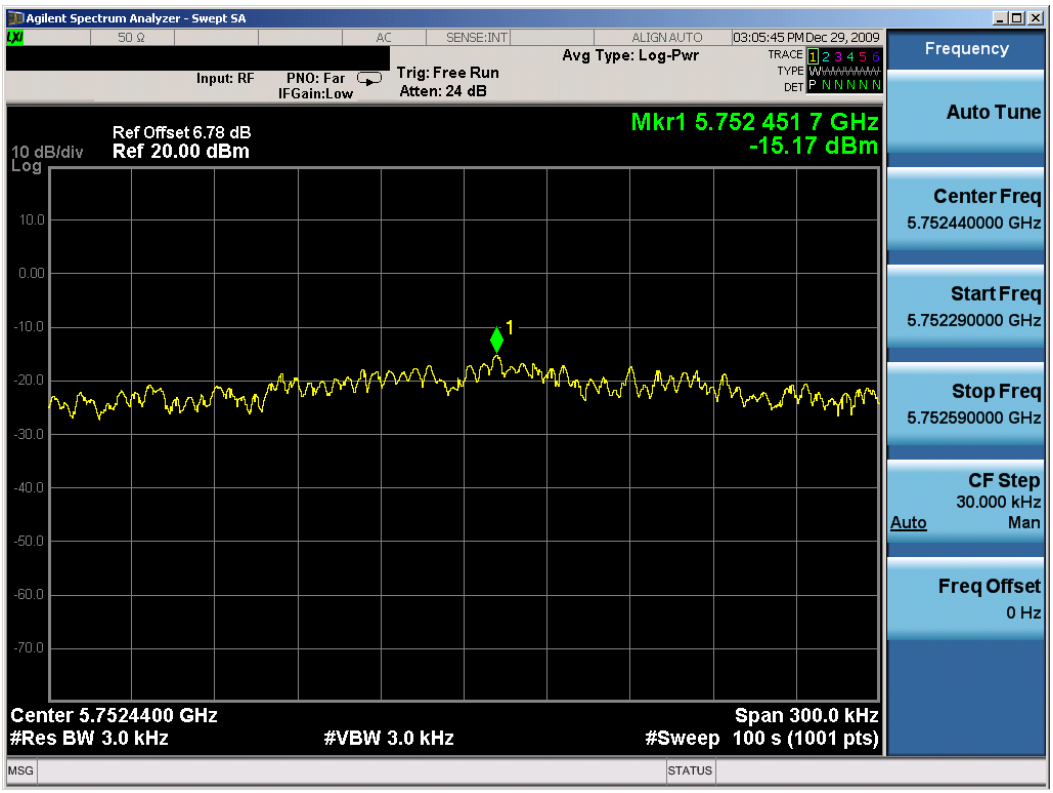
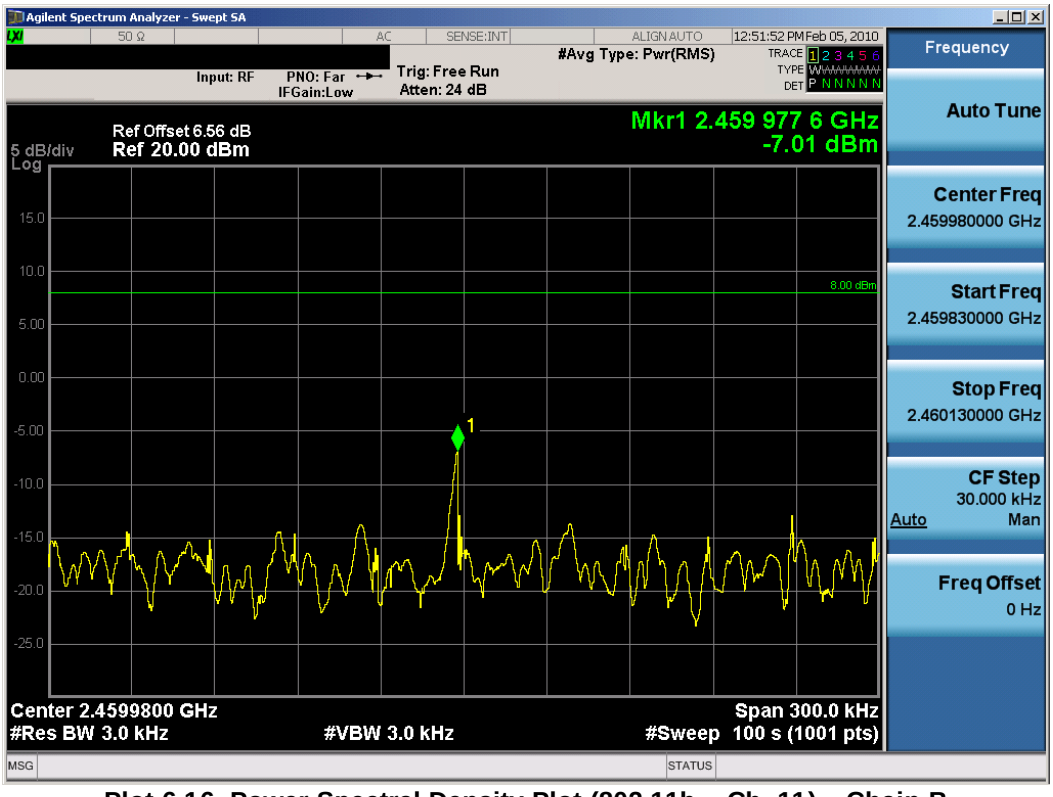


Plot 6-15. Power Spectral Density Plot (802.11n (5.8GHz) – Ch. 151) – Chain A



Plot 6-16. Power Spectral Density Plot (802.11b – Ch. 11) – Chain B

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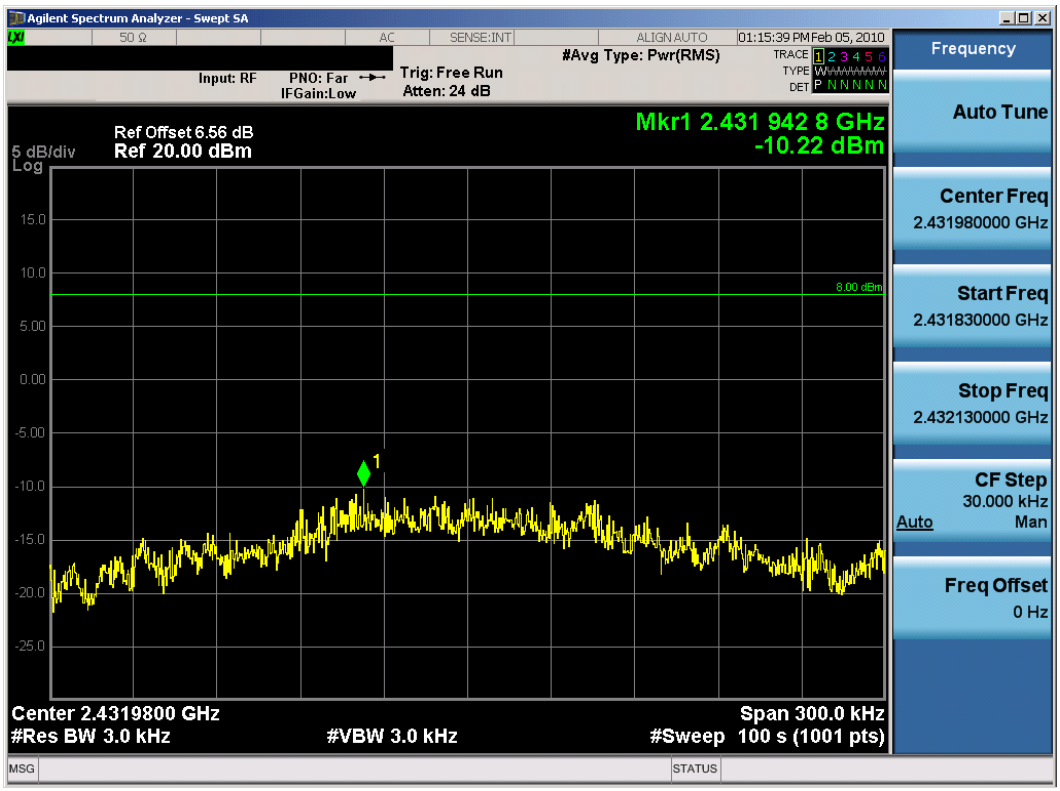
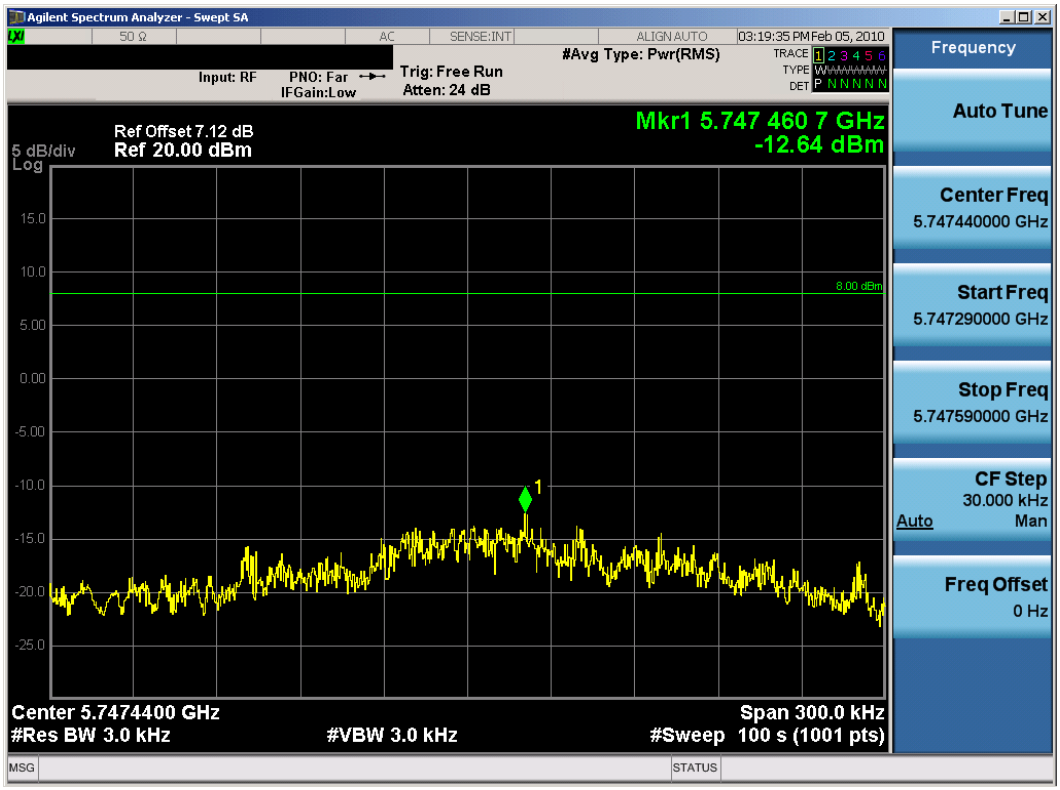


Plot 6-17. Power Spectral Density Plot (802.11g – Ch. 6) – Chain B



Plot 6-18. Power Spectral Density Plot (802.11a – Ch. 149) – Chain B

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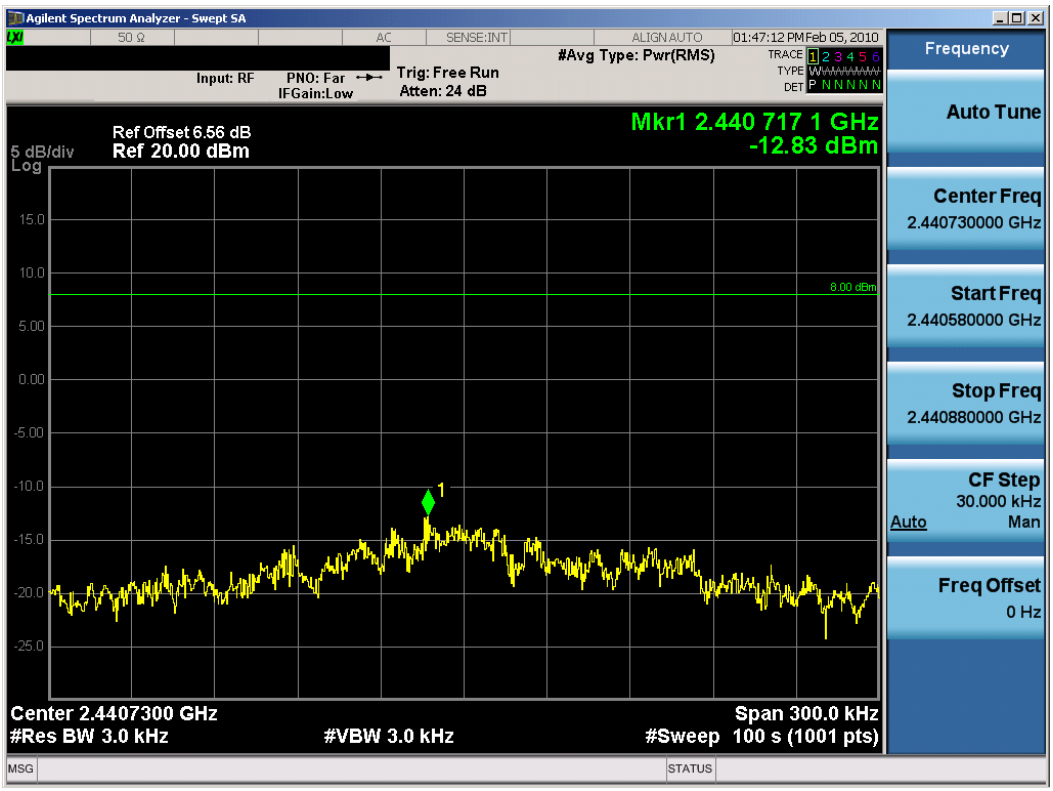
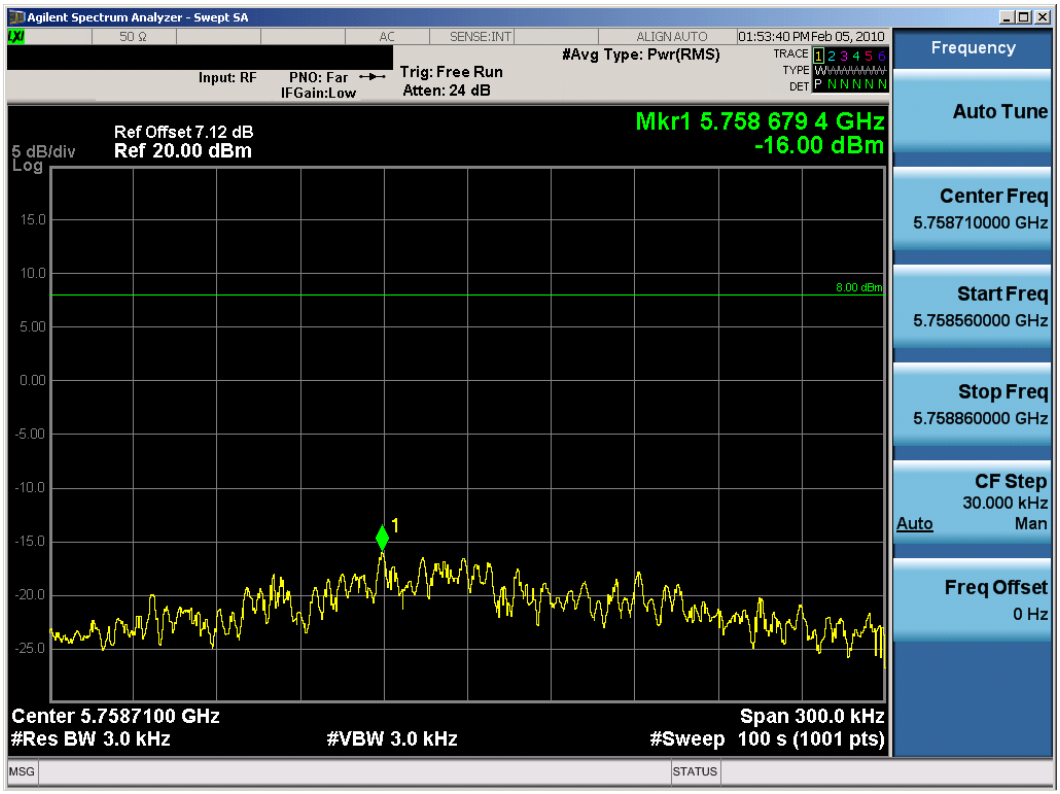


Plot 6-19. Power Spectral Density Plot (802.11n (2.4GHz) – Ch. 6) – Chain B



Plot 6-20. Power Spectral Density Plot (802.11n (5.8GHz) – Ch. 151) – Chain B

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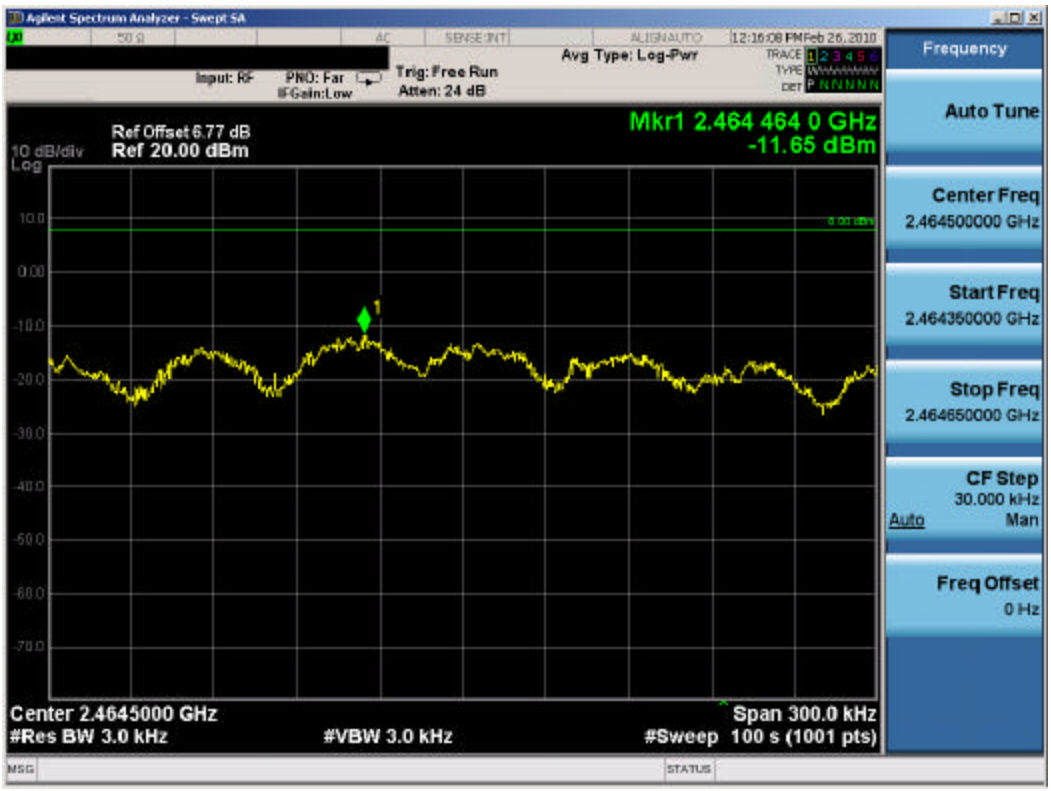

Plot 6-21. Power Spectral Density (802.11g Dual Transmit Mode – Ch. 11) – Chain A

Plot 6-22. Power Spectral Density (802.11g Dual Transmit Mode – Ch. 11) – Chain B

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Plot 6-23. Power Spectral Density (802.11a Dual Transmit Mode – Ch. 149) – Chain A

Plot 6-24. Power Spectral Density (802.11a Dual Transmit Mode – Ch. 149) – Chain B

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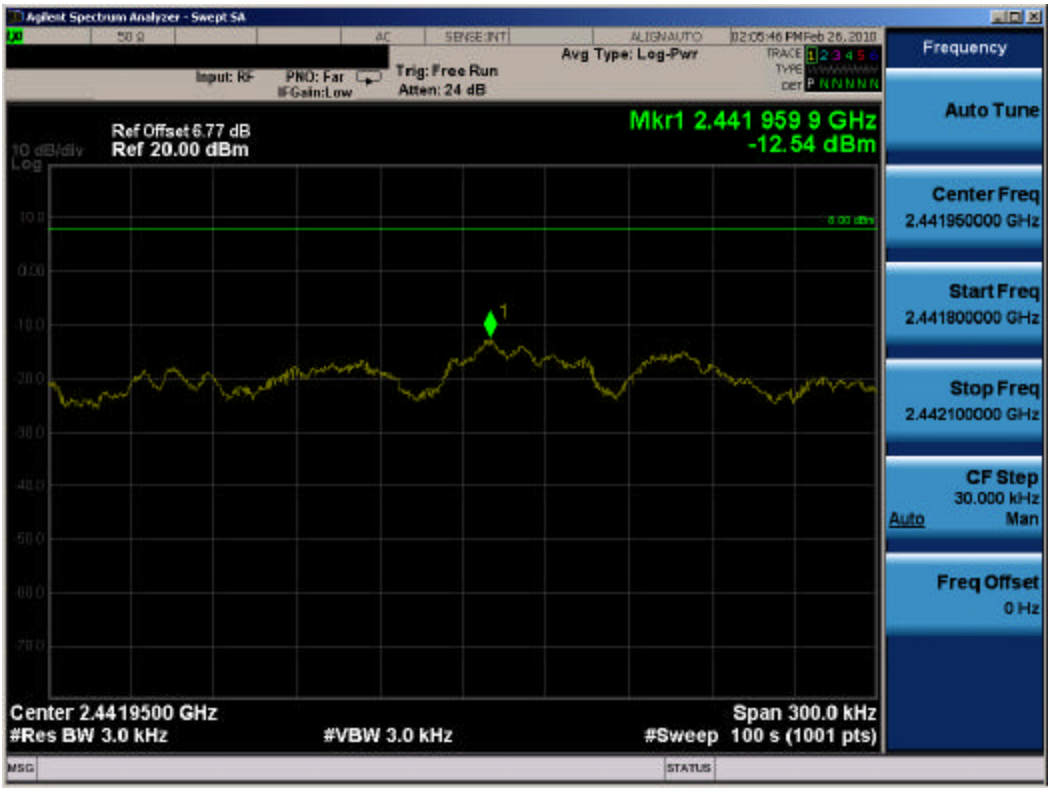
Plot 6-25. Power Spectral Density (802.11n (2.4GHz) Dual Transmit Mode – Ch. 6) – Chain A



Plot 6-26. Power Spectral Density (802.11n (2.4GHz) Dual Transmit Mode – Ch. 6) – Chain B

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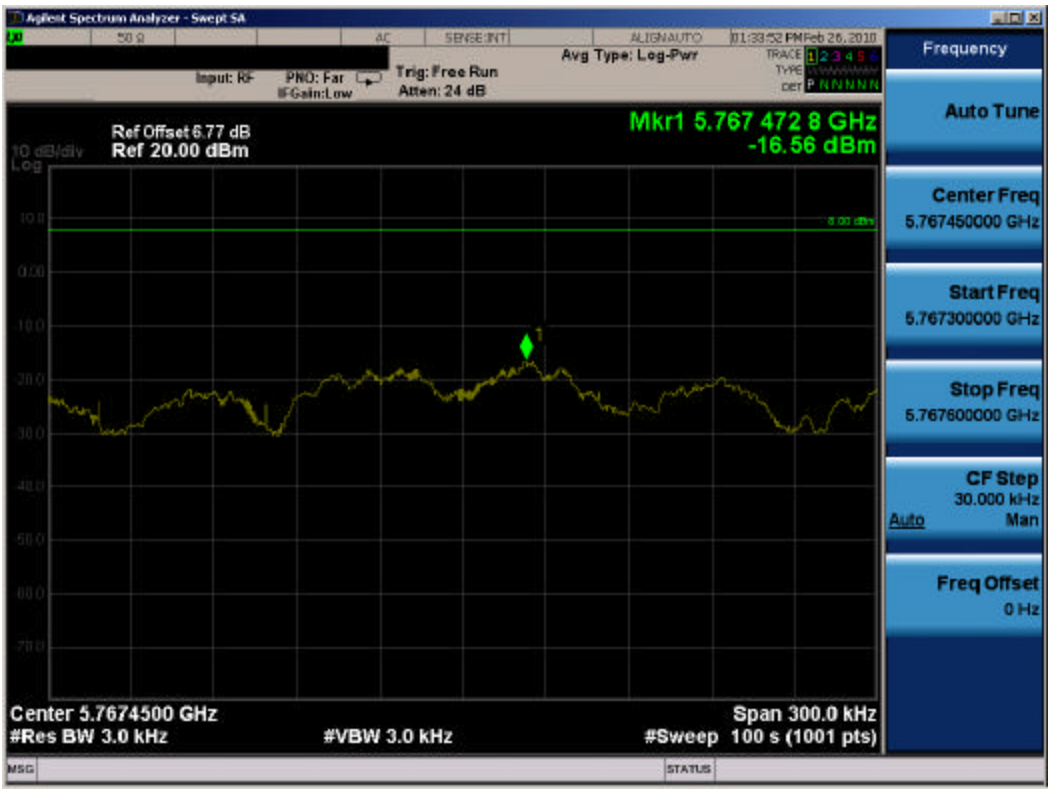

Plot 6-27. Power Spectral Density (802.11n (5.8GHz) Dual Transmit Mode – Ch. 151) – Chain A

Plot 6-28. Power Spectral Density (802.11n (5.8GHz) Dual Transmit Mode – Ch. 151) – Chain B

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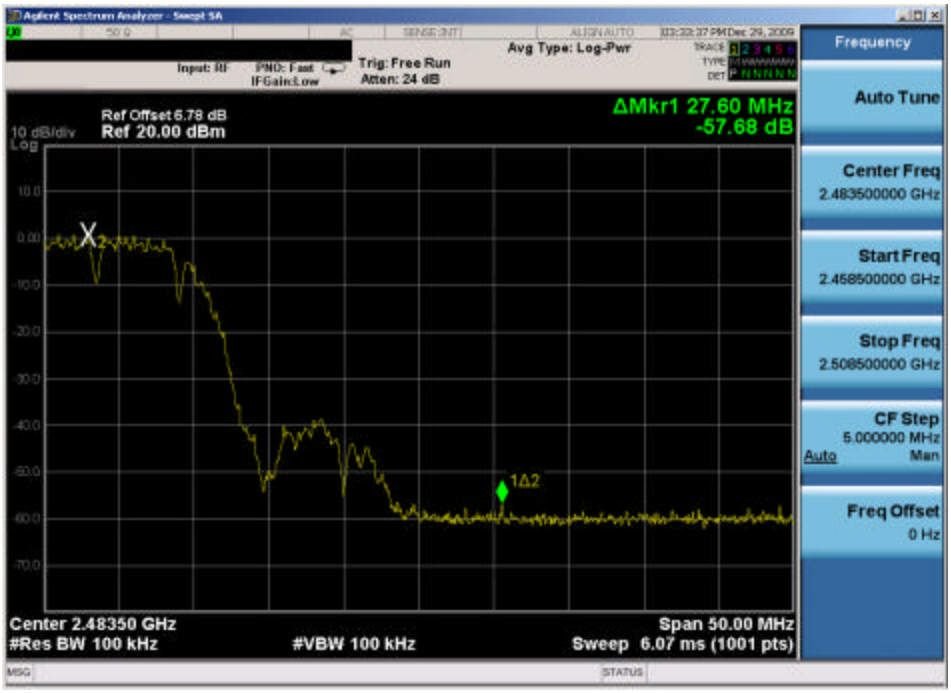
6.8 Out of Band Emissions at the Band Edge

§15.247(d); RSS-210 [A8.5]

For the following out of band conducted spurious emissions plots at the band edge, the EUT was set at a data rate of 1Mbps for "b" mode, 6 Mbps for "g" mode, 6 Mbps for "a" mode, 13.5/15 for "n (2.4GHz)" mode and "n (5.8GHz)" mode. These settings produced the worst-case emissions.

Plot 6-29. Band Edge Plot (802.11b – Ch. 1) – Chain A



Plot 6-30. Band Edge Plot (802.11b – Ch. 11) – Chain A

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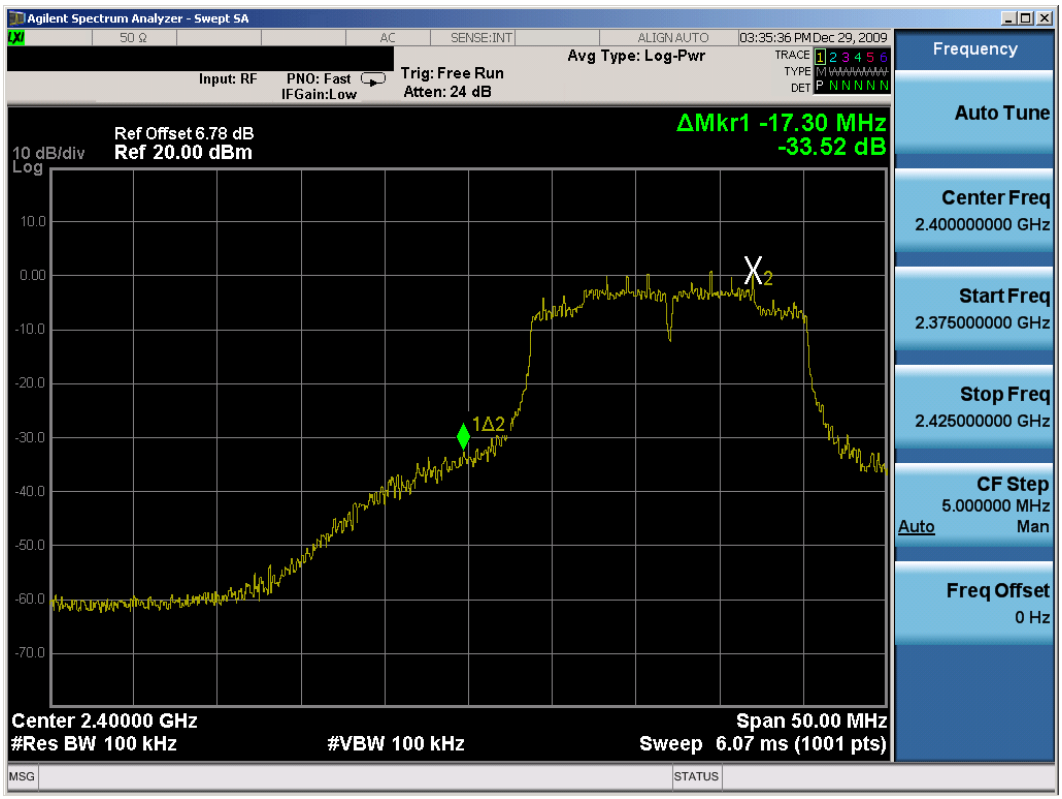
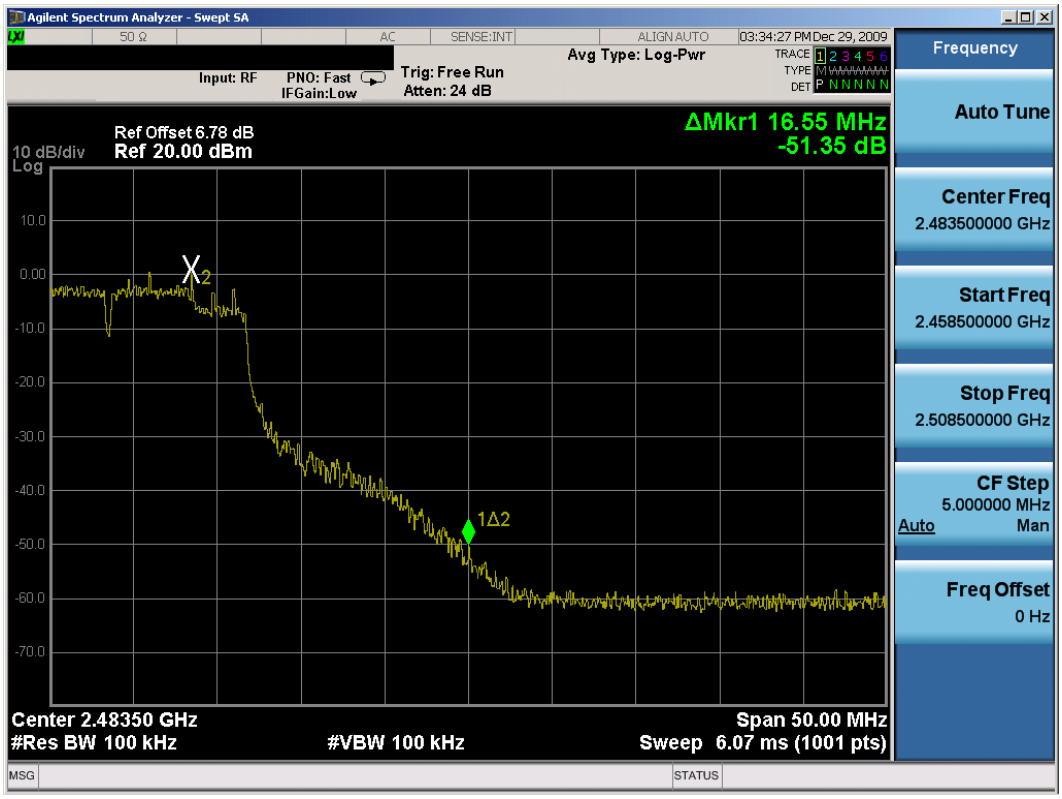


Plot 6-31. Band Edge Plot (802.11g– Ch. 1) – Chain A



Plot 6-32. Band Edge Plot (802.11g – Ch. 11) – Chain A

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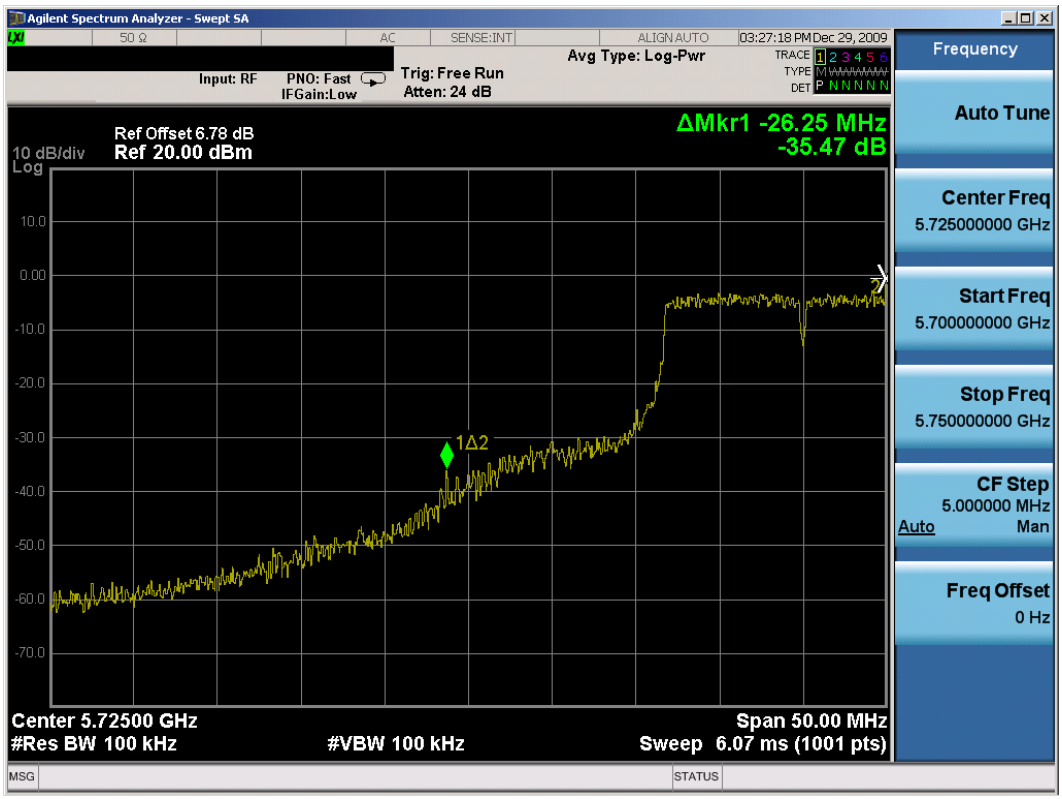
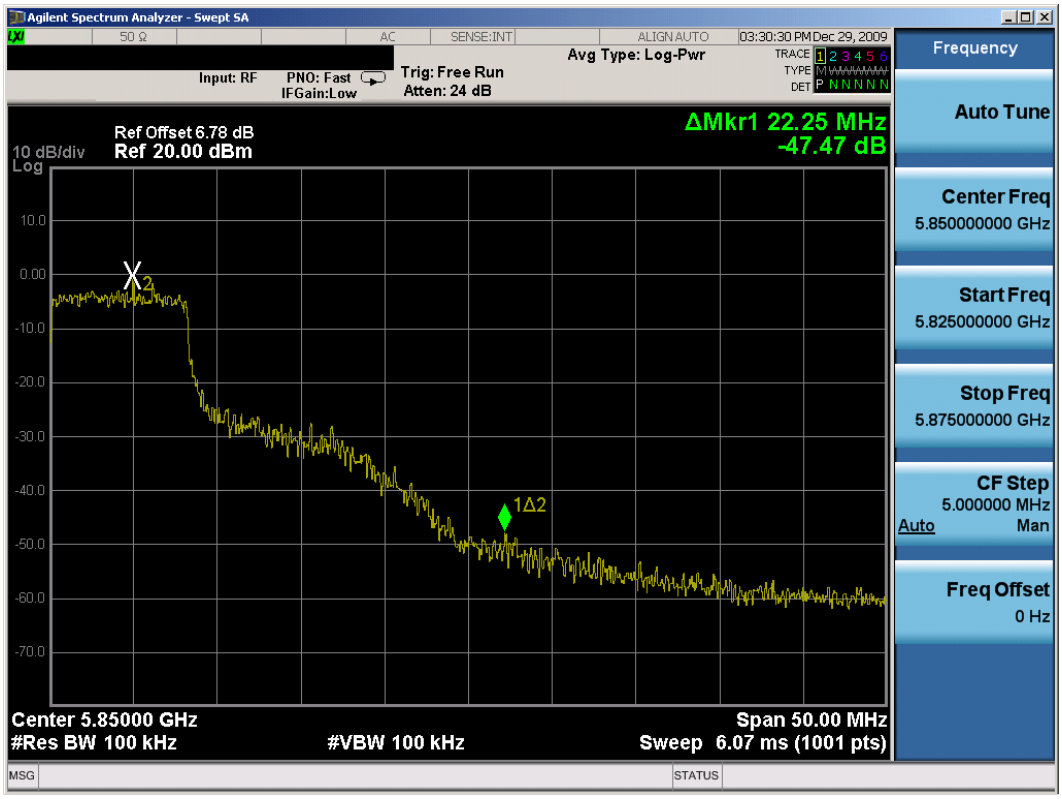


Plot 6-33. Band Edge Plot (802.11a – Ch. 149) – Chain A



Plot 6-34. Band Edge Plot (802.11a – Ch. 165) – Chain A

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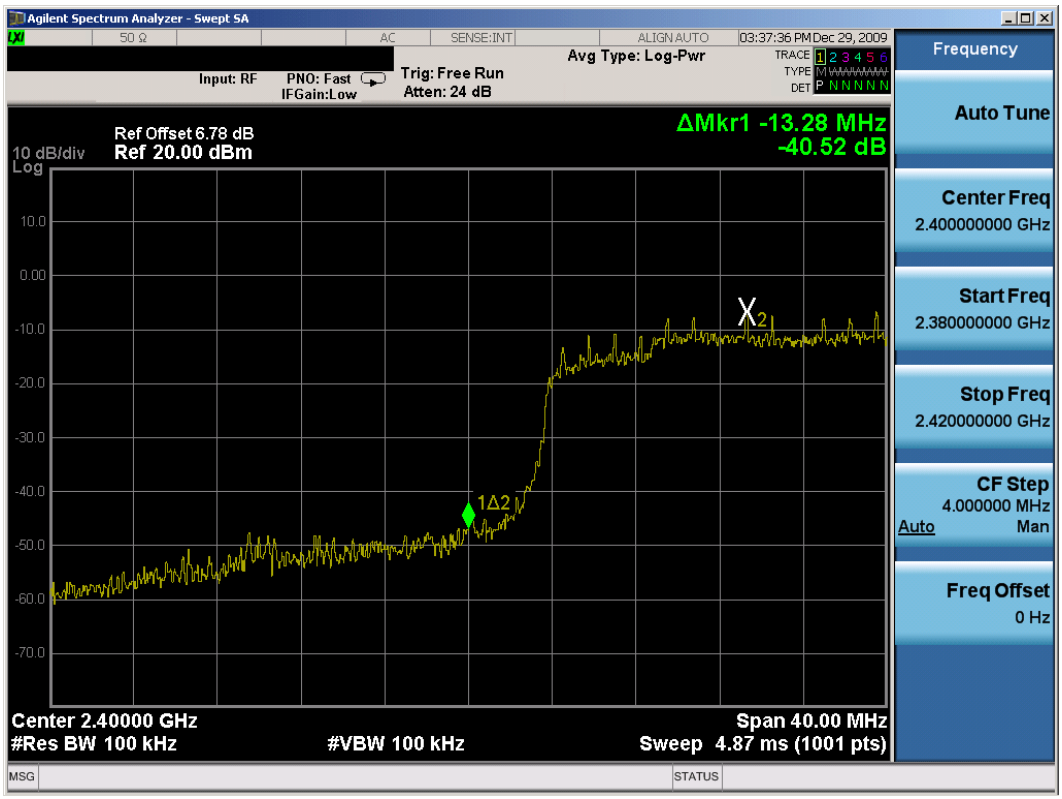
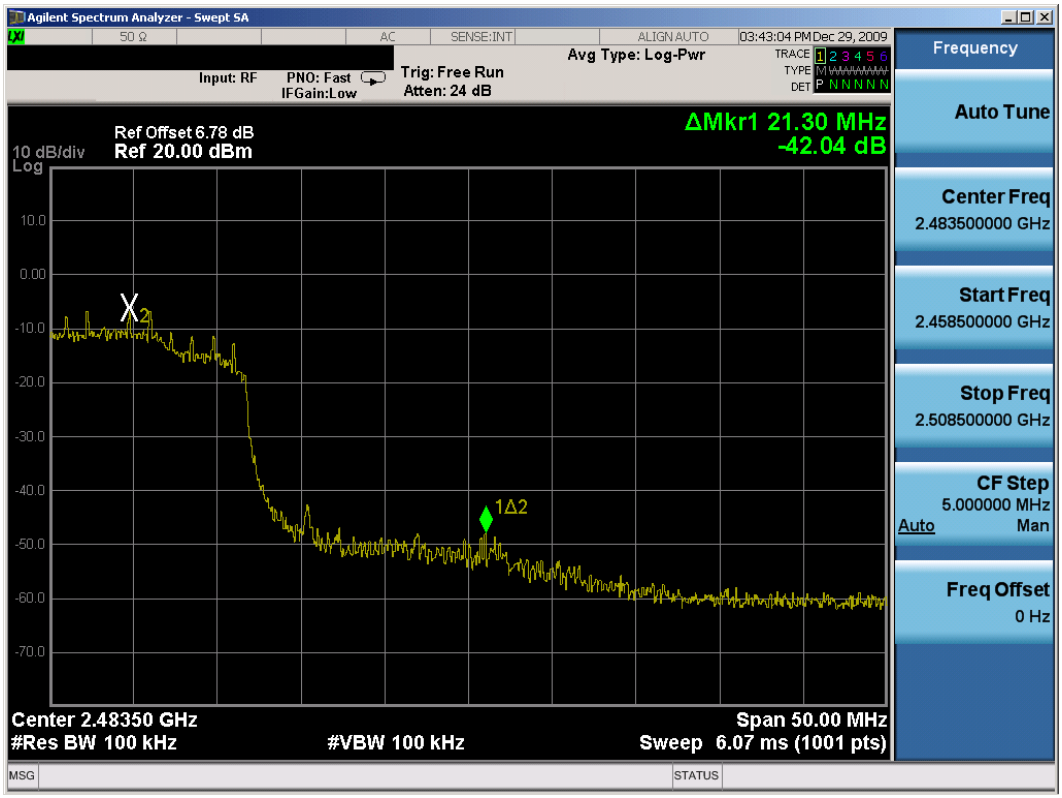


Plot 6-35. Band Edge Plot (802.11n (2.4GHz) – Ch. 3) – Chain A



Plot 6-36. Band Edge Plot (802.11n (2.4GHz) – Ch. 9) – Chain A

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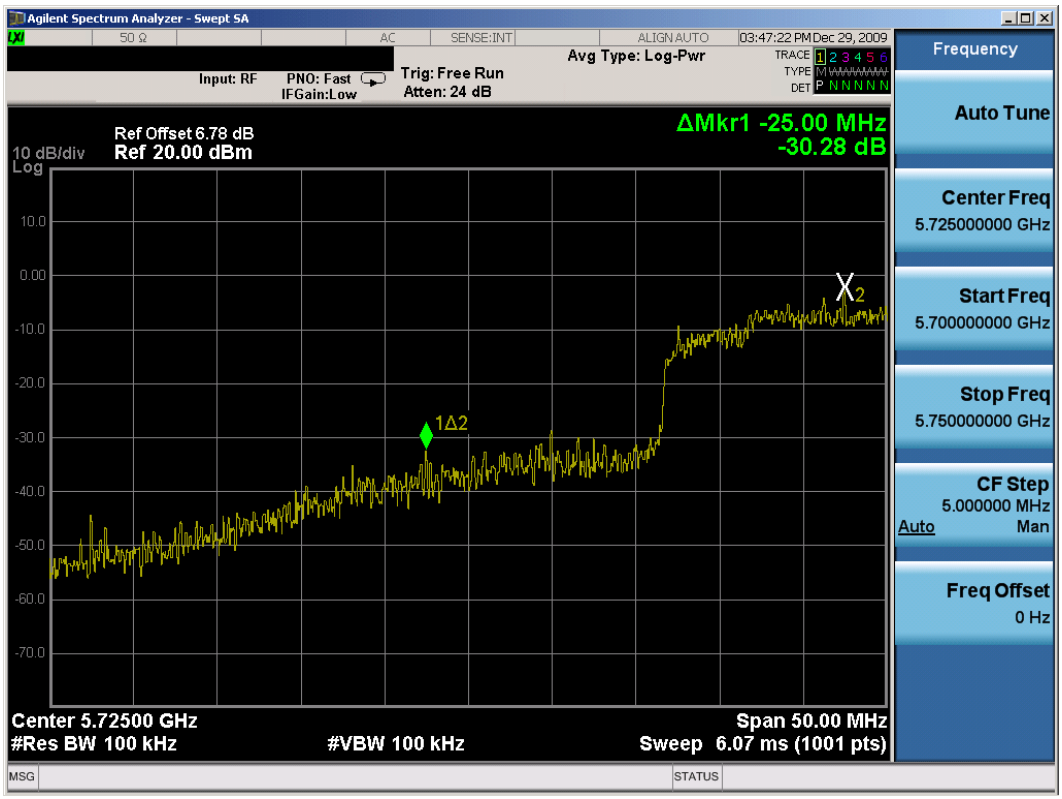
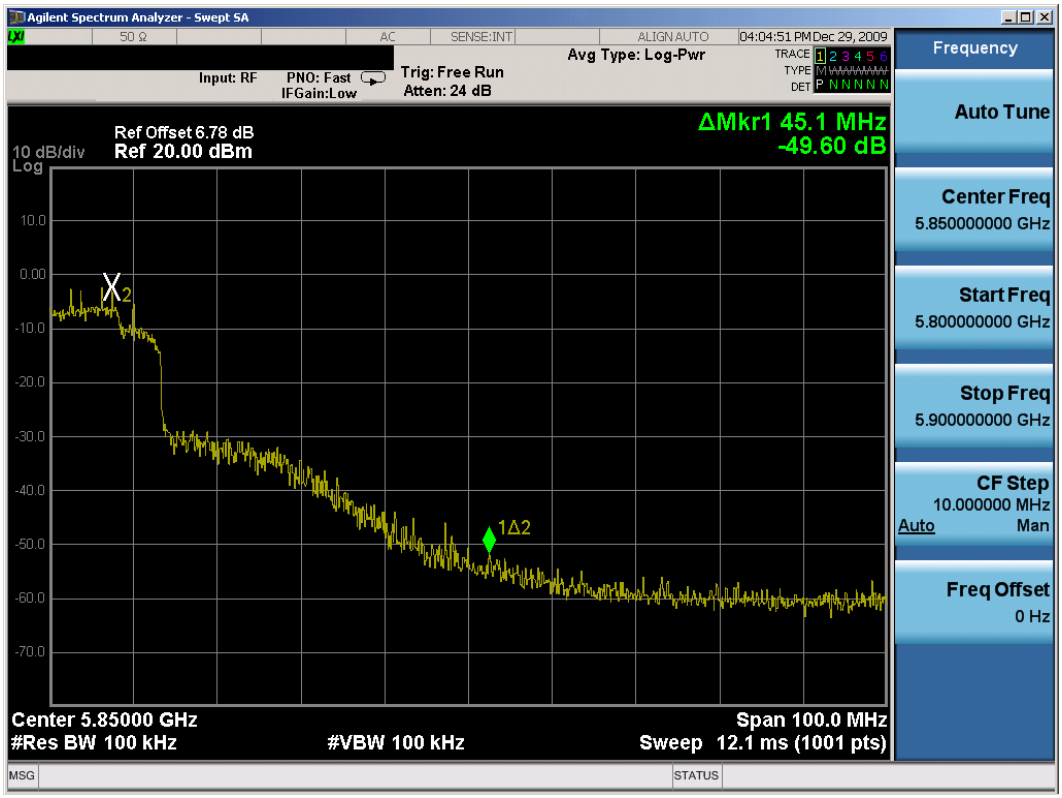


Plot 6-37. Band Edge Plot (802.11n (5.8GHz) – Ch. 151) – Chain A



Plot 6-38. Band Edge Plot (802.11n (5.8GHz) – Ch. 159) – Chain A

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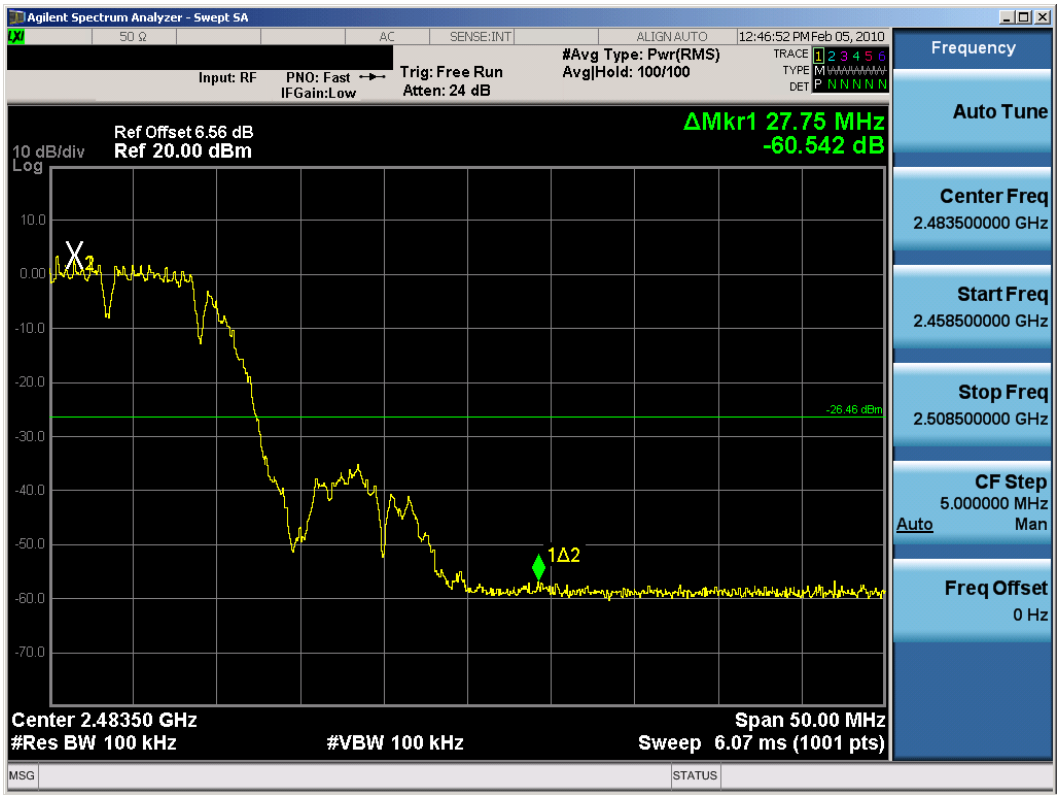
Plot 6-39. Band Edge Plot (802.11b – Ch. 1) – Chain B



Plot 6-40. Band Edge Plot (802.11b – Ch. 11) – Chain B

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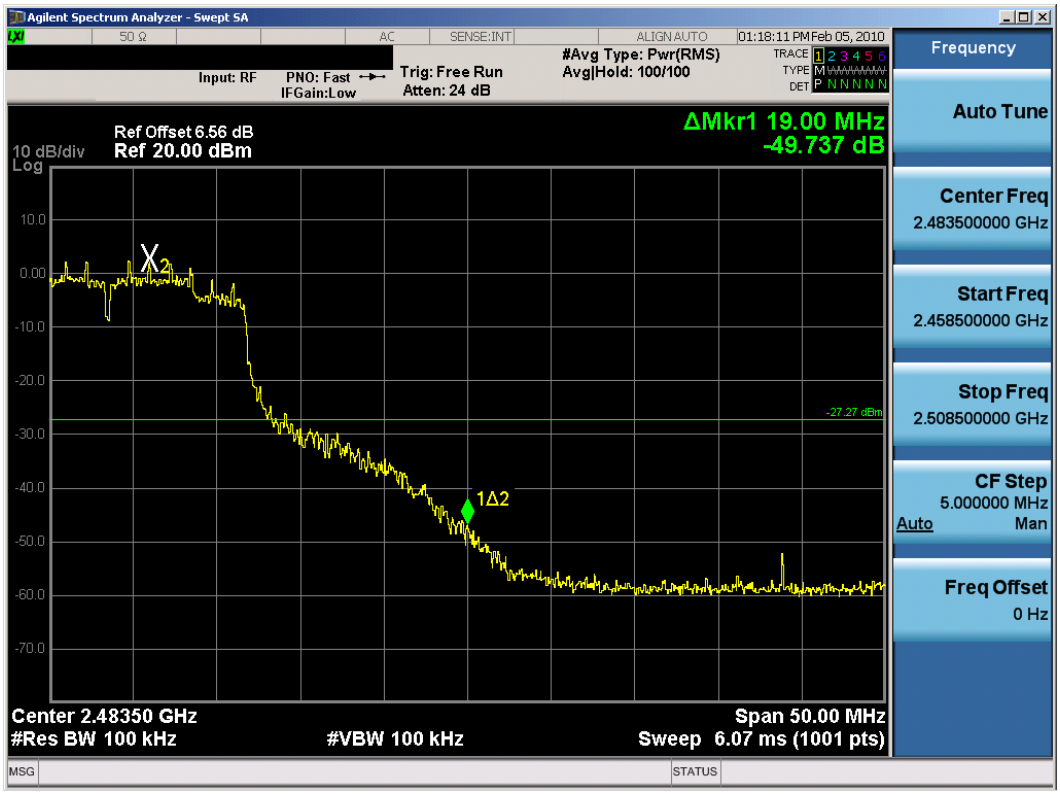
Plot 6-41. Band Edge Plot (802.11g– Ch. 1) – Chain B



Plot 6-42. Band Edge Plot (802.11g – Ch. 11) – Chain B

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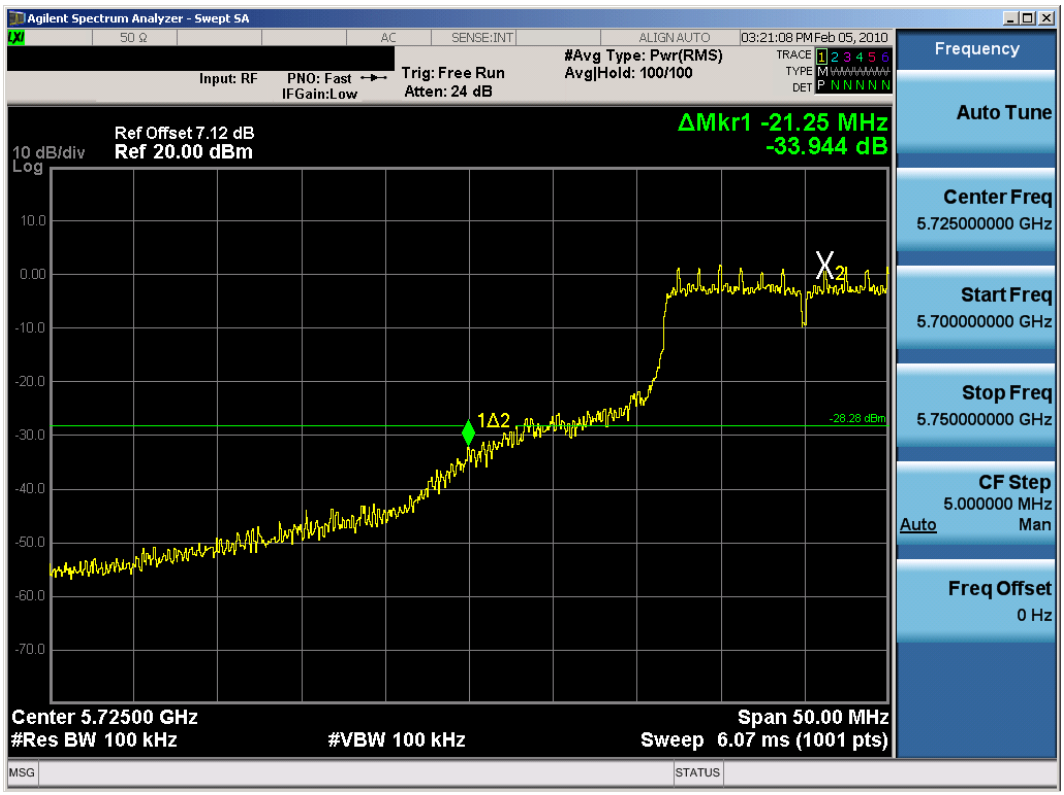
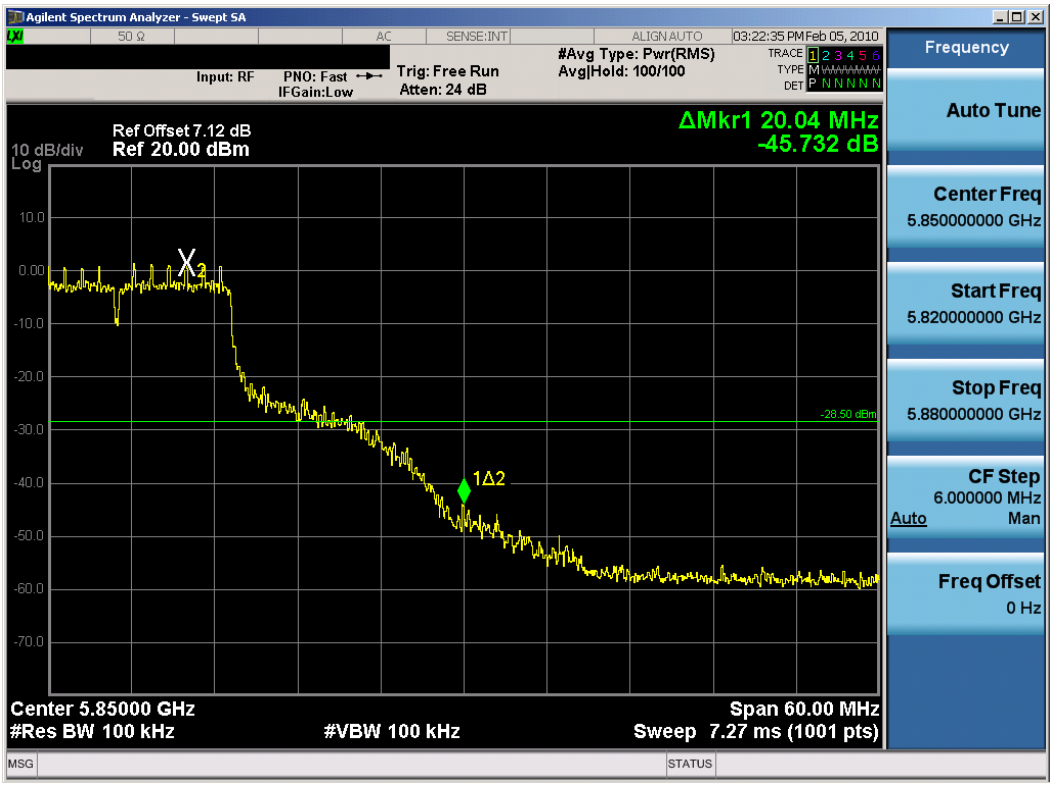


Plot 6-43. Band Edge Plot (802.11a – Ch. 149) – Chain B



Plot 6-44. Band Edge Plot (802.11a – Ch. 165) – Chain B

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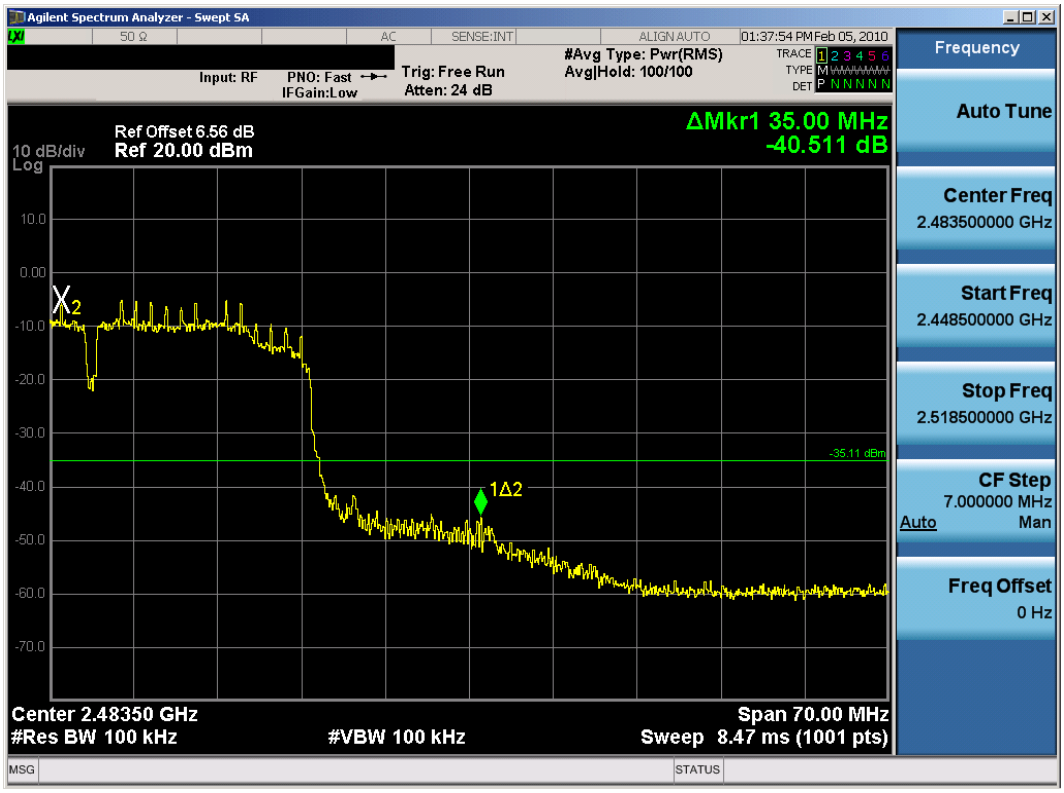
Plot 6-45. Band Edge Plot (802.11n (2.4GHz) – Ch. 3) – Chain B



Plot 6-46. Band Edge Plot (802.11n (2.4GHz) – Ch. 9) – Chain B

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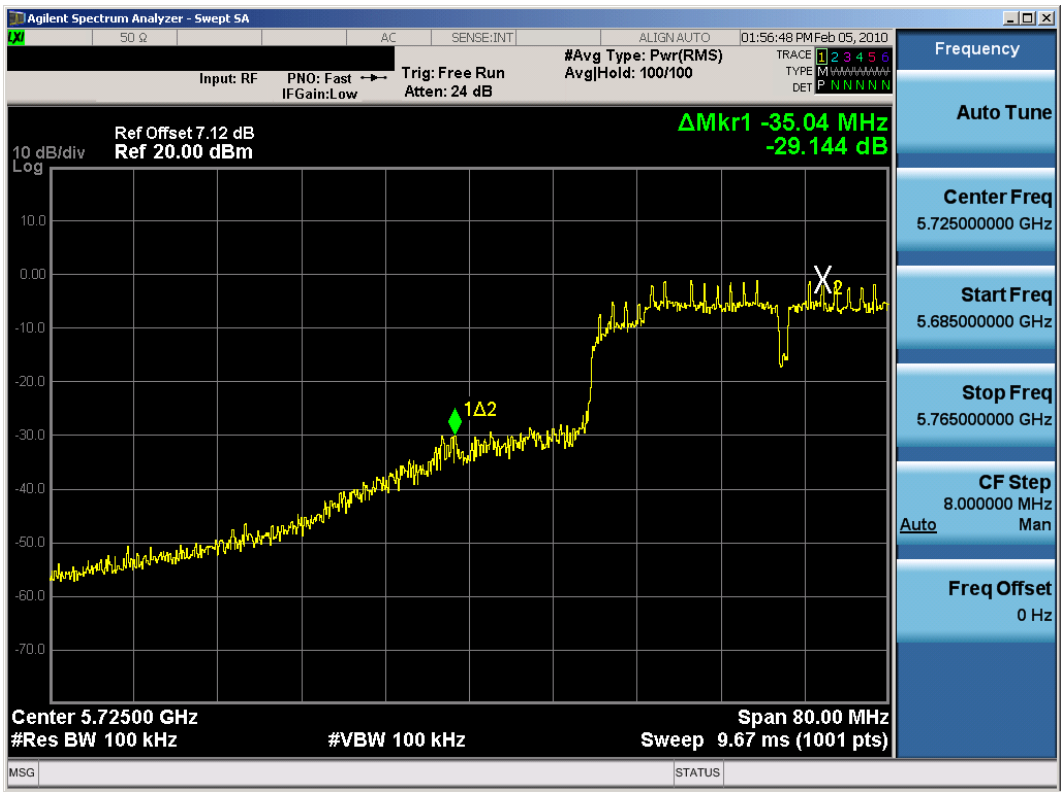
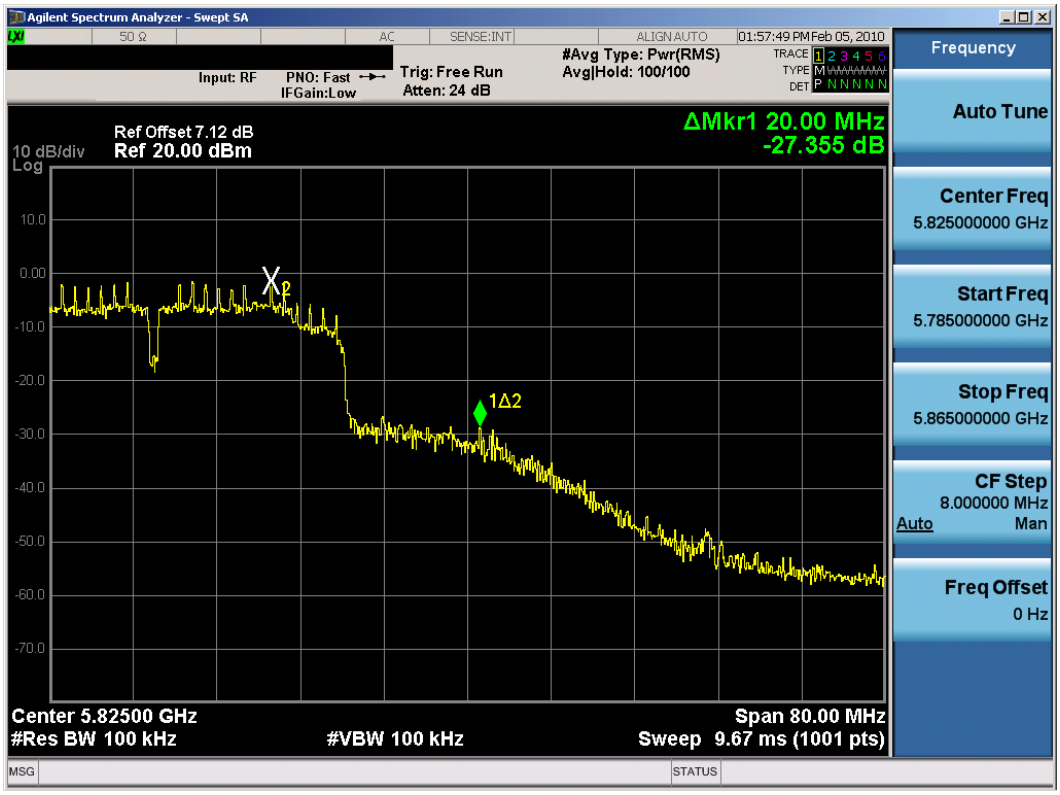


Plot 6-47. Band Edge Plot (802.11n (5.8GHz) – Ch. 151) – Chain B



Plot 6-48. Band Edge Plot (802.11n (5.8GHz) – Ch. 159) – Chain B

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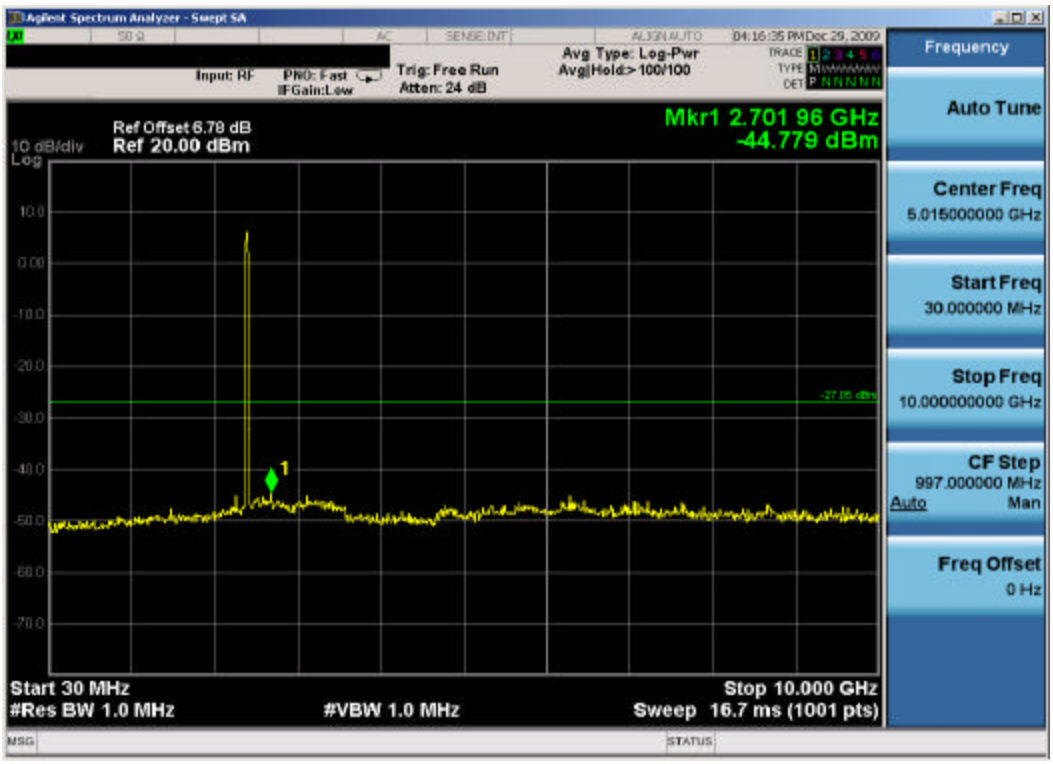
6.9 Out of Band Emissions

§15.247(d); RSS-210 [A8.5]

Out of band conducted spurious emissions plots are shown for 802.11g for the 2.4GHz operation for both Chains A and B as the conducted power in this mode is higher than the conducted power in the b and n modes therefore representing the worst case. The conducted spurious emissions of 802.11a mode (transmitting at 6Mbps) were also investigated as the worst case since the powers for Chain A and B are higher than in the 5.8GHz n mode.

Out of band spurious emissions are initially performed with a spectrum analyzer sweep up to 40GHz with a reduced resolution bandwidth (e.g. RBW = 100kHz) to determine whether or not there are any significant emissions present. If no significant emissions are detected the bandwidth is increased to an RBW of 1MHz for final measurement and data reporting. This procedure is performed for 35GHz to 40GHz as the noise floor is relatively high in this frequency range when using the final measurement bandwidth of 1MHz.



Plot 6-49. Conducted Spurious Plot (802.11g – Ch. 1) – Chain A

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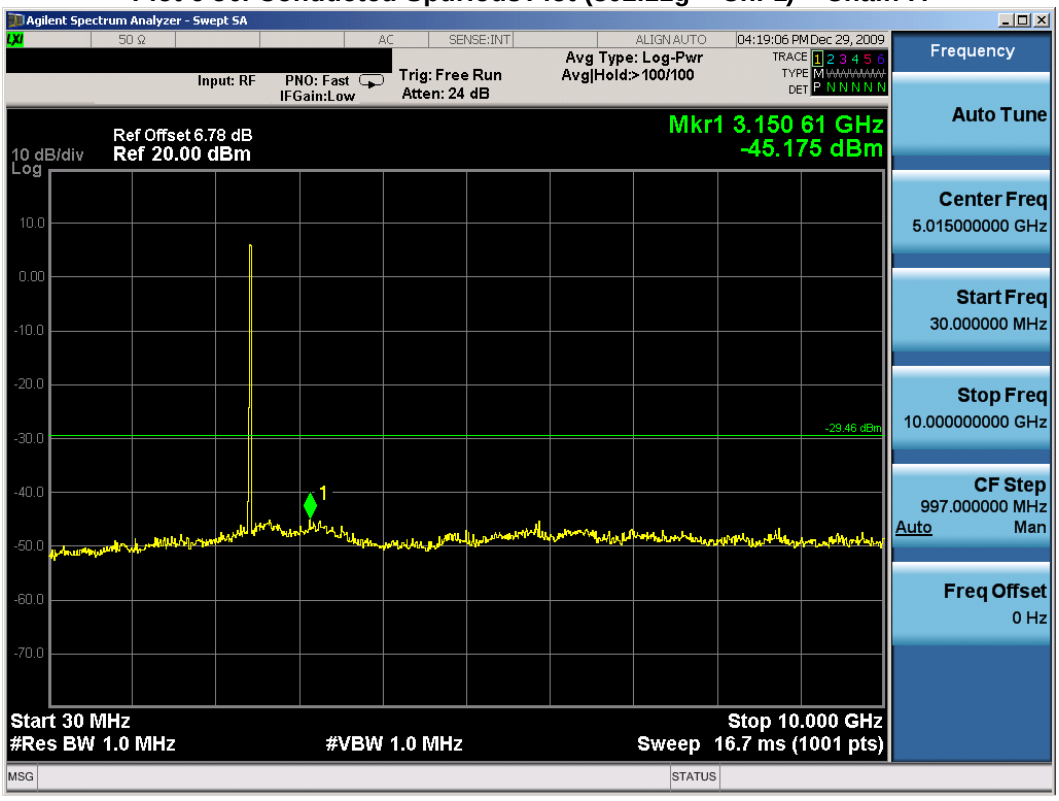
Plot 6-50. Conducted Spurious Plot (802.11g – Ch. 1) – Chain A



Plot 6-51. Conducted Spurious Plot (802.11g – Ch. 6) – Chain A

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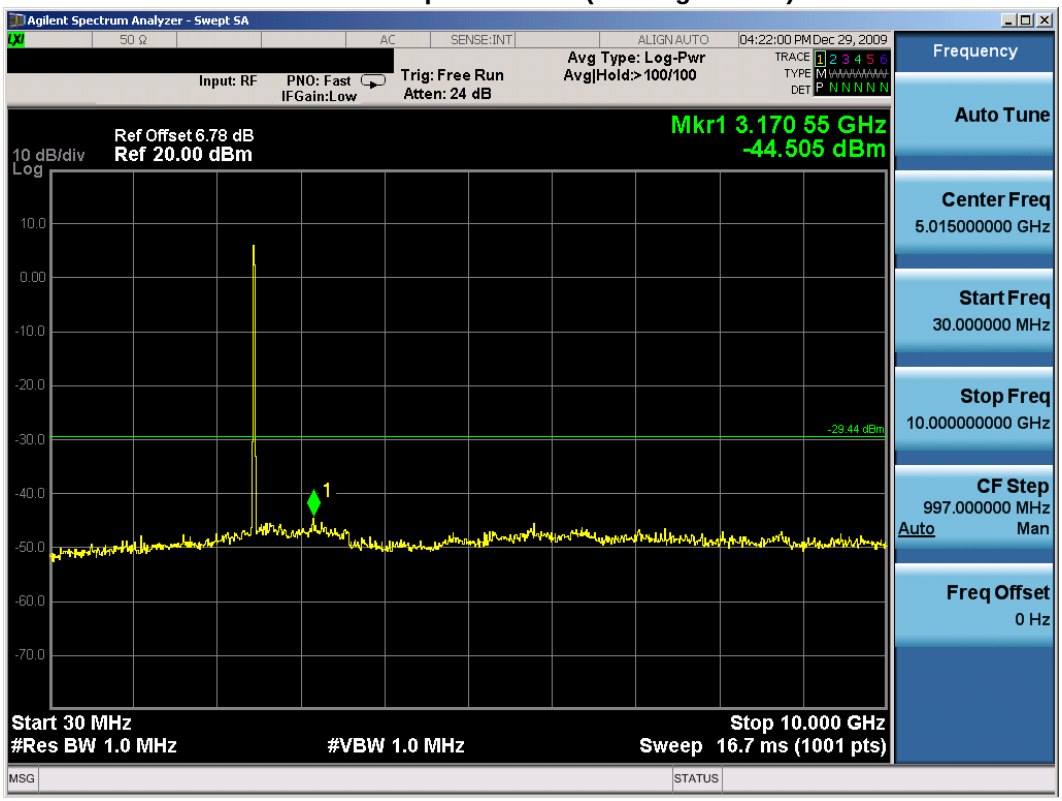
Plot 6-52. Conducted Spurious Plot (802.11g – Ch. 6) – Chain A



Plot 6-53. Conducted Spurious Plot (802.11g – Ch. 11) – Chain A

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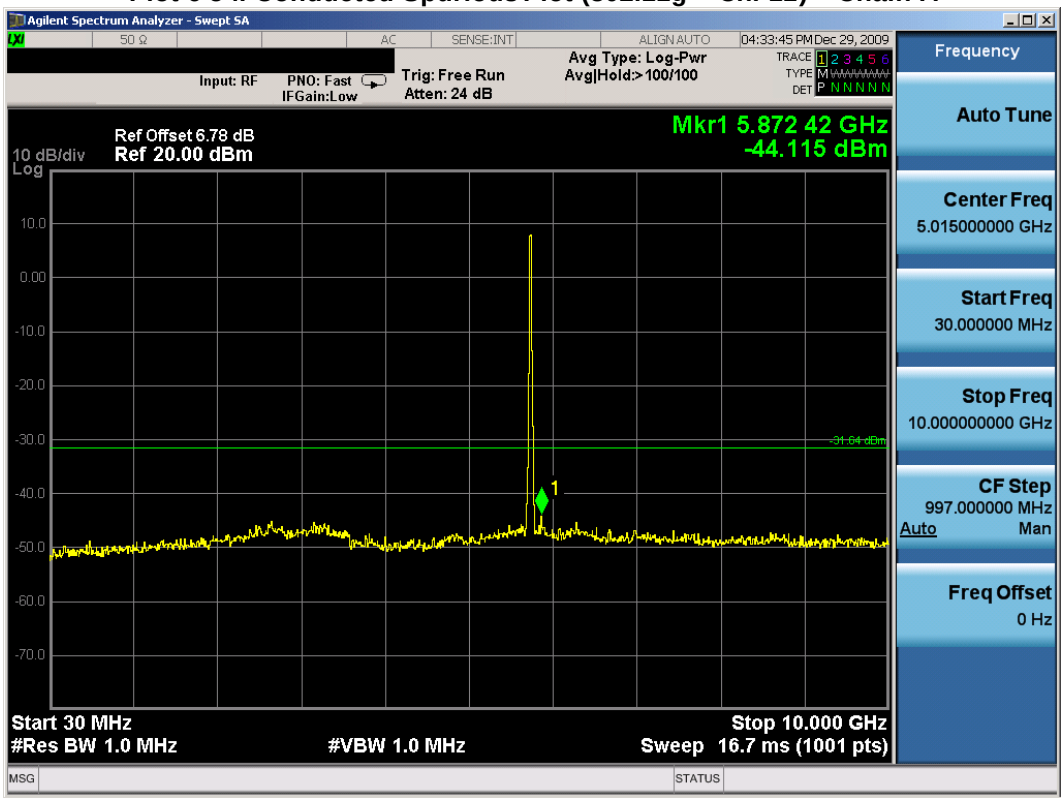
Plot 6-54. Conducted Spurious Plot (802.11g – Ch. 11) – Chain A



Plot 6-55. Conducted Spurious Plot (802.11a – Ch. 149) – Chain A

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Plot 6-56. Conducted Spurious Plot (802.11a – Ch. 149) – Chain A

Plot 6-57. Conducted Spurious Plot (802.11a – Ch. 149) – Chain A

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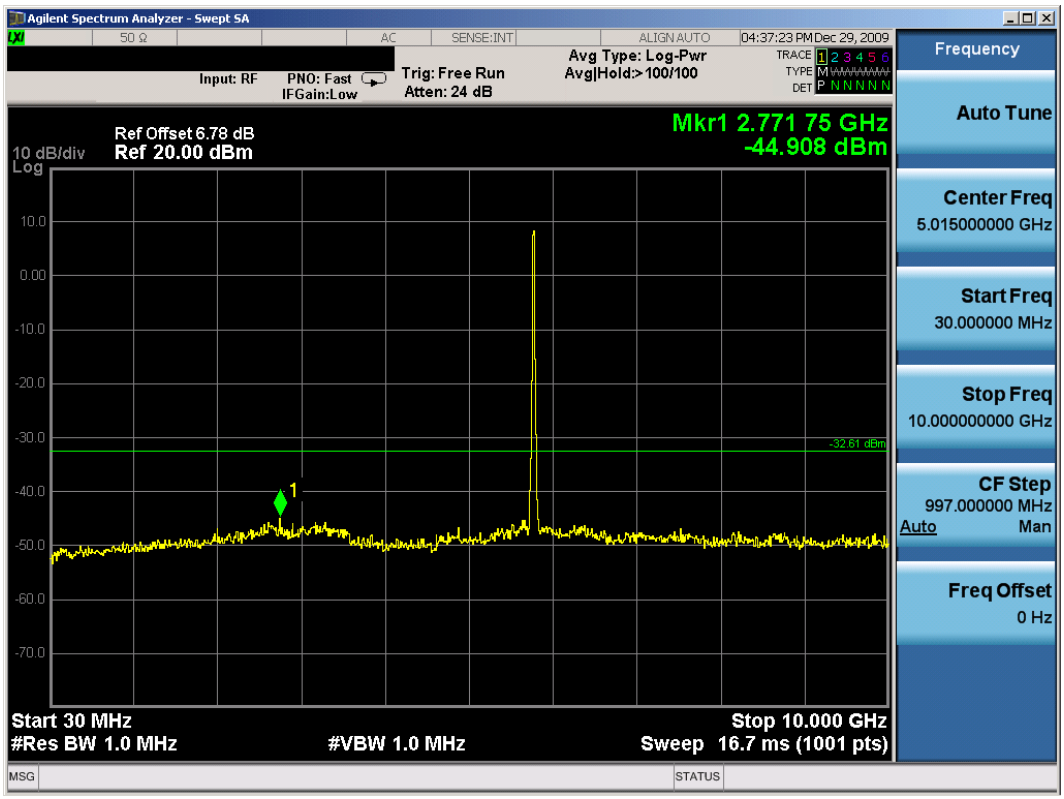

Plot 6-58. Conducted Spurious Plot (802.11a – Ch. 157) – Chain A

Plot 6-59. Conducted Spurious Plot (802.11a – Ch. 157) – Chain A

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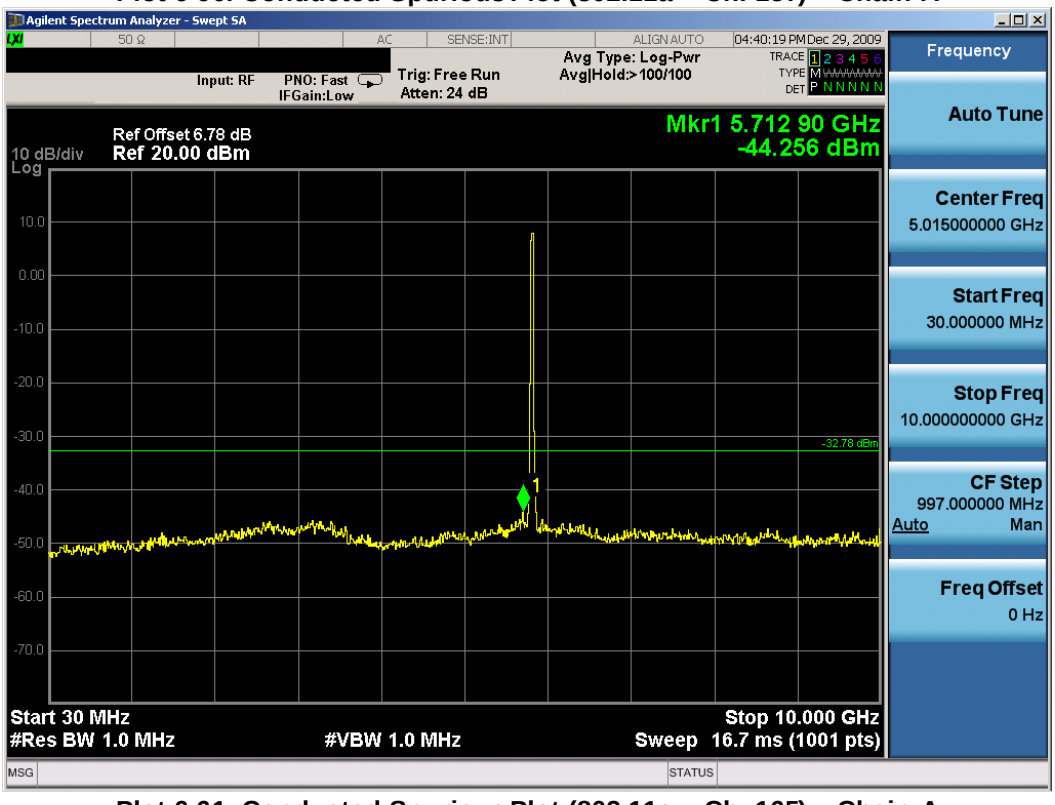
Plot 6-60. Conducted Spurious Plot (802.11a – Ch. 157) – Chain A



Plot 6-61. Conducted Spurious Plot (802.11a – Ch. 165) – Chain A

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Plot 6-62. Conducted Spurious Plot (802.11a – Ch. 165) – Chain A

Plot 6-63. Conducted Spurious Plot (802.11a – Ch. 165) – Chain A

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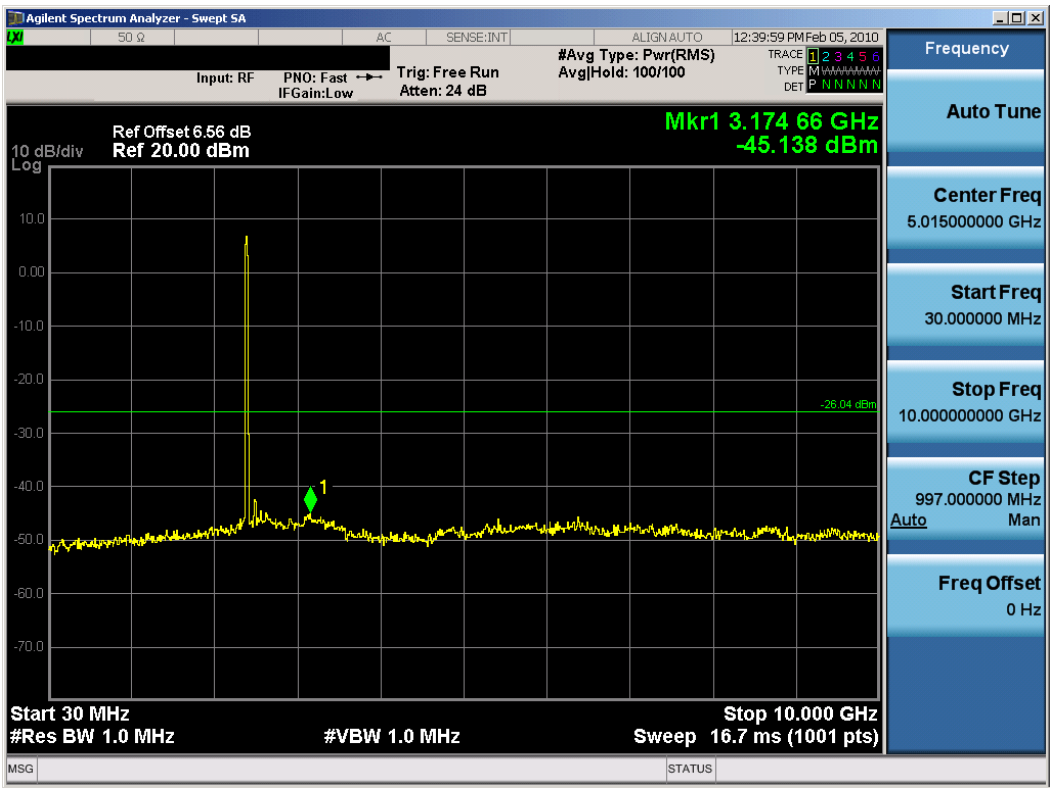

Plot 6-64. Conducted Spurious Plot (802.11g – Ch. 1) – Chain B

Plot 6-65. Conducted Spurious Plot (802.11g – Ch. 1) – Chain B

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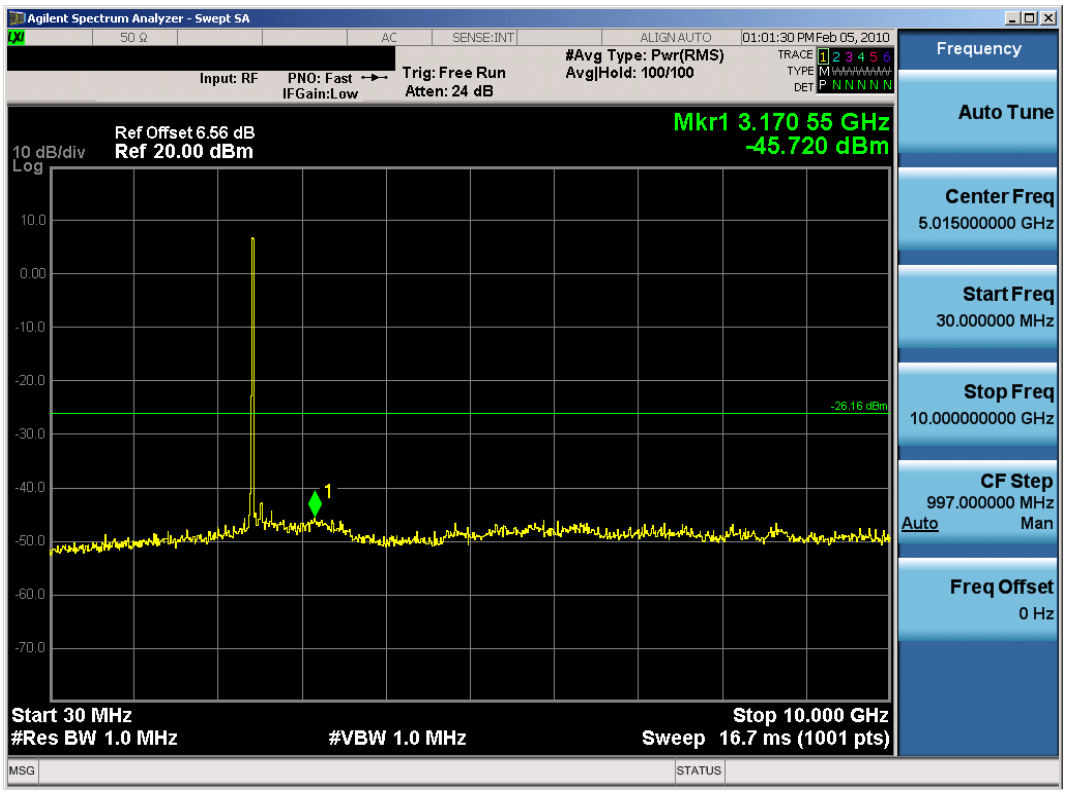

Plot 6-66. Conducted Spurious Plot (802.11g – Ch. 6) – Chain B

Plot 6-67. Conducted Spurious Plot (802.11g – Ch. 6) – Chain B

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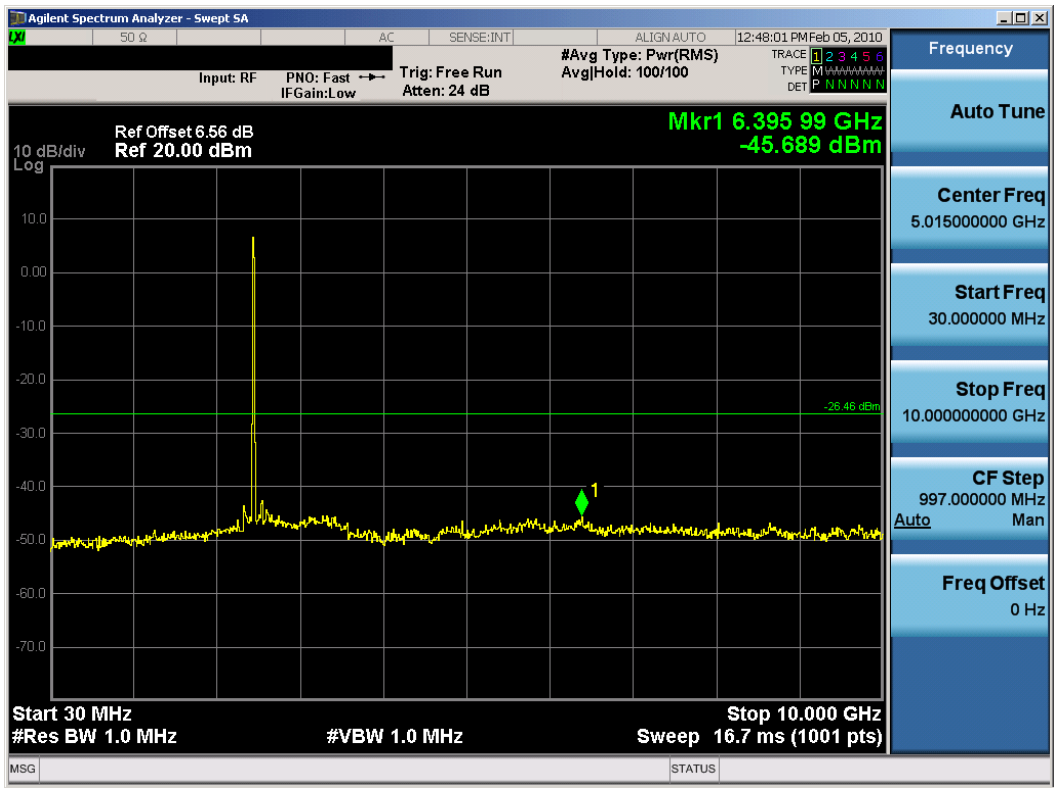
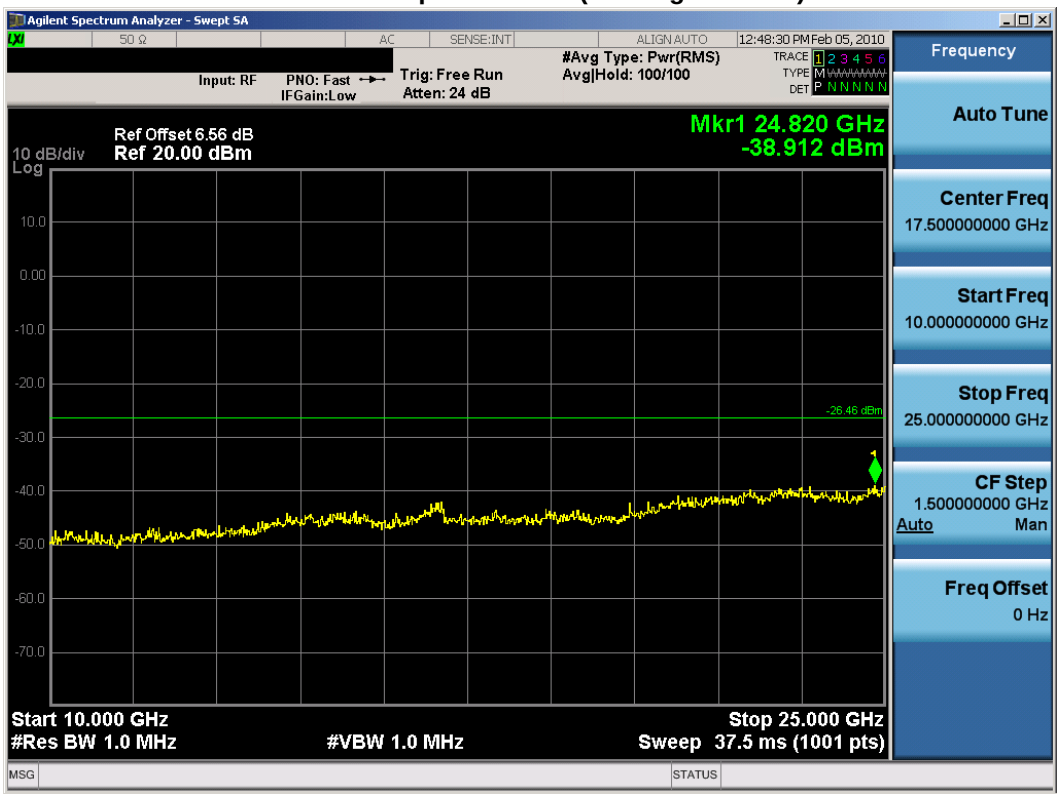


Plot 6-68. Conducted Spurious Plot (802.11g – Ch. 11) – Chain B



Plot 6-69. Conducted Spurious Plot (802.11g – Ch. 11) – Chain B

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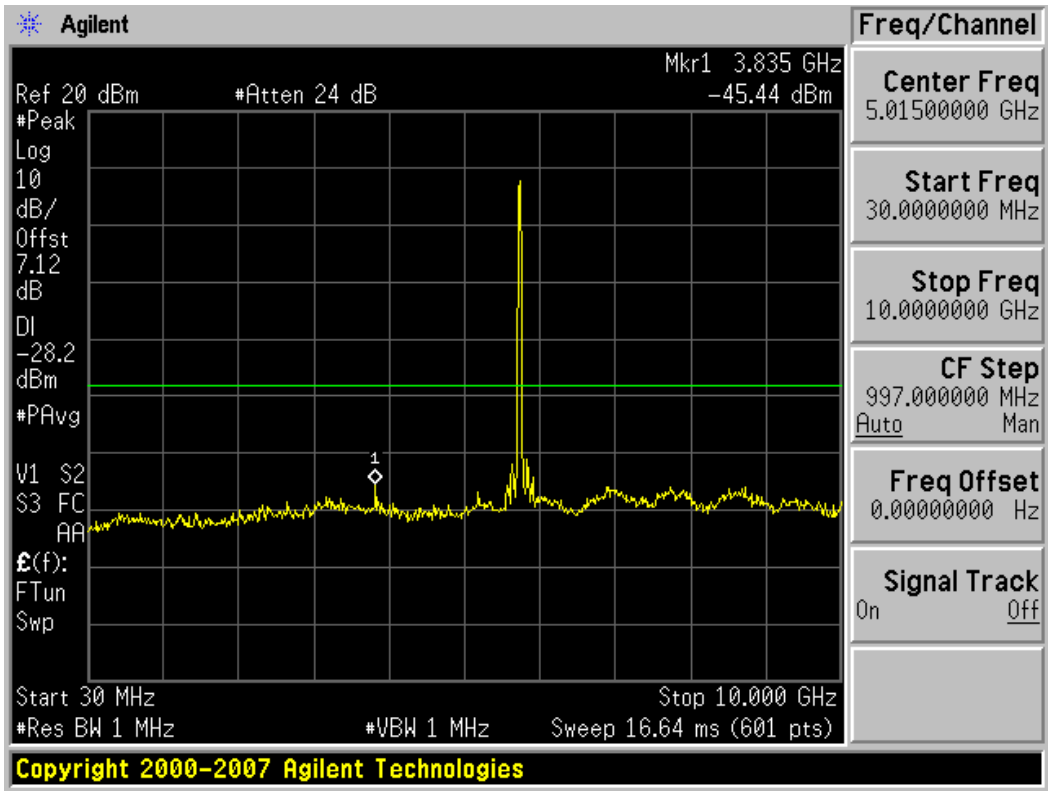

Plot 6-70. Conducted Spurious Plot (802.11a – Ch. 149) – Chain B

Plot 6-71. Conducted Spurious Plot (802.11a – Ch. 149) – Chain B

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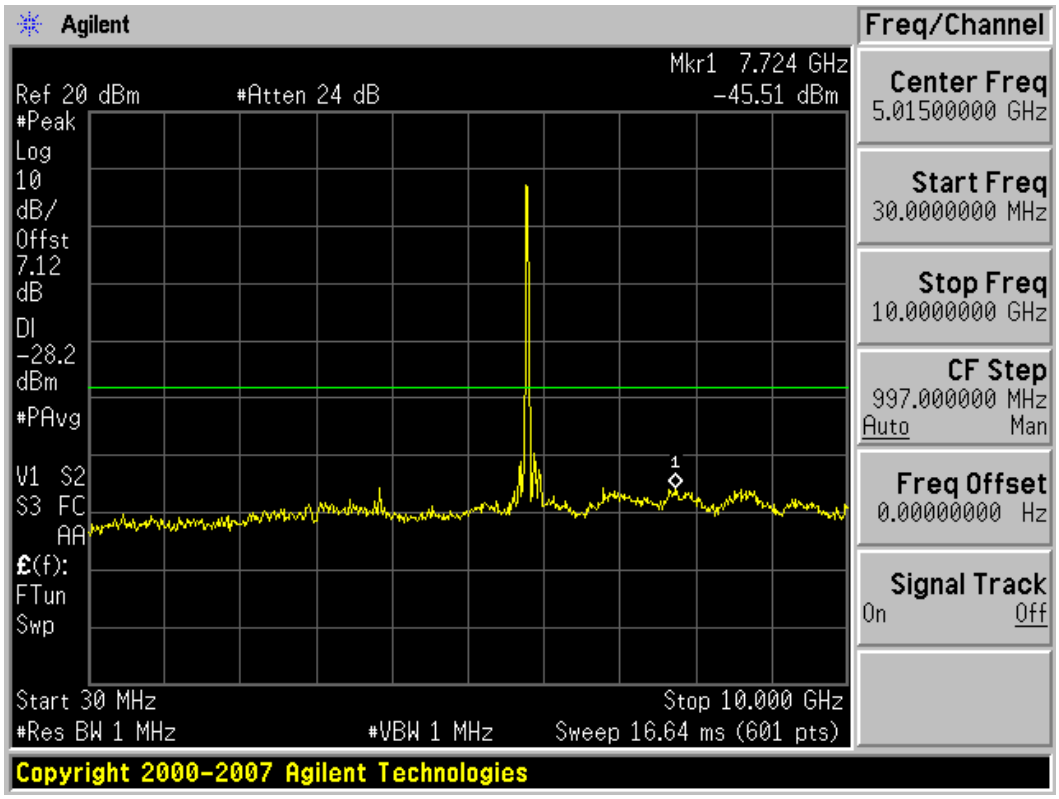

Plot 6-72. Conducted Spurious Plot (802.11a – Ch. 157) – Chain B

Plot 6-73. Conducted Spurious Plot (802.11a – Ch. 157) – Chain B

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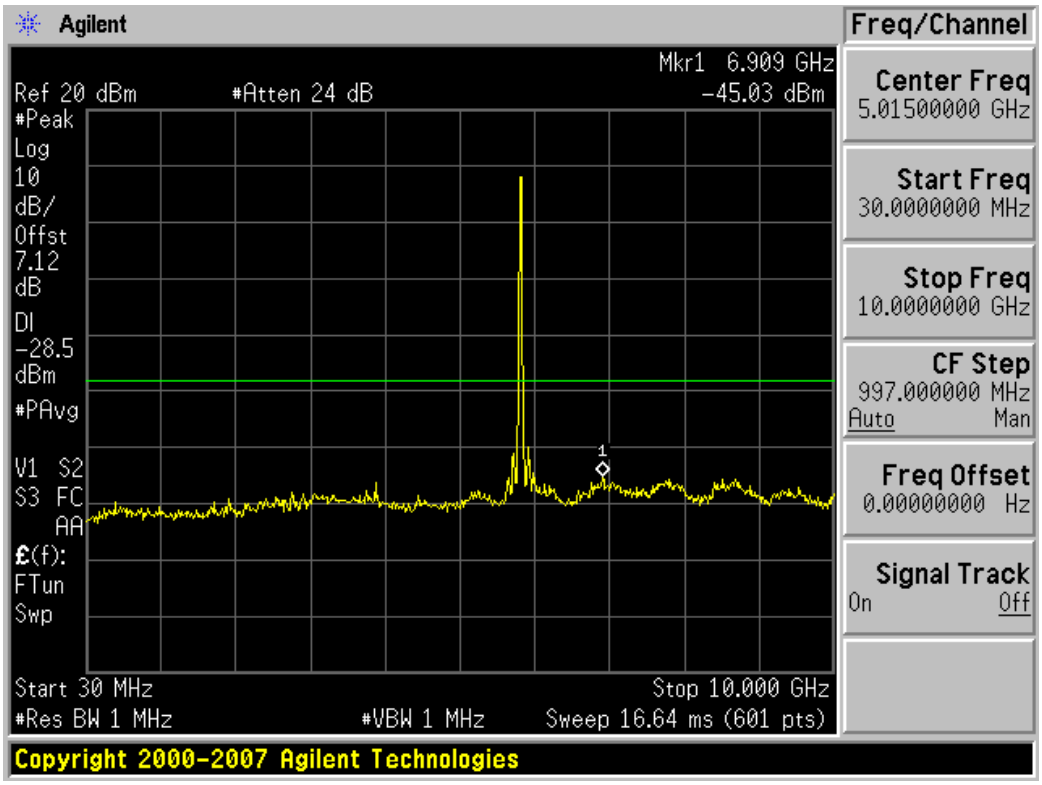
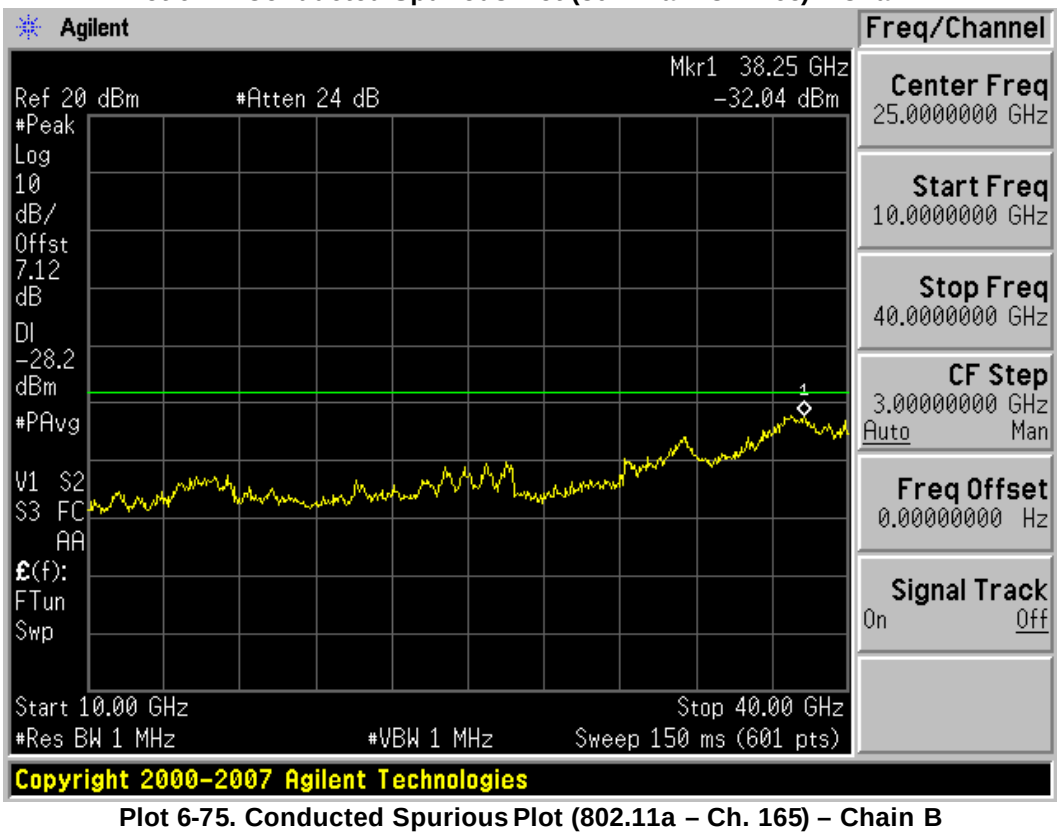


Plot 6-74. Conducted Spurious Plot (802.11a – Ch. 165) – Chain B



Plot 6-75. Conducted Spurious Plot (802.11a – Ch. 165) – Chain B

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6.10 Radiated Spurious Emission Measurements

§15.205, §15.209, §15.247(d); RSS-210 [A8.5]

The EUT was tested from 9kHz to the tenth harmonic of the fundamental frequency of the transmitter. Below 1GHZ a CISPR quasi peak detector was used. Above 1 GHz average measurements were taken, using RBW= 1MHz, VBW= 10Hz, and linearly polarized horn antennas. In addition, peak measurements (RBW= 1MHz, VBW= 1MHz) were taken to ensure that the peak levels are not more than 20dB above the average limit. No harmonics/spurs peak emissions are more than 20dB above the average limit. Special attention is taken for the EUT's harmonic and spurious radiated emissions in the restricted bands of operations, as defined in Section 15.205.

Frequency	Field Strength [mV/m]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400/F (kHz)	300
0.490 – 1.705 MHz	24000/F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3
Above 960.0 MHz	500	3

Table 6-21. Radiated Limits

Sample Calculation

- Field Strength Level $_{[dB\mu V/m]}$ = Analyzer Level $_{[dBm]}$ + 107 + AFCL $_{[dB]}$

Notes:

- AFCL = Antenna Factor $_{[dB]}$ + Cable Loss $_{[dB]}$

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Radiated Spurious Emission Measurements (Cont'd)

§15.205, §15.209, §15.247(d); RSS-210 [A8.5]

Mode: 802.11b

Transfer Rate: 1 Mbps

Distance of Measurements: 3 Meter

Operating Frequency: 2412MHz

Channel: 01

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
4824.00	-105.58	Avg	V	39.14	40.57	53.98	-13.41
4824.00	-96.49	Peak	V	39.14	49.66	73.98	-24.32
12060.00	-135.00	Avg	V	54.19	26.19	53.98	-27.79
12060.00	-125.00	Peak	V	54.19	36.19	73.98	-37.79

Table 6-22. Radiated Measurements @ 3 meter – Chain A

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
4824.00	-105.34	Avg	V	41.86	43.52	53.98	-10.45
4824.00	-96.49	Peak	V	41.86	52.37	73.98	-21.60
12060.00	-135.00	Avg	V	57.23	29.23	53.98	-24.74
12060.00	-125.00	Peak	V	57.23	39.23	73.98	-34.74

Table 6-23. Radiated Measurements @ 3 meter – Chain B

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Radiated Spurious Emission Measurements (Cont'd)

§15.205, §15.209, §15.247(d); RSS-210 [A8.5]

Mode:	802.11g
Transfer Rate:	13/14.4 Mbps (HT8)
Distance of Measurements:	3 Meter
Operating Frequency:	2412MHz
Channel:	01

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
4824.00	-106.01	Avg	V	41.86	42.85	53.98	-11.12
4824.00	-96.27	Peak	V	41.86	52.59	73.98	-21.38
12060.00	-135.00	Avg	V	57.23	29.23	53.98	-24.74
12060.00	-125.00	Peak	V	57.23	39.23	73.98	-34.74

Table 6-24. Radiated Measurements @ 3 meter – Chain A+B

NOTES:

1. All emissions shown lie in the restricted bands specified in §15.205 are below the limit shown in Table 6-21.
2. Data shown is for worst case mode and data rate. All modes 802.11b, g, and n were evaluated.
3. Average Measurements > 1GHz using RBW = 1MHz VBW = 10Hz
4. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
5. The EUT is supplied with nominal AC voltage and/or a new/fully-recharged battery.
6. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.
7. Levels at - 135 dBm represent the analyzer noise floor and signify that no emission was detected.
8. Above 960MHz the limit is 500 µV/m (54dBµ/m) at 3 meters radiated.

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Radiated Spurious Emission Measurements (Cont'd)

§15.205, §15.209, §15.247(d); RSS-210 [A8.5]

Mode: 802.11b

Transfer Rate: 1 Mbps

Distance of Measurements: 3 Meter

Operating Frequency: 2437MHz

Channel: 06

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
4874.00	-105.77	Avg	V	39.25	40.48	53.98	-13.50
4874.00	-96.52	Peak	V	39.25	49.73	73.98	-24.25
7311.00	-135.00	Avg	V	44.76	16.76	53.98	-37.22
7311.00	-125.00	Peak	V	44.76	26.76	73.98	-47.22
12185.00	-135.00	Avg	V	54.44	26.44	53.98	-27.54
12185.00	-125.00	Peak	V	54.44	36.44	73.98	-37.54

Table 6-25. Radiated Measurements @ 3 meter – Chain A

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
4874.00	-108.48	Avg	V	42.00	40.51	53.98	-13.47
4874.00	-99.04	Peak	V	42.00	49.95	73.98	-24.03
7311.00	-135.00	Avg	V	47.34	19.34	53.98	-34.64
7311.00	-125.00	Peak	V	47.34	29.34	73.98	-44.64
12185.00	-135.00	Avg	V	57.53	29.53	53.98	-24.45
12185.00	-125.00	Peak	V	57.53	39.53	73.98	-34.45

Table 6-26. Radiated Measurements @ 3 meter – Chain B

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Radiated Spurious Emission Measurements (Cont'd)

§15.205, §15.209, §15.247(d); RSS-210 [A8.5]

Mode:	802.11g
Transfer Rate:	13/14.4 Mbps (HT8)
Distance of Measurements:	3 Meter
Operating Frequency:	2437MHz
Channel:	06

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
4874.00	-111.64	Avg	V	42.00	37.35	53.98	-16.63
4874.00	-100.05	Peak	V	42.00	48.94	73.98	-25.04
7311.00	-135.00	Avg	V	47.34	19.34	53.98	-34.64
7311.00	-125.00	Peak	V	47.34	29.34	73.98	-44.64
12185.00	-135.00	Avg	V	57.53	29.53	53.98	-24.45
12185.00	-125.00	Peak	V	57.53	39.53	73.98	-34.45

Table 6-27. Radiated Measurements @ 3 meter – Chain A+B

NOTES:

1. All emissions shown lie in the restricted bands specified in §15.205 are below the limit shown in Table 6-21.
2. Data shown is for worst case mode and data rate. All modes 802.11b, g, and n were evaluated.
3. Average Measurements > 1GHz using RBW = 1MHz VBW = 10Hz
4. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
5. The EUT is supplied with nominal AC voltage and/or a new/fully-recharged battery.
6. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.
7. Levels at - 135 dBm represent the analyzer noise floor and signify that no emission was detected.
8. Above 960MHz the limit is 500 µV/m (54dBµ/m) at 3 meters radiated.

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Radiated Spurious Emission Measurements (Cont'd)

§15.205, §15.209, §15.247(d); RSS-210 [A8.5]

Mode: 802.11b

Transfer Rate: 1 Mbps

Distance of Measurements: 3 Meters

Operating Frequency: 2462MHz

Channel: 11

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
4924.00	-108.33	Avg	V	39.37	38.04	53.98	-15.94
4924.00	-98.58	Peak	V	39.37	47.79	73.98	-26.19
7386.00	-135.00	Avg	V	44.84	16.84	53.98	-37.14
7386.00	-125.00	Peak	V	44.84	26.84	73.98	-47.14
12310.00	-135.00	Avg	V	54.68	26.68	53.98	-27.30
12310.00	-125.00	Peak	V	54.68	36.68	73.98	-37.30

Table 6-28. Radiated Measurements @ 3 meter – Chain A

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
4924.00	-111.07	Avg	V	42.13	38.06	53.98	-15.92
4924.00	-99.41	Peak	V	42.13	49.72	73.98	-24.26
7386.00	-135.00	Avg	V	47.42	19.42	53.98	-34.56
7386.00	-125.00	Peak	V	47.42	29.42	73.98	-44.56
12310.00	-135.00	Avg	V	57.82	29.82	53.98	-24.16
12310.00	-125.00	Peak	V	57.82	39.82	73.98	-34.16

Table 6-29. Radiated Measurements @ 3 meter – Chain B

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Radiated Spurious Emission Measurements (Cont'd)

§15.205, §15.209, §15.247(d); RSS-210 [A8.5]

Mode: 802.11g

Transfer Rate: 13/14.4 Mbps (HT8)

Distance of Measurements: 3 Meter

Operating Frequency: 2462MHz

Channel: 11

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
4924.00	-111.33	Avg	V	42.13	37.80	53.98	-16.18
4924.00	-99.91	Peak	V	42.13	49.22	73.98	-24.76
7386.00	-135.00	Avg	V	47.42	19.42	53.98	-34.56
7386.00	-125.00	Peak	V	47.42	29.42	73.98	-44.56
12310.00	-135.00	Avg	V	57.82	29.82	53.98	-24.16
12310.00	-125.00	Peak	V	57.82	39.82	73.98	-34.16

Table 6-30. Radiated Measurements @ 3 meter – Chain A+B

NOTES:

1. All emissions shown lie in the restricted bands specified in §15.205 are below the limit shown in Table 6-21.
2. Data shown is for worst case mode and data rate. All modes 802.11b, g, and n were evaluated.
3. Average Measurements > 1GHz using RBW = 1MHz VBW = 10Hz
4. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
5. The EUT is supplied with nominal AC voltage and/or a new/fully-recharged battery.
6. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.
7. Levels at - 135 dBm represent the analyzer noise floor and signify that no emission was detected.
8. Above 960MHz the limit is 500 µV/m (54dBµ/m) at 3 meters radiated.

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Radiated Spurious Emission Measurements (Cont'd)

§15.205, §15.209, §15.247(d); RSS-210 [A8.5]

Mode: 802.11a

Transfer Rate: 6 Mbps

Distance of Measurements: 3 Meter

Operating Frequency: 5745MHz

Channel: 149

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
11490.00	-106.84	Avg	H	48.13	48.29	53.98	-5.69
11490.00	-97.56	Peak	H	48.13	57.57	73.98	-16.41
22980.00	-135.00	Avg	H	48.23	20.23	53.98	-33.75
22980.00	-125.00	Peak	H	48.23	30.23	73.98	-43.75

Table 6-31. Radiated Measurements @ 3 meter – Chain A.

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
11490.00	-107.58	Avg	V	48.13	47.55	53.98	-6.43
11490.00	-97.29	Peak	V	48.13	57.84	73.98	-16.14
22980.00	-135.00	Avg	V	48.23	20.23	53.98	-33.75
22980.00	-125.00	Peak	V	48.23	30.23	73.98	-43.75

Table 6-32. Radiated Measurements @ 3 meter – Chain B

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Radiated Spurious Emission Measurements (Cont'd)

§15.205, §15.209, §15.247(d); RSS-210 [A8.5]

Mode: 802.11a

Transfer Rate: 13/14.4 Mbps (HT8)

Distance of Measurements: 3 Meter

Operating Frequency: 5745MHz

Channel: 149

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
11490.00	-107.45	Avg	V	48.13	47.68	53.98	-6.30
11490.00	-97.67	Peak	V	48.13	57.46	73.98	-16.52
22980.00	-135.00	Avg	V	48.23	20.23	53.98	-33.75
22980.00	-125.00	Peak	V	48.23	30.23	73.98	-43.75

Table 6-33. Radiated Measurements @ 3 meter – Chain A+B

NOTES:

1. All emissions shown lie in the restricted bands specified in §15.205 are below the limit shown in Table 6-21.

2. Average Measurements > 1GHz using RBW = 1MHz VBW = 10Hz

3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.

4. The EUT is supplied with nominal AC voltage and/or a new/fully-recharged battery.

5. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.

6. Levels at - 135 dBm represent the analyzer noise floor and signify that no emission was detected.

7. Above 960MHz the limit is 500 µV/m (54dBµ/m) at 3 meters radiated.

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Radiated Spurious Emission Measurements (Cont'd)

§15.205, §15.209, §15.247(d); RSS-210 [A8.5]

Mode: 802.11a

Transfer Rate: 6 Mbps

Distance of Measurements: 3 Meter

Operating Frequency: 5785MHz

Channel: 157

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
11570.00	-107.35	Avg	H	48.42	48.07	53.98	-5.91
11570.00	-96.97	Peak	H	48.42	58.45	73.98	-15.53

Table 6-34. Radiated Measurements @ 3 meter – Chain A

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
11570.00	-107.80	Avg	V	48.42	47.62	53.98	-6.36
11570.00	-97.92	Peak	V	48.42	57.50	73.98	-16.48

Table 6-35. Radiated Measurements @ 3 meter – Chain B

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Radiated Spurious Emission Measurements (Cont'd)

§15.205, §15.209, §15.247(d); RSS-210 [A8.5]

Mode:	802.11a
Transfer Rate:	13/14.4 Mbps (HT8)
Distance of Measurements:	3 Meter
Operating Frequency:	5785 MHz
Channel:	157

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
11570.00	-107.52	Avg	V	48.42	47.90	53.98	-6.08
11570.00	-97.86	Peak	V	48.42	57.56	73.98	-16.42

Table 6-36. Radiated Measurements @ 3 meter – Chain A+B

NOTES:

1. All emissions shown lie in the restricted bands specified in §15.205 are below the limit shown in Table 6-21.

2. Average Measurements > 1GHz using RBW = 1MHz VBW = 10Hz

3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.

4. The EUT is supplied with nominal AC voltage and/or a new/fully-recharged battery.

5. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.

6. Levels at - 135 dBm represent the analyzer noise floor and signify that no emission was detected.

7. Above 960MHz the limit is 500 µV/m (54dBµ/m) at 3 meters radiated.

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Radiated Spurious Emission Measurements (Cont'd)

§15.205, §15.209, §15.247(d); RSS-210 [A8.5]

Mode: 802.11a

Transfer Rate: 6 Mbps

Distance of Measurements: 3 Meter

Operating Frequency: 5825MHz

Channel: 165

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
11650.00	-107.43	Avg	H	48.73	48.30	53.98	-5.68
11650.00	-97.66	Peak	H	48.73	58.07	73.98	-15.91

Table 6-37. Radiated Measurements @ 3 meter – Chain A

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
11650.00	-107.47	Avg	V	48.73	48.26	53.98	-5.72
11650.00	-97.85	Peak	V	48.73	57.88	73.98	-16.10

Table 6-38. Radiated Measurements @ 3 meter – Chain B

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Radiated Spurious Emission Measurements (Cont'd)

§15.205, §15.209, §15.247(d); RSS-210 [A8.5]

Mode:	802.11a
Transfer Rate:	13/14.4 Mbps (HT8)
Distance of Measurements:	3 Meter
Operating Frequency:	5825 MHz
Channel:	165

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
11650.00	-107.39	Avg	V	48.73	48.34	53.98	-5.64
11650.00	-96.67	Peak	V	48.73	59.06	73.98	-14.92

Table 6-39. Radiated Measurements @ 3 meter – Chain A+B

NOTES:

1. All emissions shown lie in the restricted bands specified in §15.205 are below the limit shown in Table 6-21.

2. Average Measurements > 1GHz using RBW = 1MHz VBW = 10Hz

3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.

4. The EUT is supplied with nominal AC voltage and/or a new/fully-recharged battery.

5. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.

6. Levels at - 135 dBm represent the analyzer noise floor and signify that no emission was detected.

7. Above 960MHz the limit is 500 µV/m (54dBµ/m) at 3 meters radiated.

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6.11 Radiated Restricted Band Edge Measurements

§15.205, §15.209, §15.247(d); RSS-210 [A8.5]

Lower Band Edge:

Mode: 802.11g

Transfer Rate: 6 Mbps

Distance of Measurements: 3 Meters

Operating Frequency: 2412MHz

Channel: 1

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
2388.70	-99.38	Avg	H	33.11	40.73	53.98	-13.25
2388.70	-81.84	Peak	H	33.11	58.27	73.98	-15.71
2389.40	-97.73	Avg	H	33.11	42.39	53.98	-11.59
2389.40	-77.78	Peak	H	33.11	62.34	73.98	-11.64
2389.80	-96.65	Avg	H	33.11	43.47	53.98	-10.51
2389.80	-75.72	Peak	H	33.11	64.40	73.98	-9.58

Table 6-40. Radiated Restricted Band Measurements at 3-meters – Chain A

Mode: 802.11n

Transfer Rate: 13.5/15 Mbps (HT0)

Distance of Measurements: 3 Meters

Operating Frequency: 2422MHz

Channel: 3

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
2388.20	-96.87	Avg	H	33.11	43.24	53.98	-10.74
2388.20	-82.05	Peak	H	33.11	58.06	73.98	-15.92
2388.70	-95.11	Avg	H	33.11	45.00	53.98	-8.98
2388.70	-80.20	Peak	H	33.11	59.91	73.98	-14.07
2389.75	-94.30	Avg	H	33.11	45.82	53.98	-8.16
2389.75	-79.53	Peak	H	33.11	60.59	73.98	-13.39

Table 6-41. Radiated Restricted Band Measurements at 3-meters – Chain B

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Radiated Spurious Emission Measurements (Cont'd)

§15.205, §15.209, §15.247(d); RSS-210 [A8.5]

Mode: 802.11n

Transfer Rate: 27/30 Mbps (HT8)

Distance of Measurements: 3 Meters

Operating Frequency: 2422MHz

Channel: 3

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
2387.50	-96.76	Avg	H	33.10	43.35	53.98	-10.63
2387.50	-78.26	Peak	H	33.10	61.85	73.98	-12.13
2388.70	-96.09	Avg	H	33.11	44.02	53.98	-9.96
2388.70	-74.04	Peak	H	33.11	66.07	73.98	-7.91
2389.80	-95.34	Avg	H	33.11	44.78	53.98	-9.20
2389.80	-76.08	Peak	H	33.11	64.04	73.98	-9.94

Table 6-42. Radiated Restricted Band Measurements at 3-meters – Chain A+B

NOTES:

1. All emissions shown lie in the restricted bands specified in §15.205 are below the limit shown in Table 6-21.
2. Data shown is for worst case mode and data rate. All modes 802.11b, g, and n were evaluated.
3. Average Measurements > 1GHz using RBW = 1MHz VBW = 10Hz
4. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
5. The EUT is supplied with nominal AC voltage and/or a new/fully-recharged battery.
6. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.
7. Levels at - 135 dBm represent the analyzer noise floor and signify that no emission was detected.
8. Above 960MHz the limit is 500 µV/m (54dBµ/m) at 3 meters radiated.

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Upper Band Edge:

Mode: 802.11n

Transfer Rate: 13.5/15 Mbps (HT0)

Distance of Measurements: 3 Meters

Operating Frequency: 2452MHz

Channel: 9

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
2483.60	-96.82	Avg	H	33.05	43.23	53.98	-10.75
2483.60	-79.73	Peak	H	33.05	60.32	73.98	-13.66
2484.30	-96.96	Avg	H	33.06	43.10	53.98	-10.88
2484.30	-80.47	Peak	H	33.06	59.59	73.98	-14.39
2485.10	-97.23	Avg	H	33.06	42.83	53.98	-11.15
2485.10	-82.27	Peak	H	33.06	57.79	73.98	-16.19

Table 6-43. Radiated Restricted Band Measurements at 3-meters – Chain A

Mode: 802.11n

Transfer Rate: 13.5/15 Mbps (HT0)

Distance of Measurements: 3 Meters

Operating Frequency: 2452MHz

Channel: 9

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
2483.70	-93.57	Avg	H	33.05	46.48	53.98	-7.50
2483.70	-78.97	Peak	H	33.05	61.08	73.98	-12.90
2484.50	-93.73	Avg	H	33.06	46.33	53.98	-7.65
2484.50	-80.10	Peak	H	33.06	59.96	73.98	-14.02
2485.20	-93.85	Avg	H	33.06	46.21	53.98	-7.77
2485.20	-80.16	Peak	H	33.06	59.90	73.98	-14.08

Table 6-44. Radiated Restricted Band Measurements at 3-meters – Chain B

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Radiated Spurious Emission Measurements (Cont'd)

§15.205, §15.209, §15.247(d); RSS-210 [A8.5]

Mode: 802.11n

Transfer Rate: 27/30 Mbps (HT8)

Distance of Measurements: 3 Meters

Operating Frequency: 2452MHz

Channel: 9

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol. [H/V]	AFCL [dB]	Field Strength [dBmV/m]	Limit [dBmV/m]	Margin [dB]
2484.30	-96.92	Avg	H	33.06	43.14	53.98	-10.84
2484.30	-80.90	Peak	H	33.06	59.16	73.98	-14.82
2484.80	-96.99	Avg	H	33.06	43.07	53.98	-10.91
2484.80	-81.30	Peak	H	33.06	58.76	73.98	-15.22
2485.10	-97.04	Avg	H	33.06	43.02	53.98	-10.96
2485.10	-81.38	Peak	H	33.06	58.68	73.98	-15.30

Table 6-45. Radiated Restricted Band Measurements at 3-meters – Chain A+B

NOTES:

1. All emissions shown lie in the restricted bands specified in §15.205 are below the limit shown in Table 6-21.
2. Data shown is for worst case mode and data rate. All modes 802.11b, g, and n were evaluated.
3. Average Measurements > 1GHz using RBW = 1MHz VBW = 10Hz
4. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
5. The EUT is supplied with nominal AC voltage and/or a new/fully-recharged battery.
6. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.
7. Levels at - 135 dBm represent the analyzer noise floor and signify that no emission was detected.
8. Above 960MHz the limit is 500 µV/m (54dBµ/m) at 3 meters radiated.

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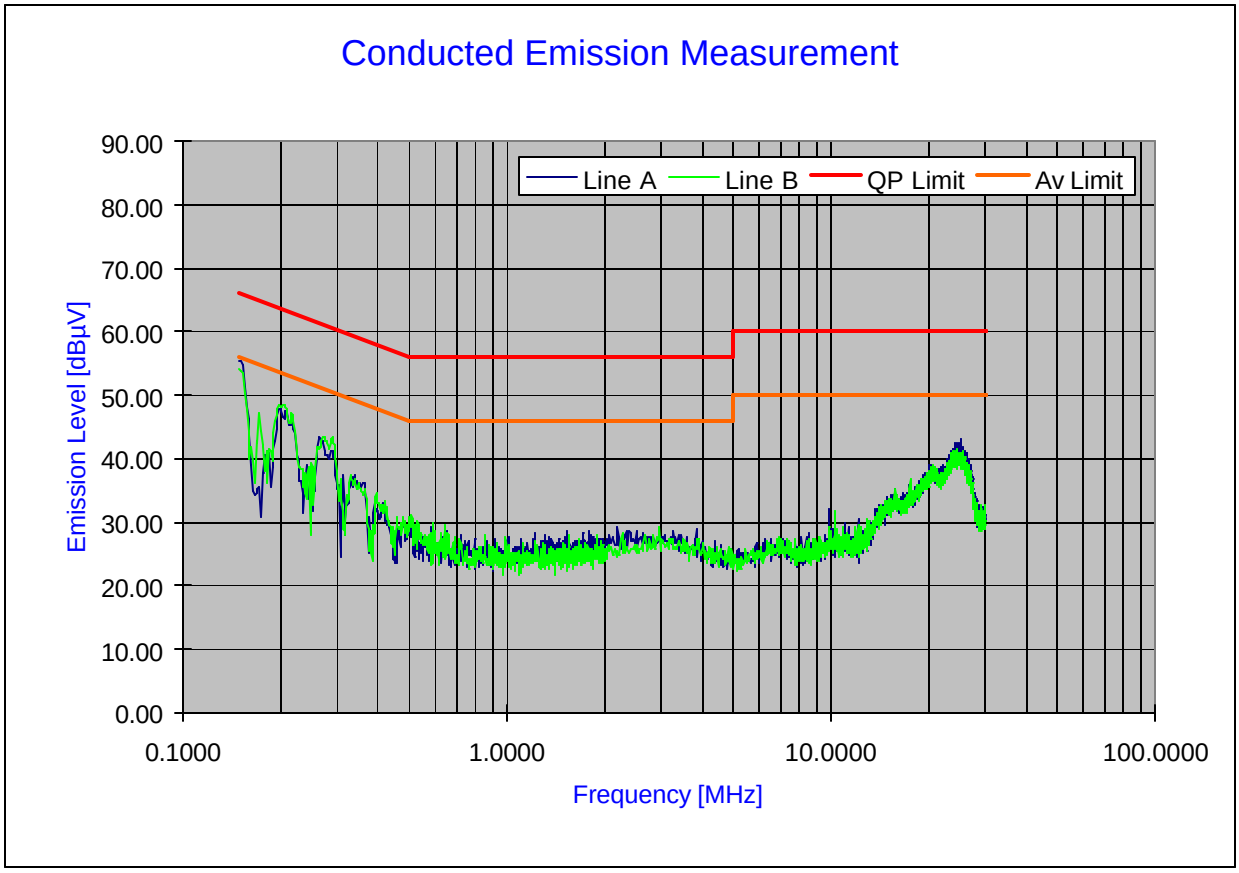
6.12 Line-Conducted Test Data

§15.207; RSS-Gen [7.2.2]

PCTEST Engineering Laboratory Inc.

Company : Panasonic Corporation
Model Number : CF-S91
FCC ID Code : ACJ9TGCF-S91
Standard : FCC Part 15C, 15.207

Power Source : AC120V/60Hz
Tested Date : 06/22/2010
Note : Tested with WLAN b ON



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Plot 6-76. Line Conducted Plot with 802.11b

Notes:

1. All Modes of operation were investigated and the worst-case emissions are reported with a 1Mbps data rate.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Line A = Phase; Line B = Neutral
4. Traces shown in plot are made using a peak detector.
5. Deviations to the Specifications: None.

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Line-Conducted Test Data (Cont'd)

§15.207; RSS-Gen [7.2.2]

No.	Line	Frequency	Factor	QP	Limit	Margin	Average	Limit	Margin
		[MHz]	[dB]	[dBµV]	[dBµV]	[dB]	[dBµV]	[dBµV]	[dB]
1	A	0.150	6.85	57.69	66.00	-8.31	43.56	56.00	-12.44
2	A	0.202	6.87	44.73	63.53	-18.80	31.67	53.53	-21.86
3	A	0.265	6.90	37.80	61.29	-23.49	26.31	51.29	-24.98
4	A	23.690	8.92	36.45	60.00	-23.55	30.29	50.00	-19.71
5	A	23.915	8.95	36.64	60.00	-23.36	30.66	50.00	-19.34
6	A	24.178	8.98	36.73	60.00	-23.27	30.80	50.00	-19.20
7	A	24.434	9.00	36.70	60.00	-23.30	30.89	50.00	-19.11
8	A	25.164	9.08	36.33	60.00	-23.67	30.34	50.00	-19.66
9	A	25.830	9.15	35.60	60.00	-24.40	29.48	50.00	-20.52
10	A	26.087	9.18	35.29	60.00	-24.71	28.96	50.00	-21.04
11	B	0.150	6.84	58.41	66.00	-7.59	43.34	56.00	-12.66
12	B	0.156	6.84	45.55	65.70	-20.15	31.52	55.70	-24.18
13	B	0.202	6.87	45.28	63.53	-18.25	30.24	53.53	-23.29
14	B	0.203	6.87	45.20	63.52	-18.32	32.52	53.52	-21.00
15	B	0.267	6.90	38.90	61.20	-22.30	26.60	51.20	-24.60
16	B	0.271	6.90	38.48	61.08	-22.60	26.34	51.08	-24.74
17	B	23.854	9.08	35.66	60.00	-24.34	30.14	50.00	-19.86
18	B	24.078	9.10	35.92	60.00	-24.08	29.91	50.00	-20.09
19	B	24.382	9.14	35.74	60.00	-24.26	30.19	50.00	-19.81
20	B	25.388	9.26	35.36	60.00	-24.64	29.27	50.00	-20.73

Table 6-46. Line Conducted Data with 802.11b

Notes:

1. All Modes of operation were investigated and the worst-case emissions are reported with a 1Mbps data rate.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Line A = Phase; Line B = Neutral
4. Traces shown in plot are made using a peak detector.
5. Deviations to the Specifications: None.

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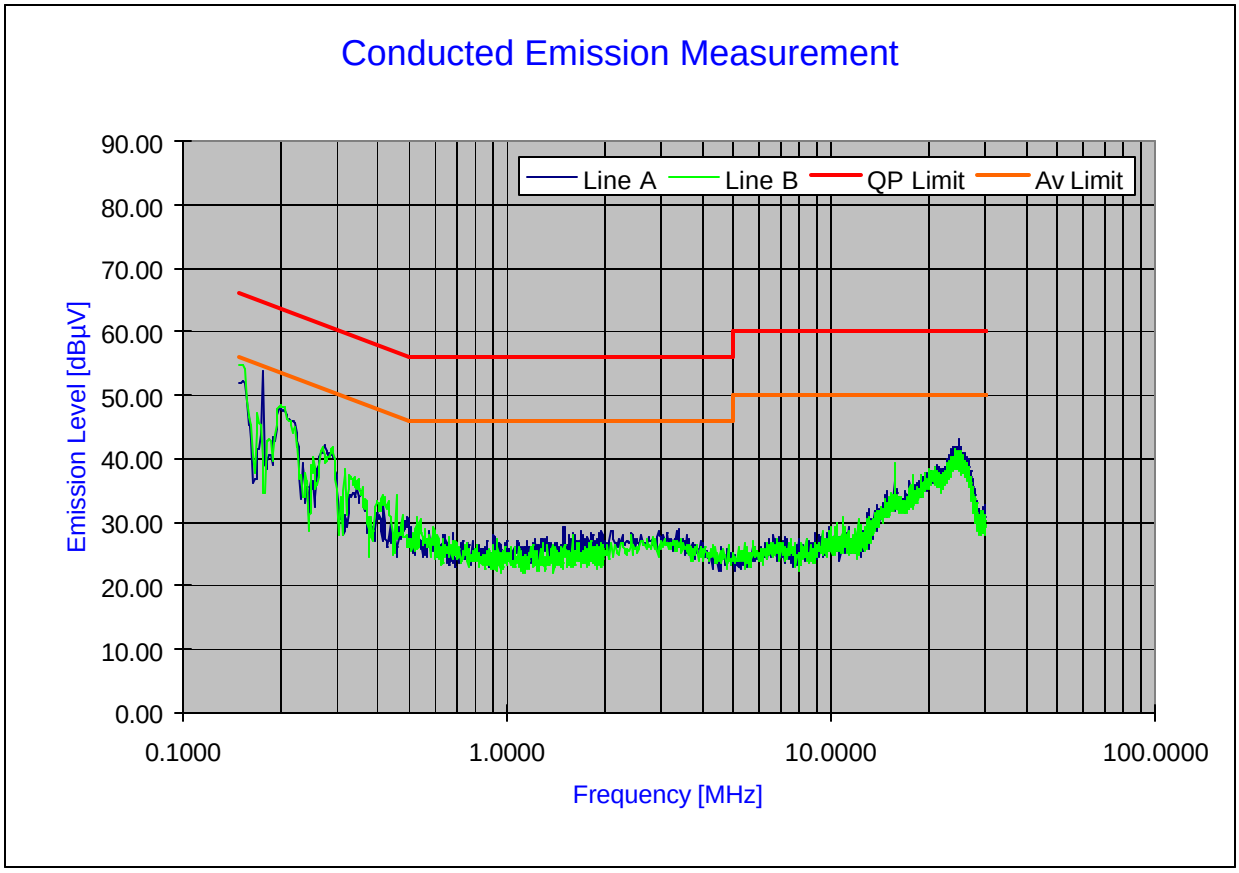
Line-Conducted Test Data (Cont'd)
§15.207; RSS-Gen [7.2.2]

PCTEST Engineering Laboratory Inc.

Company : Panasonic Corporation
Model Number : CF-S91
FCC ID Code : ACJ9TGCF-S91
Standard : FCC Part 15C, 15.207

Power Source : AC120V/60Hz
Tested Date : 06/22/2010
Note : Tested with WLAN g ON



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Plot 6-77. Line Conducted Plot with 802.11g

Notes:

1. All Modes of operation were investigated and the worst-case emissions are reported with a 6Mbps data rate.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Line A = Phase; Line B = Neutral
4. Traces shown in plot are made using a peak detector.
5. Deviations to the Specifications: None.

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Line-Conducted Test Data (Cont'd)

§15.207; RSS-Gen [7.2.2]

No.	Line	Frequency	Factor	QP	Limit	Margin	Average	Limit	Margin
		[MHz]	[dB]	[dBµV]	[dBµV]	[dB]	[dBµV]	[dBµV]	[dB]
1	A	0.150	6.85	56.56	66.00	-9.44	41.60	56.00	-14.40
2	A	0.159	6.85	45.48	65.51	-20.03	30.87	55.51	-24.64
3	A	0.199	6.87	43.55	63.64	-20.09	28.48	53.64	-25.16
4	A	0.267	6.90	37.29	61.22	-23.93	24.98	51.22	-26.24
5	A	23.196	8.86	35.20	60.00	-24.80	29.02	50.00	-20.98
6	A	24.751	9.04	36.53	60.00	-23.47	30.89	50.00	-19.11
7	A	24.819	9.04	36.30	60.00	-23.70	29.96	50.00	-20.04
8	A	25.584	9.13	35.70	60.00	-24.30	29.58	50.00	-20.42
9	A	25.866	9.16	35.41	60.00	-24.59	28.81	50.00	-21.19
10	A	26.035	9.17	35.19	60.00	-24.81	28.38	50.00	-21.62
11	B	0.150	6.84	57.37	66.00	-8.63	42.32	56.00	-13.68
12	B	0.152	6.84	47.68	65.89	-18.21	31.11	55.89	-24.78
13	B	0.203	6.87	44.79	63.48	-18.69	31.46	53.48	-22.02
14	B	0.287	6.91	37.47	60.62	-23.15	25.24	50.62	-25.38
15	B	24.034	9.10	35.30	60.00	-24.70	29.17	50.00	-20.83
16	B	24.199	9.12	35.45	60.00	-24.55	29.08	50.00	-20.92
17	B	24.200	9.12	35.52	60.00	-24.48	29.09	50.00	-20.91
18	B	24.555	9.16	35.63	60.00	-24.37	29.57	50.00	-20.43
19	B	24.556	9.16	35.74	60.00	-24.26	29.20	50.00	-20.80
20	B	24.997	9.22	35.18	60.00	-24.82	28.93	50.00	-21.07

Table 6-47. Line Conducted Data with 802.11g

Notes:

1. All Modes of operation were investigated and the worst-case emissions are reported with a 6Mbps data rate.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Line A = Phase; Line B = Neutral
4. Traces shown in plot are made using a peak detector.
5. Deviations to the Specifications: None.

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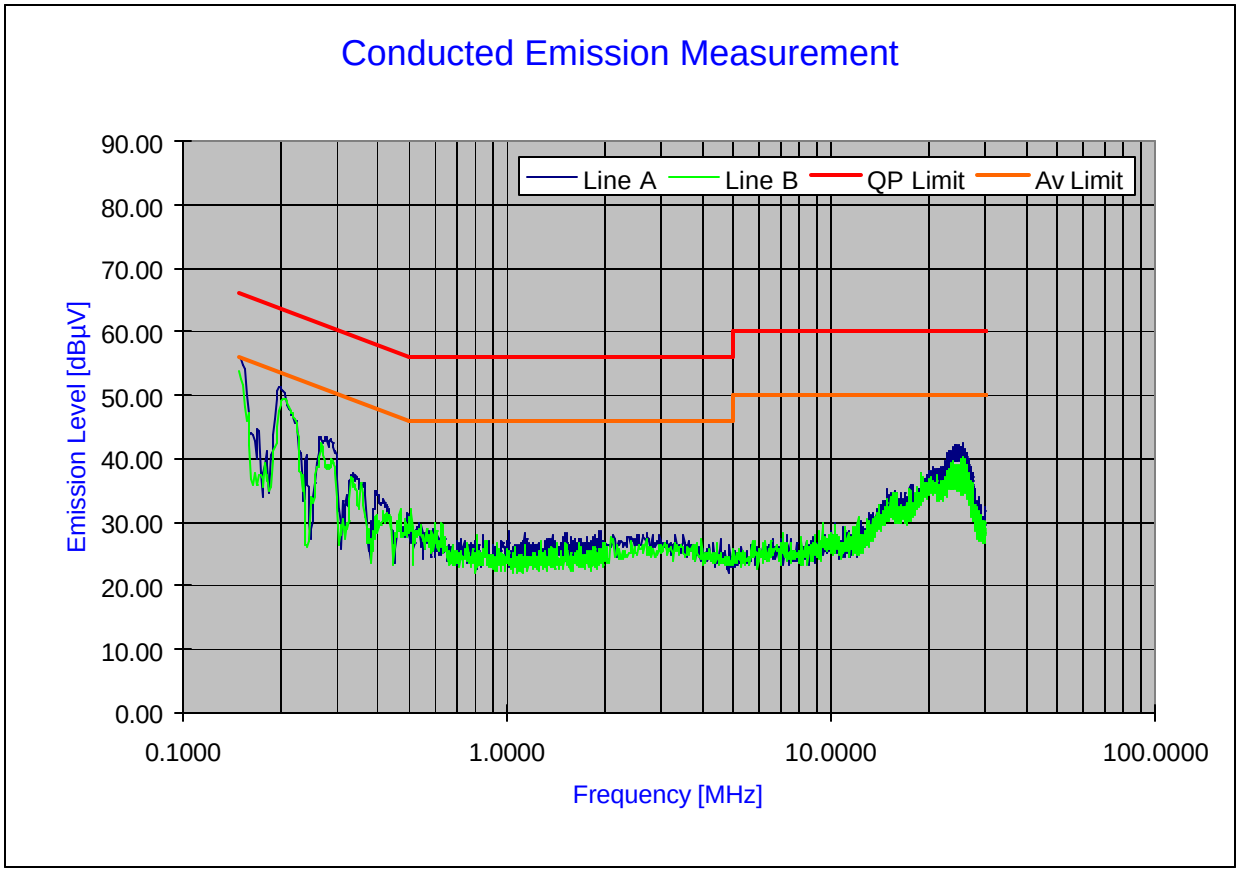
Line-Conducted Test Data (Cont'd)
§15.207; RSS-Gen [7.2.2]

PCTEST Engineering Laboratory Inc.

Company : Panasonic Corporation
Model Number : CF-S91
FCC ID Code : ACJ9TGCF-S91
Standard : FCC Part 15C, 15.207

Power Source : AC120V/60Hz
Tested Date : 06/22/2010
Note : Tested with WLAN a ON



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Plot 6-78. Line Conducted Plot with 802.11a

Notes:

1. All Modes of operation were investigated and the worst-case emissions are reported with a 6Mbps data rate.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Line A = Phase; Line B = Neutral
4. Traces shown in plot are made using a peak detector.
5. Deviations to the Specifications: None.

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Line-Conducted Test Data (Cont'd)

§15.207; RSS-Gen [7.2.2]

No.	Line	Frequency	Factor	QP	Limit	Margin	Average	Limit	Margin
		[MHz]	[dB]	[dBµV]	[dBµV]	[dB]	[dBµV]	[dBµV]	[dB]
1	A	0.150	6.85	59.31	66.00	-6.69	43.34	56.00	-12.66
2	A	0.202	6.87	46.87	63.53	-16.66	30.41	53.53	-23.12
3	A	0.267	6.90	37.96	61.22	-23.26	24.26	51.22	-26.96
4	A	0.268	6.90	38.23	61.21	-22.98	24.78	51.21	-26.43
5	A	23.131	8.86	34.81	60.00	-25.19	27.32	50.00	-22.68
6	A	23.338	8.88	35.13	60.00	-24.87	27.57	50.00	-22.43
7	A	24.128	8.97	36.17	60.00	-23.83	28.28	50.00	-21.72
8	A	24.492	9.01	35.97	60.00	-24.03	28.03	50.00	-21.97
9	A	25.397	9.11	35.66	60.00	-24.34	28.05	50.00	-21.95
10	A	25.905	9.16	34.75	60.00	-25.25	26.95	50.00	-23.05
11	B	0.150	6.84	57.91	66.00	-8.09	42.50	56.00	-13.50
12	B	0.202	6.87	46.35	63.53	-17.18	33.30	53.53	-20.23
13	B	0.267	6.90	36.06	61.22	-25.16	24.26	51.22	-26.96
14	B	23.258	9.00	33.85	60.00	-26.15	25.33	50.00	-24.67
15	B	23.857	9.08	36.35	60.00	-23.65	25.94	50.00	-24.06
16	B	25.179	9.24	32.77	60.00	-27.23	25.94	50.00	-24.06
17	B	25.538	9.28	33.69	60.00	-26.31	26.53	50.00	-23.47
18	B	25.667	9.29	32.79	60.00	-27.21	25.79	50.00	-24.21
19	B	26.073	9.34	32.81	60.00	-27.19	24.55	50.00	-25.45
20	B	26.251	9.36	32.67	60.00	-27.33	24.63	50.00	-25.37

Table 6-48. Line Conducted Data with 802.11a

Notes:

1. All Modes of operation were investigated and the worst-case emissions are reported with a 6Mbps data rate.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Line A = Phase; Line B = Neutral
4. Traces shown in plot are made using a peak detector.
5. Deviations to the Specifications: None.

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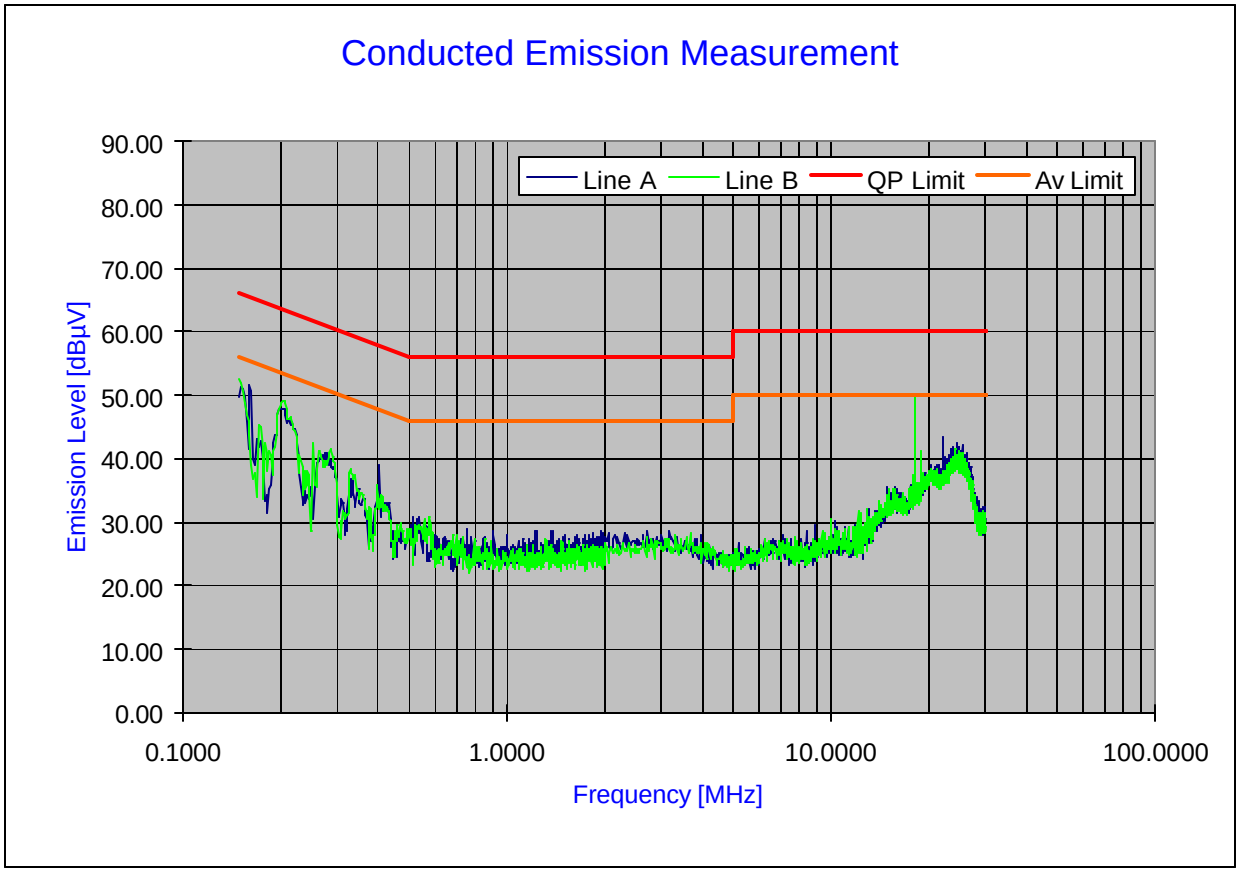
Line-Conducted Test Data (Cont'd)
§15.207; RSS-Gen [7.2.2]

PCTEST Engineering Laboratory Inc.

Company : Panasonic Corporation
Model Number : CF-S91
FCC ID Code : ACJ9TGCF-S91
Standard : FCC Part 15C, 15.207

Power Source : AC120V/60Hz
Tested Date : 06/22/2010
Note : Tested with WLAN n ON



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Plot 6-79. Line Conducted Plot with 802.11n

Notes:

1. All Modes of operation were investigated and the worst-case emissions are reported with a 13/14.4Mbps data rate.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Line A = Phase; Line B = Neutral
4. Traces shown in plot are made using a peak detector.
5. Deviations to the Specifications: None.

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Line-Conducted Test Data (Cont'd)

§15.207; RSS-Gen [7.2.2]

No.	Line	Frequency	Factor	QP	Limit	Margin	Average	Limit	Margin
		[MHz]	[dB]	[dBµV]	[dBµV]	[dB]	[dBµV]	[dBµV]	[dB]
1	A	0.150	6.85	54.97	66.00	-11.03	33.51	56.00	-22.49
2	A	0.151	6.85	56.60	66.00	-9.40	42.73	56.00	-13.27
3	A	0.199	6.87	44.11	63.66	-19.55	31.94	53.66	-21.72
4	A	0.394	6.94	28.93	57.98	-29.05	20.36	47.98	-27.62
5	A	22.152	8.74	33.37	60.00	-26.63	27.43	50.00	-22.57
6	A	24.492	9.01	36.70	60.00	-23.30	30.44	50.00	-19.56
7	A	24.872	9.05	36.21	60.00	-23.79	30.13	50.00	-19.87
8	A	25.328	9.10	35.85	60.00	-24.15	29.68	50.00	-20.32
9	A	25.517	9.12	35.78	60.00	-24.22	29.36	50.00	-20.64
10	A	26.067	9.18	35.25	60.00	-24.75	28.83	50.00	-21.17
11	B	0.150	6.84	57.77	66.00	-8.23	44.47	56.00	-11.53
12	B	0.198	6.87	45.56	63.70	-18.14	31.15	53.70	-22.55
13	B	0.269	6.90	37.98	61.14	-23.16	24.49	51.14	-26.65
14	B	0.282	6.91	37.76	60.77	-23.01	26.23	50.77	-24.54
15	B	18.294	8.42	32.35	60.00	-27.65	24.28	50.00	-25.72
16	B	18.931	8.47	36.84	60.00	-23.16	27.24	50.00	-22.76
17	B	24.081	9.10	35.50	60.00	-24.50	29.75	50.00	-20.25
18	B	24.562	9.16	35.79	60.00	-24.21	30.03	50.00	-19.97
19	B	24.926	9.21	35.51	60.00	-24.49	29.74	50.00	-20.26
20	B	25.397	9.26	35.14	60.00	-24.86	28.99	50.00	-21.01

Table 6-49. Line Conducted Data with 802.11n

Notes:

1. All Modes of operation were investigated and the worst-case emissions are reported with a 13/14.4Mbps data rate.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Line A = Phase; Line B = Neutral
4. Traces shown in plot are made using a peak detector.
5. Deviations to the Specifications: None.

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7.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Panasonic Toughbook Model: CF-S9 FCC ID: ACJ9TGCF-S91** is in compliance with Part 15C of the FCC Rules and RSS-210 of the Industry Canada Rules.

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