MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
914 WEST PATAPSCO AVENUE ● BALTIMORE, MARYLAND 21230-3432 ● PHONE (410) 354-3300 ● FAX (410) 354-3313
33439 WESTERN AVENUE ● UNION CITY, CALIFORNIA 94587 ● PHONE (510) 489-6300 ● FAX (510) 489-6372
3162 BELICK STREET ● SANTA CLARA, CALIFORNIA 95054 ● PHONE (408 748-3585 ● FAX (510) 489-6372

August 8, 2011

Motorola Solutions, Inc.
1064 Greenwood Blvd. Suite 400
Lake Mary, FL 32746

Dear Tom Costello,

Enclosed is the EMC Wireless test report for compliance testing of the Motorola Solutions, Inc., AP-7161, tested to the requirements of Title 47 of the Code of Federal Regulations (CFR), Part 90 Subpart Y for Land Mobile Radio Services and RSS-111, Issue 3, June 2009.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
MET LABORATORIES, INC.

Jennifer Warnell
Documentation Department

Reference: (\Motorola Solutions, Inc.\EMC30461-FCC90Y Rev. 1)

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Electromagnetic Compatibility Criteria Test Report

For the

Motorola Solutions, Inc.
AP-7161

Tested under

The FCC Verification Rules
Contained in Title 47 of the CFR, Part 90, Subpart Y
for Private Land Mobile Radio Services
and
RSS-111, Issue 3, June 2009

MET Report: EMC30461-FCC90Y Rev. 1

August 8, 2011

Prepared For:
Motorola Solutions, Inc.
1064 Greenwood Blvd. Suite 400
Lake Mary, FL 32746

Prepared By:
MET Laboratories, Inc.
914 W. Patapsco Ave.
Baltimore, MD 21230

Electromagnetic Compatibility Criteria
Test Report

For the

Motorola Solutions, Inc.
AP-7161

Tested under

The FCC Verification Rules
Contained in Title 47 of the CFR, Part 90, Subpart Y
for Private Land Mobile Radio Services
and
RSS-111, Issue 3, June 2009

MET Report: EMC30461-FCC90Y Rev. 1

Jeff Pratt, Project Engineer
Electromagnetic Compatibility Lab

Jennifer Warnell
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is / is not capable of operation in accordance with the requirements of Part 90, Subpart Y of the FCC Rules and Industry Canada standard RSS-111, Issue 3, June 2009 under normal use and maintenance.

Shawn McMillen,
Wireless Manager, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
0	May 11, 2011	Initial issue.
1	August 8, 2011	Revised to reflect editorial corrections.

Table of Contents

All references to section numbers are taken directly from the standard/specification used. Only sections requiring testing or evaluation are included.

List of Tables

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**ert**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ert**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**microh**enry
µ	**microf**arad
µs	**micros**econds
NEBS	**N**etwork **E**quipment-**B**uilding **S**ystem
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

Executive Summary

1. Testing Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 90, Subpart Y. All tests were conducted using measurement procedure ANSI TIA/EIA-603-A-2004.

Title 47 of the CFR, Part 90, Subpart Y, and FCC 04-265 Reference and Test Description	RSS-111, Issue 3, June 2009 Reference	Conformance			Comments
		Yes	No	N/A	
		Yes - Equipment complies with the Requirement *No - Equipment does not comply with the Requirement* *N/A - Not applicable to the equipment under tests*			
2.1046; 90.1215(a) Peak Power Output	RSS-111, Section 5.3	✓			Measured emissions below applicable limits.
2.1046; 90.1215(a) Peak Power Spectral Density	RSS-111, Section 4.2	✓			Measured emissions below applicable limits.
2.1047(a) Modulation Characteristics	N/A			✓	EUT is non-voice, data only.
2.1049; 90.210(L) Occupied Bandwidth (Emission Mask)	RSS-111, Section 5.3	✓			Measured emissions below applicable limits.
2.1051; 90.210(L) Spurious Emissions at Antenna Terminals	RSS-111, Section 5.4	✓			Measured emissions below applicable limits.
2.1053; 90.210(L) Radiated Spurious Emissions	RSS-111, Section 5.4	✓			Measured emissions below applicable limits.
2.1055(a) (1); 90.213 Frequency Stability over Temperature Variations	RSS-111, Section 5.2	✓			Measured emissions below applicable limits.
2.1055(d) (2) Frequency Stability over Voltage Variations	RSS-111, Section 5.2	✓			Measured emissions below applicable limits.
90.214 Transient Frequency Behavior	RSS-111, Section 5.2			✓	EUT operating frequency is at 4.9 GHz.

Equipment Configuration

2. Equipment Configuration

2.1. Overview

MET Laboratories, Inc. was contracted by Motorola Solutions, Inc. to perform testing on the AP-7161 under purchase order number NP5280921.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Motorola Solutions, Inc., AP-7161.

An EMC evaluation to determine compliance of the TB 4.9 with the requirements of Part 90, Subpart Y, was conducted. (All references are to the most current version of Title 47 of the Code of Federal Regulations in effect). In accordance with §2.1033, the following data is presented in support of the Certification of the TB4.9. Motorola Solutions, Inc. should retain a copy of this document and it should be kept on file for at least five years after the manufacturing of the EUT has been **permanently** discontinued. The results obtained relate only to the item(s) tested.

Model(s) Tested:	AP-7161	
Model(s) Covered:	AP-7161	
EUT Specifications:	Primary Power Source: 115 VAC	
	FCC ID: QJEAP716102 IC: 4602A-AP716102	
	Type of Modulations:	OFDM
	Max Peak and Output Power:	3x3 – 13.73 dBm 1x1 – 18.12 dBm
	Equipment Code:	TNB
	EUT Frequency Ranges:	4950 – 4980 MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature (15-35º C):	
	Relative Humidity (30-60%):	
	Barometric Pressure (860-1060 mbar):	
Evaluated by:	Jeff Pratt	
Report Date(s):	August 8, 2011	

2.2. Test Site

All testing was performed at MET Laboratories, Inc., 914 W. Patapsco Ave., Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

2.3. Description of Test Sample

The Motorola Solutions, Inc. AP-7161, Equipment Under Test (EUT), is an Outdoor 802.11n access point.

2.4. Equipment Configuration

The EUT was set up as outlined in Figure 1, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Name / Description	Model Number
1	AP 7161	AP-7161
2	Power Cable	N/A

Table 1. Equipment Configuration

2.5. Support Equipment

Motorola Solutions, Inc. supplied support equipment necessary for the operation and testing of the AP-7161. All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number
1	Laptop with ART software	Dell	D600

Table 2. Support Equipment

2.6. Ports and Cabling Information

Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded (Y/N)	Termination Point
GE1 (LAN)	Cat5	1	N/A	Y	N/A
GE2 (WAN)	Cat5	1	N/A	Y	N/A
Console (Serial)	RJ-45	1	N/A	N	N/A
Power	16 AWG Power Cable	1	6	N/A	N/A

Table 3. Ports and Cabling Information

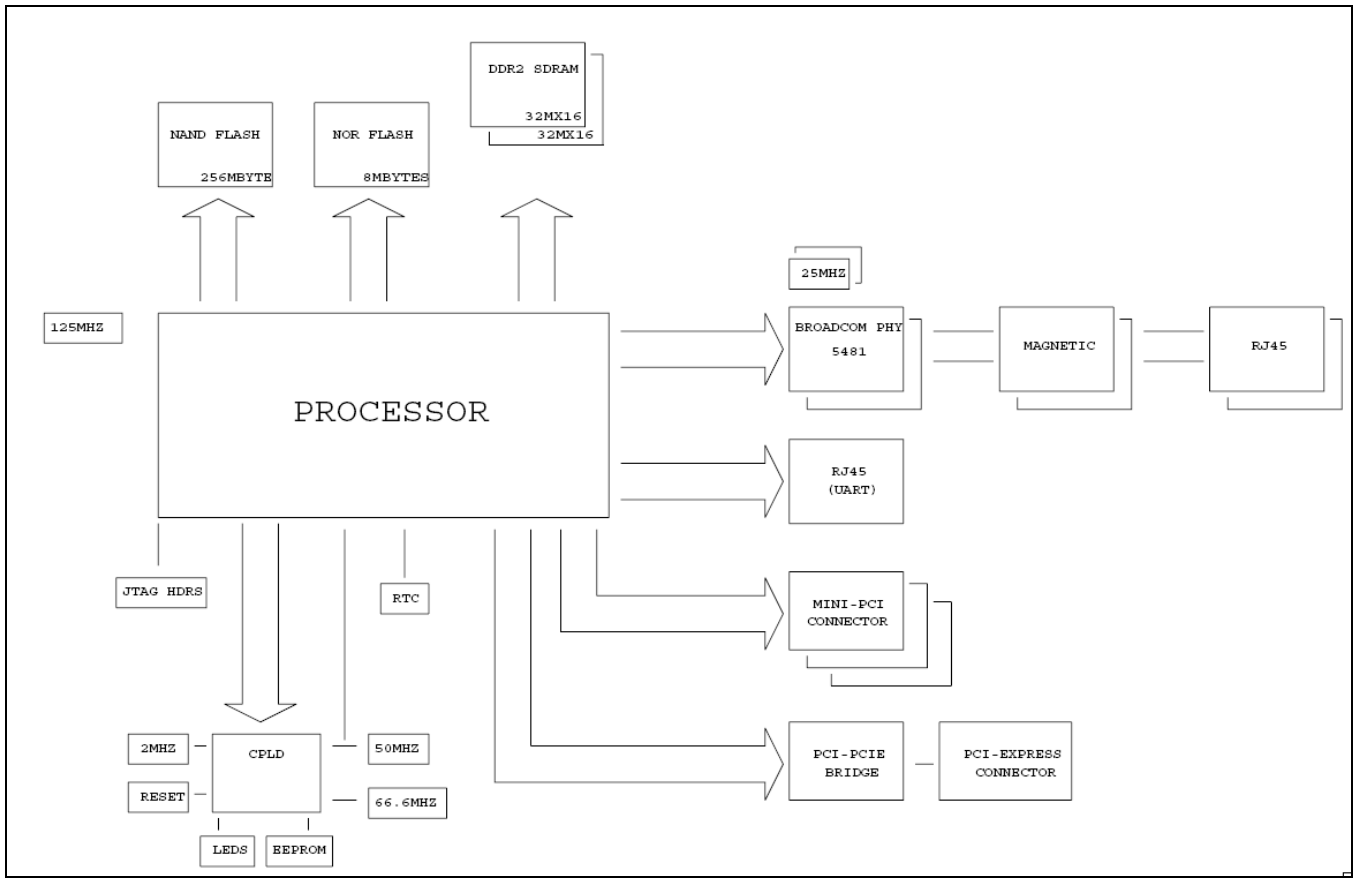


Figure 1. Block Diagram of Test Configuration

2.7. Mode of Operation

Test software (ART – Atheros Radio Test) running on laptop and EUT which communicate over Ethernet.

2.8. Method of Monitoring EUT Operation

Wireless radios are monitored in the intended frequency bands.

2.9. Modifications

2.9.1. Modifications to EUT

No modifications were made to the EUT.

2.9.2. Modifications to Test Standard

No modifications were made to the test standard.

2.10. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Motorola Solutions, Inc. upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

3. Electromagnetic Compatibility RF Power Output Requirements

3.1. RF Power Output

Test Requirement(s): **§2.1046 and §90.1215(a) with FCC 04-265**

Test Procedures: As required by 47 CFR 2.1046, *RF power output measurements* were made at the RF output terminals using a Spectrum Analyzer.

A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected to a Spectrum Analyzer via an attenuator to measure the Peak power. The EUT power was adjusted enough to produce maximum output power as specified in the owner's manual. The output power was then recorded with peak reading. Measurements were made at the low, mid and high channels.

Test Results: Equipment complies with 47CFR 2.1046 and 90.1215(a) with FCC 04-265.

All RF Power output measurements were direct connection to RF output Terminal of EUT from a Spectrum Analyzer.

Test Engineer(s): Jeff Pratt

Test Date(s): 03/08/11

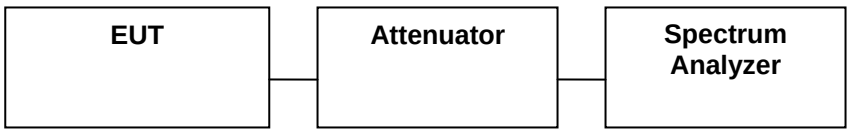


Figure 2. RF Power Output Test Setup

Frequency (MHz)	Mode/Modulation Type	Port A Output Power (dBm)	Port B Output Power (dBm)	Port C Output Power (dBm)	Summed Output Power (mW)	Summed Output Power (dBm)	Maximum Antenna Gain (dBi)	Output Power Limit (dBm)	Margin (dBm)	Port A (mW)	Port B (mW)	Port C (mW)
4950	802.11a	7.31	6.4	10.8	21.77	13.38	14.77	14.23	-0.85	5.38	4.37	12.02
4960	802.11a	7.43	5.72	9.54	18.26	12.62	14.77	14.23	-1.61	5.53	3.73	8.99
4970	802.11a	9.73	6.25	9.17	21.87	13.40	14.77	14.23	-0.83	9.40	4.22	8.26
4980	802.11a	9.78	6.28	9.18	22.03	13.43	14.77	14.23	-0.80	9.51	4.25	8.28
4950	802.11n HT20	9.68	6.71	9.83	23.59	13.73	14.77	14.23	-0.50	9.29	4.69	9.62
4960	802.11n HT20	7.5	6.44	9.1	18.16	12.59	14.77	14.23	-1.64	5.62	4.41	8.13
4970	802.11n HT20	8.39	5.1	8.68	17.52	12.43	14.77	14.23	-1.80	6.90	3.24	7.38
4980	802.11n HT20	9.86	6.74	8.86	22.09	13.44	14.77	14.23	-0.79	9.68	4.72	7.69

Table 4. RF Output Power, Test Results, 3x3

Frequency (MHz)	Mode/Modulation Type	Output Power (dBm)	Maximum Antenna Gain (dBi)	Maximum Allowable Power (dBm), assuming a 1x1	Relative Margin (dBm)
4950	802.11a	17.37	10	19	-1.63
4960	802.11a	18.05	10	19	-0.95
4970	802.11a	17.77	10	19	-1.23
4980	802.11a	17.82	10	19	-1.18
4950	802.11n HT20	17.93	10	19	-1.07
4960	802.11n HT20	18.12	10	19	-0.88
4970	802.11n HT20	17.88	10	19	-1.12
4980	802.11n HT20	18.03	10	19	-0.97

Table 5. RF Output Power, Test Results, 1x1

3.2. Peak Power Spectral Density

Test Requirement(s): **§90.1215(a) with FCC 04-265**

Test Procedures: As required by 47 CFR 2.1046, *RF power output measurements* were made at the RF output terminals using a Directional Coupler through a Spectrum Analyzer and Power Meter.

A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected to a Spectrum Analyzer in order to measure the power level. The Spectrum Analyzer was set to a RBW = 1 & VBW = 3 MHz. The EUT power was adjusted at the maximum output power level. The max hold key from the Spectrum Analyzer was activated capturing the modulated envelope of the EUT. The Peak Power Spectral Density was then recorded. Measurements were made at the low, mid and high channels.

Test Results: Equipment complies with 47 CFR 2.1046 and 90.1215(a) with FCC 04-265 (High Power devices). The EUT does not exceed 21dBm/MHz peak power spectral density at the carrier frequency.

The following pages show measurements of Peak Power Spectral Density plots which is recorded below.

Test Engineer(s): Jeff Pratt

Test Date(s): 03/09/11

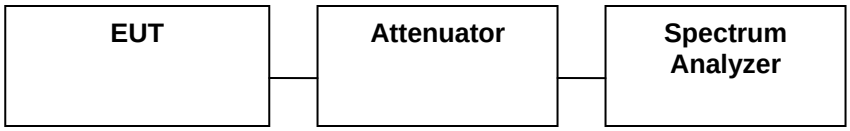


Figure 3. Peak Spectral Density Test Setup

Frequency (MHz)	Mode/Modulation Type	Port A PSD (dBm)	Port B PSD (dBm)	Port C PSD (dBm)	Summed PSD (mW)	Summed PSD (dBm)	Maximum Antenna Gain (dBi)	Maximum Allowable PSD (dBm)	Margin (dBm)	Port A PSD (mW)	Port B PSD (mW)	Port C PSD (mW)
4950	802.11a	-3.79	-2.78	-1.74	1.61	2.08	14.77	2.23	-0.15	0.42	0.53	0.67
4960	802.11a	-3.87	-2.89	-1.77	1.59	2.01	14.77	2.23	-0.22	0.41	0.51	0.67
4970	802.11a	-3.26	-3.23	-2.12	1.56	1.93	14.77	2.23	-0.30	0.47	0.48	0.61
4980	802.11a	-2.49	-3.13	-2.34	1.63	2.13	14.77	2.23	-0.10	0.56	0.49	0.58
4950	802.11n HT20	-4.25	-2.58	-1.45	1.64	2.16	14.77	2.23	-0.07	0.38	0.55	0.72
4960	802.11n HT20	-4.29	-3.39	-2.11	1.45	1.60	14.77	2.23	-0.63	0.37	0.46	0.62
4970	802.11n HT20	-3.66	-3.21	-2.73	1.44	1.59	14.77	2.23	-0.64	0.43	0.48	0.53
4980	802.11n HT20	-2.8	-3.14	-2.78	1.54	1.87	14.77	2.23	-0.36	0.52	0.49	0.53

Table 6. Peak Power Spectral Density, Test Results, 3x3

Frequency (MHz)	Mode/Modulation Type	Peak Power Spectral Density (dBm/MHz)	Maximum Antenna Gain (dBi)	Maximum Allowable Spectral Density (dBm/MHz), assuming a 1x1	Relative Margin (dB)
4950	802.11a	6.41	10	7	-0.59
4960	802.11a	6.87	10	7	-0.13
4970	802.11a	6.83	10	7	-0.17
4980	802.11a	6.93	10	7	-0.07
4950	802.11n HT20	6.81	10	7	-0.19
4960	802.11n HT20	6.94	10	7	-0.06
4970	802.11n HT20	6.51	10	7	-0.49
4980	802.11n HT20	6.87	10	7	-0.13

Table 7. Peak Power Spectral Density, Test Results, 1x1

4. Electromagnetic Compatibility Occupied Bandwidth Requirements

4.1. Occupied Bandwidth (Emission Mask)

Test Requirement(s): **§2.1049 and §90.210 (L) with FCC 04-265 (Emissions Mask L)**

Test Procedures: As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made at the RF output terminals using a Spectrum Analyzer.

A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected to a Spectrum Analyzer via attenuator. The measured highest Average Power was set relative to zero dB reference. The RBW of the Spectrum Analyzer was set to at least 1% of the channel bandwidth. The EUT power was adjusted at the maximum output power level. Measurements were carried out at the low, mid and high channels of the TX band.

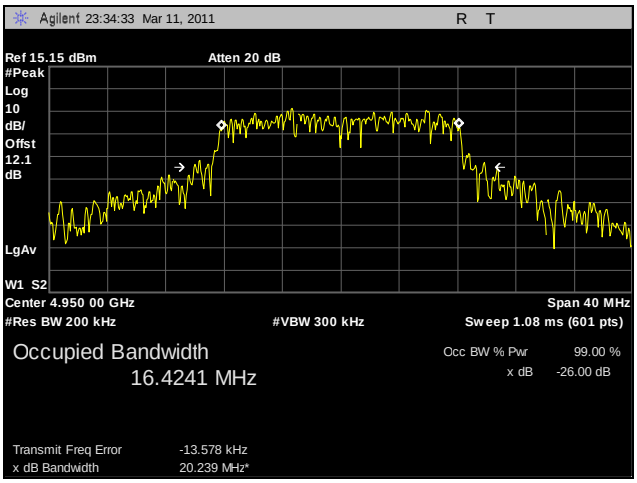
Test Results: Equipment complies with Section 2.1049 and 90.210(L) with FCC 04-265 (Emission Mask M). The EUT does not exceed the Emission Masks limit.

The following pages show measurements of Emission Mask plots.

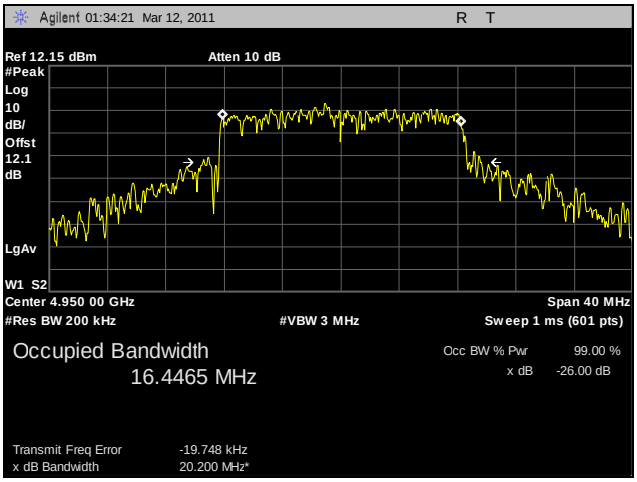
Test Engineer(s): Jeff Pratt

Test Date(s): 03/11/11

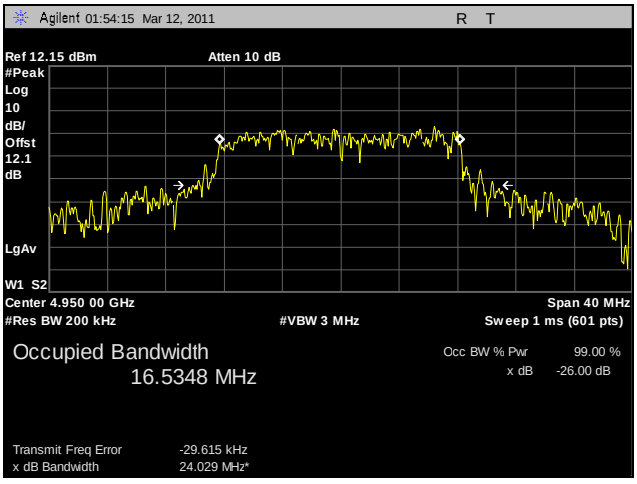
Occupied Bandwidth



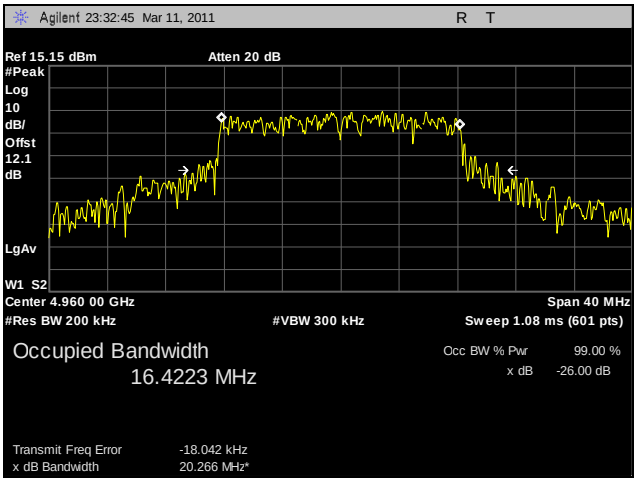
Plot 1. Emission Bandwidth, 802.11a, 4950 MHz, Port A (3x3)



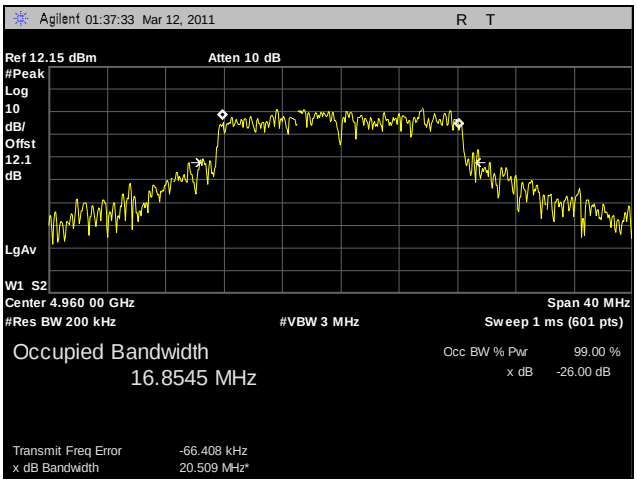
Plot 2. Emission Bandwidth, 802.11a, 4950 MHz, Port B (3x3)



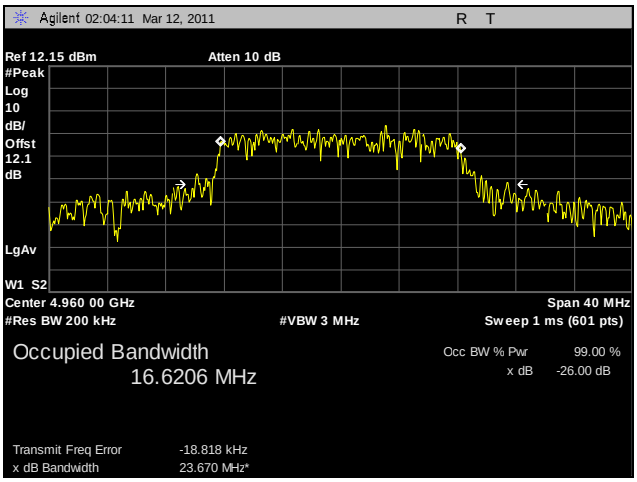
Plot 3. Emission Bandwidth, 802.11a, 4950 MHz, Port C (3x3)



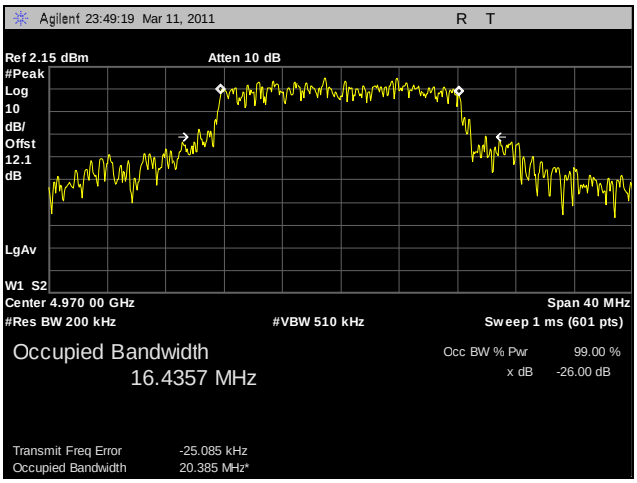
Plot 4. Emission Bandwidth, 802.11a, 4960 MHz, Port A (3x3)



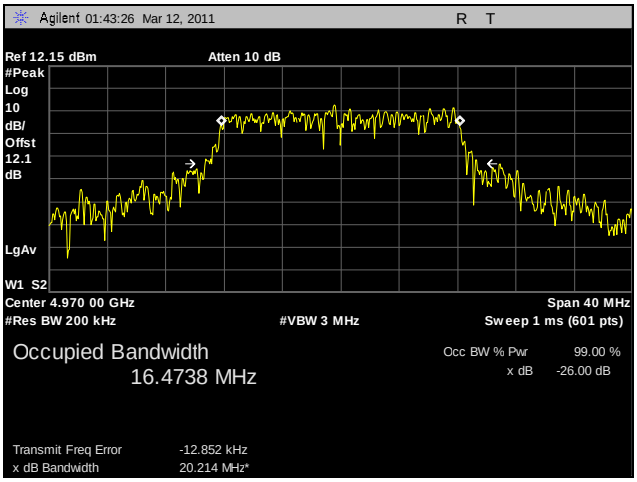
Plot 5. Emission Bandwidth, 802.11a, 4960 MHz, Port B (3x3)



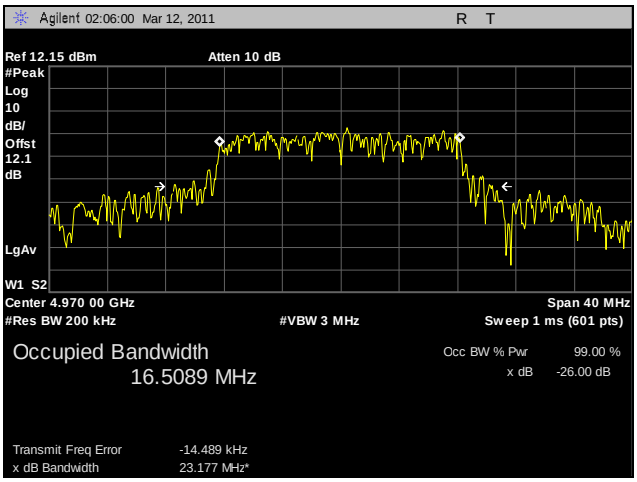
Plot 6. Emission Bandwidth, 802.11a, 4960 MHz, Port C (3x3)



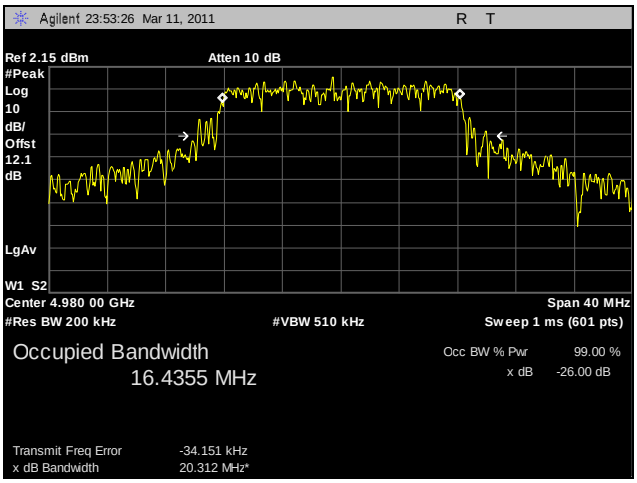
Plot 7. Emission Bandwidth, 802.11a, 4970 MHz, Port A (3x3)



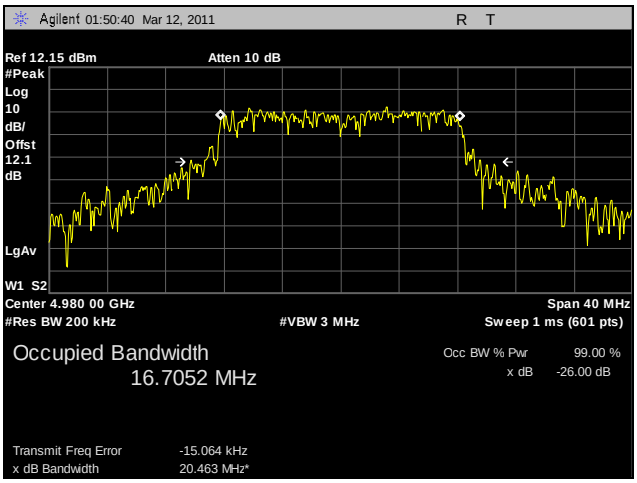
Plot 8. Emission Bandwidth, 802.11a, 4970 MHz, Port B (3x3)



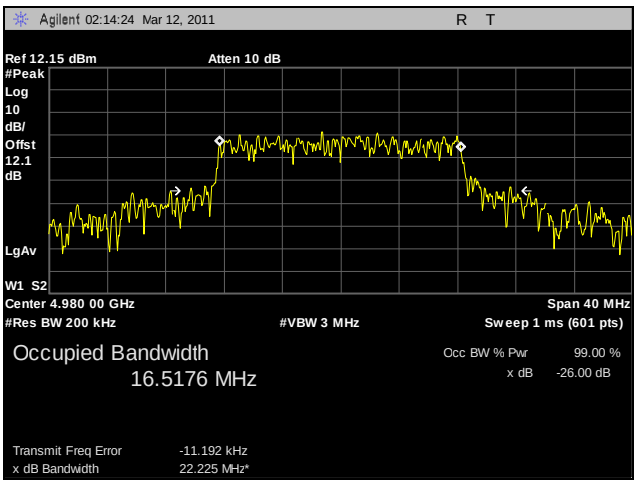
Plot 9. Emission Bandwidth, 802.11a, 4970 MHz, Port C (3x3)



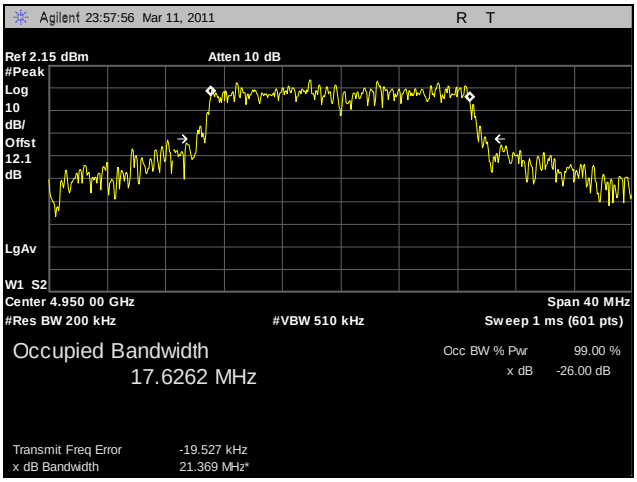
Plot 10. Emission Bandwidth, 802.11a, 4980 MHz, Port A (3x3)



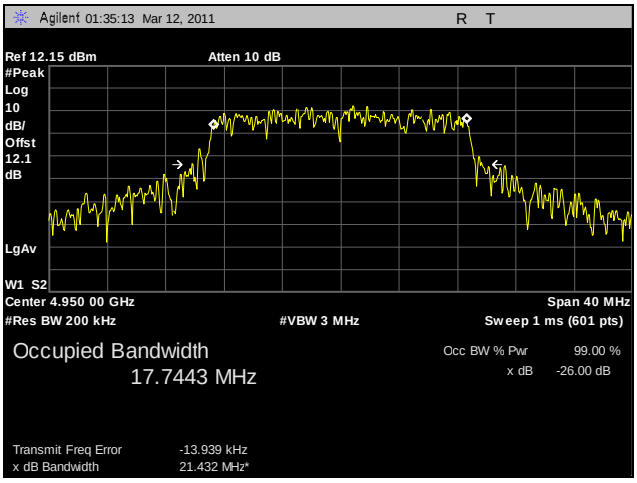
Plot 11. Emission Bandwidth, 802.11a, 4980 MHz, Port B (3x3)



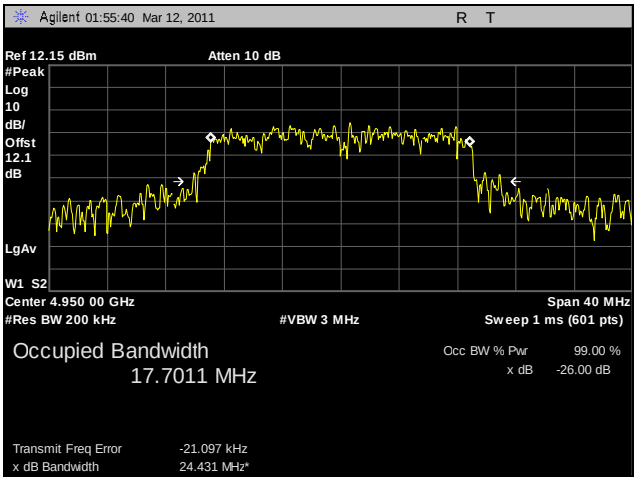
Plot 12. Emission Bandwidth, 802.11a, 4980 MHz, Port C (3x3)



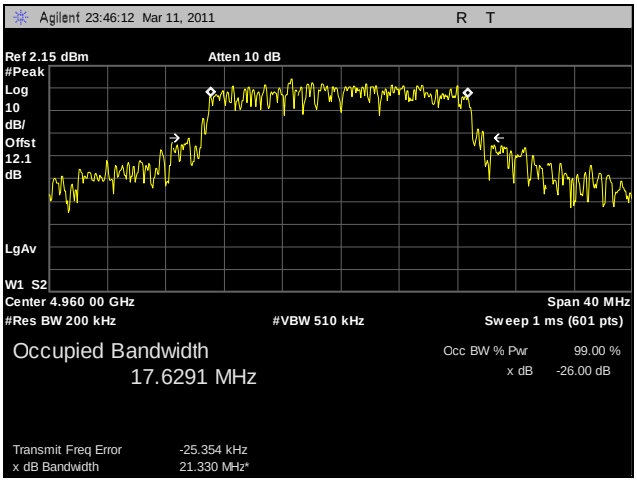
Plot 13. Emission Bandwidth, 802.11n HT20, 4950 MHz, Port A (3x3)



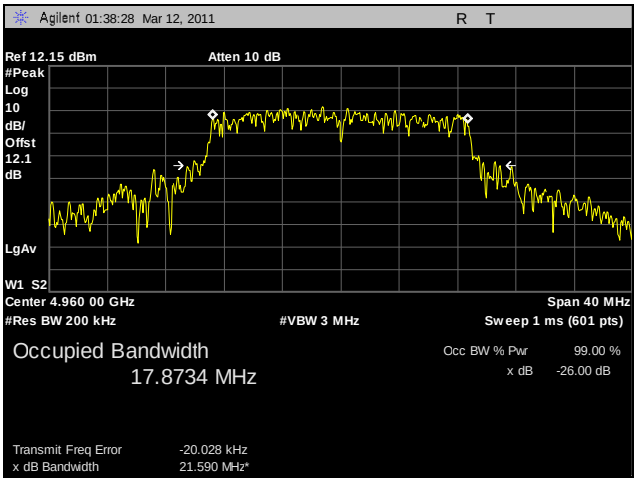
Plot 14. Emission Bandwidth, 802.11n HT20, 4950 MHz, Port B (3x3)



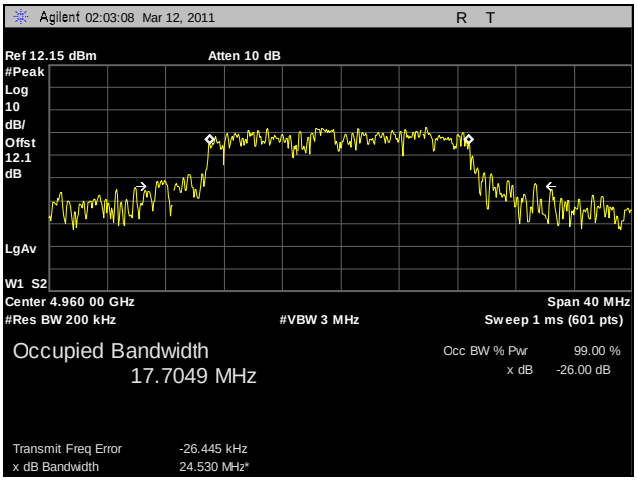
Plot 15. Emission Bandwidth, 802.11n HT20, 4950 MHz, Port C (3x3)



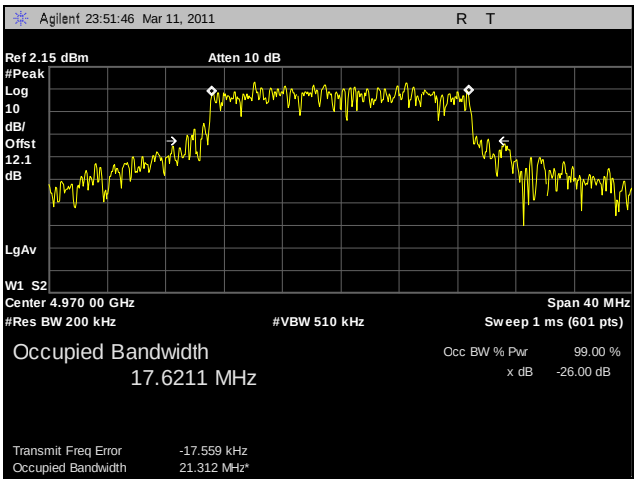
Plot 16. Emission Bandwidth, 802.11n HT20, 4960 MHz, Port A (3x3)



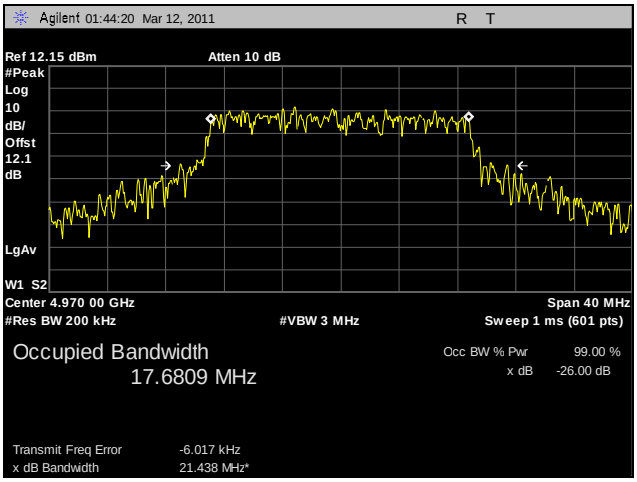
Plot 17. Emission Bandwidth, 802.11n HT20, 4960 MHz, Port B (3x3)



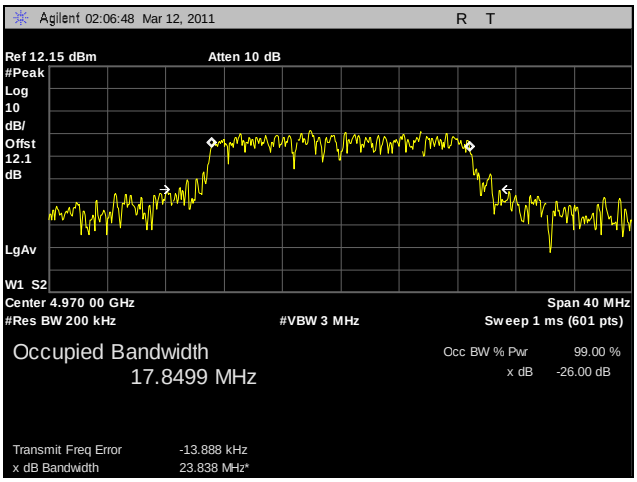
Plot 18. Emission Bandwidth, 802.11n HT20, 4960 MHz, Port C (3x3)



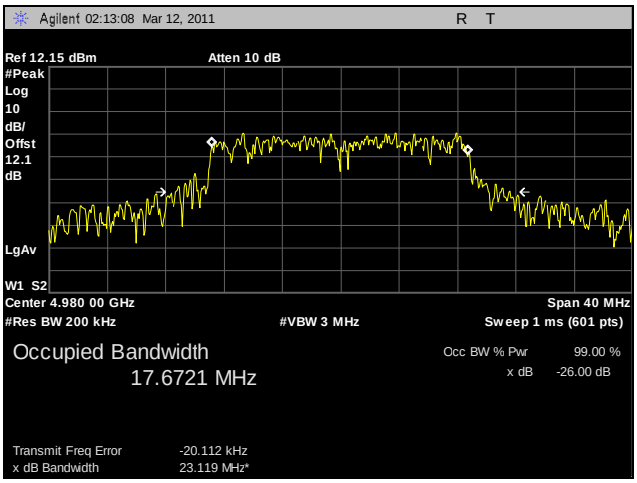
Plot 19. Emission Bandwidth, 802.11n HT20, 4970 MHz, Port A (3x3)



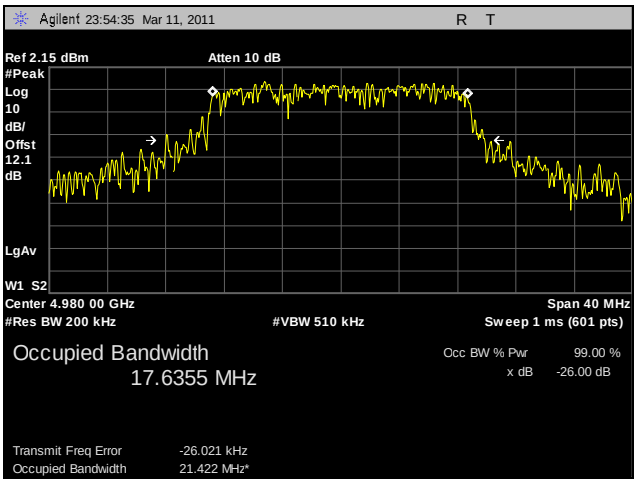
Plot 20. Emission Bandwidth, 802.11n HT20, 4970 MHz, Port B (3x3)



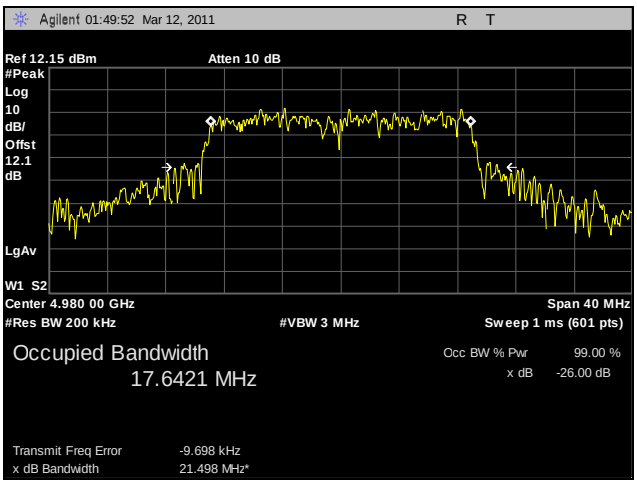
Plot 21. Emission Bandwidth, 802.11n HT20, 4970 MHz, Port C (3x3)



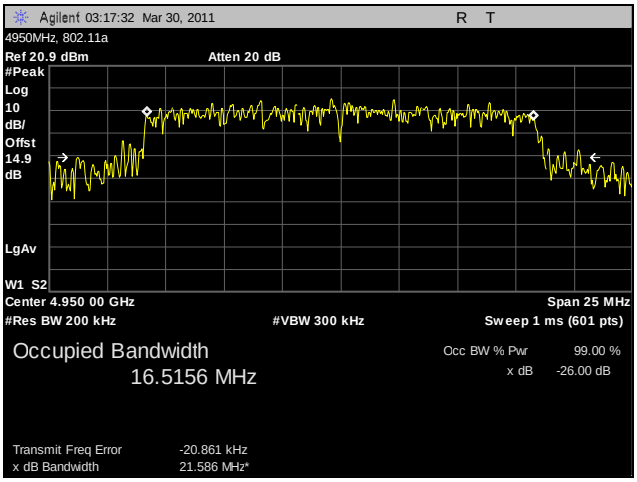
Plot 22. Emission Bandwidth, 802.11n HT20, 4980 MHz, Port A (3x3)



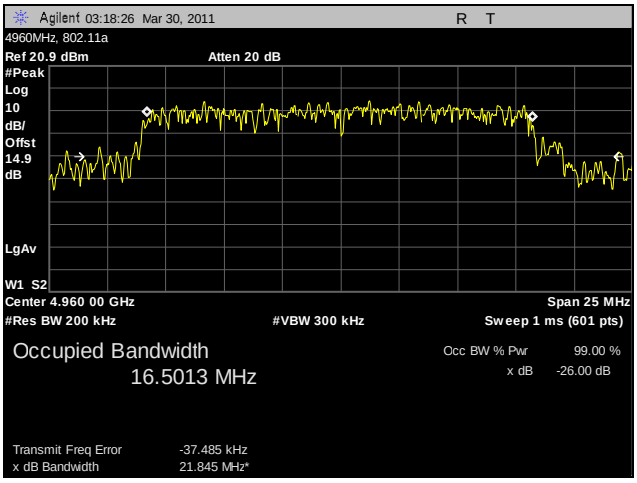
Plot 23. Emission Bandwidth, 802.11n HT20, 4980 MHz, Port B (3x3)



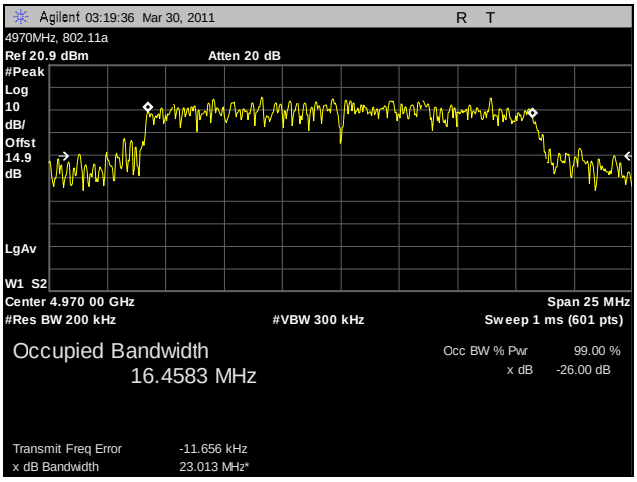
Plot 24. Emission Bandwidth, 802.11n HT20, 4980 MHz, Port C (3x3)



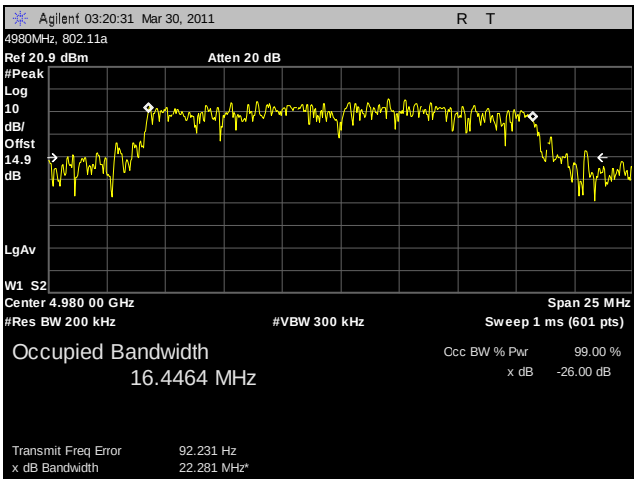
Plot 25. Emission Bandwidth, 802.11a, 4950 MHz, (1x1)



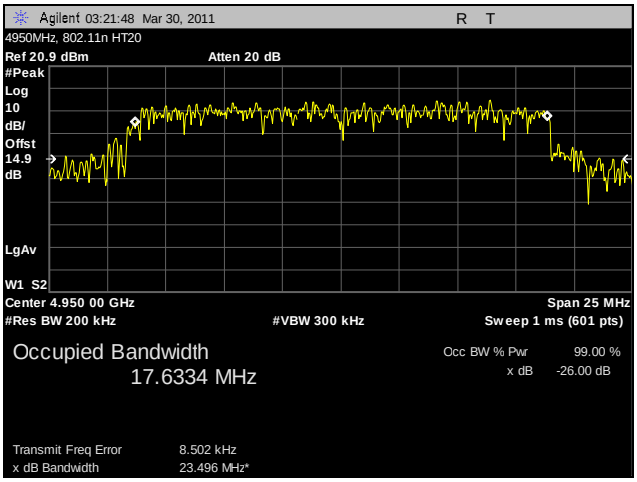
Plot 26. Emission Bandwidth, 802.11a, 4960 MHz (1x1)



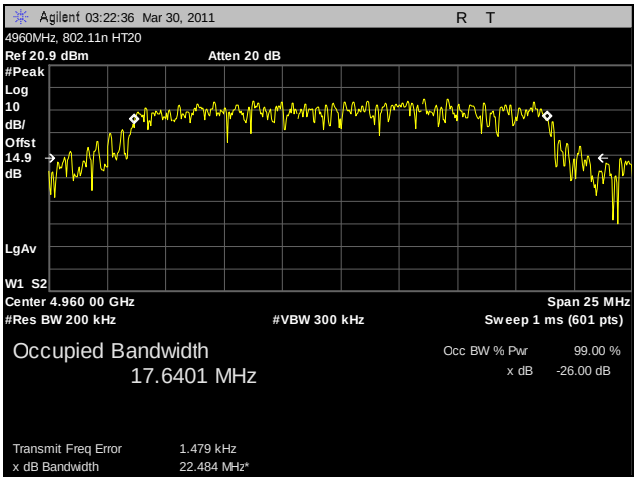
Plot 27. Emission Bandwidth, 802.11a, 4970 MHz (1x1)



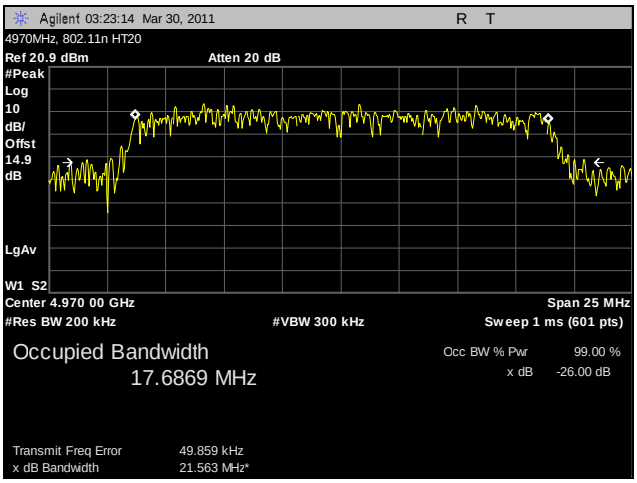
Plot 28. Emission Bandwidth, 802.11a, 4980 MHz (1x1)



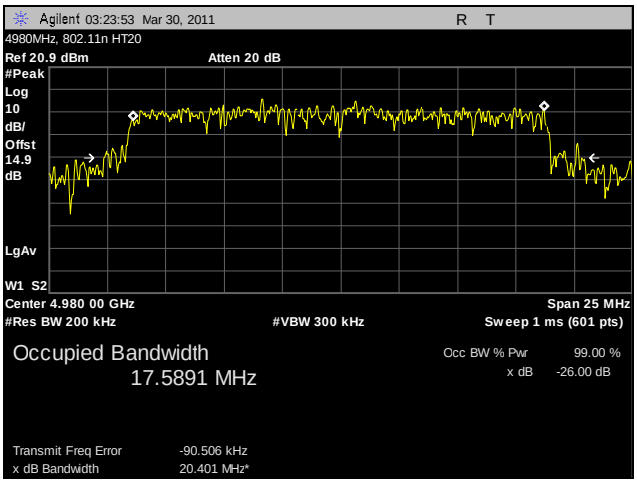
Plot 29. Emission Bandwidth, 802.11n HT20, 4950 MHz, (1x1)



Plot 30. Emission Bandwidth, 802.11n HT20, 4960 MHz (1x1)



Plot 31. Emission Bandwidth, 802.11n HT20, 4970 MHz (1x1)



Plot 32. Emission Bandwidth, 802.11n HT20, 4980 MHz (1x1)

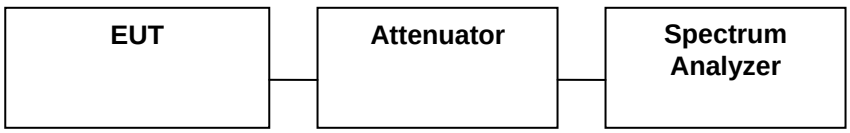
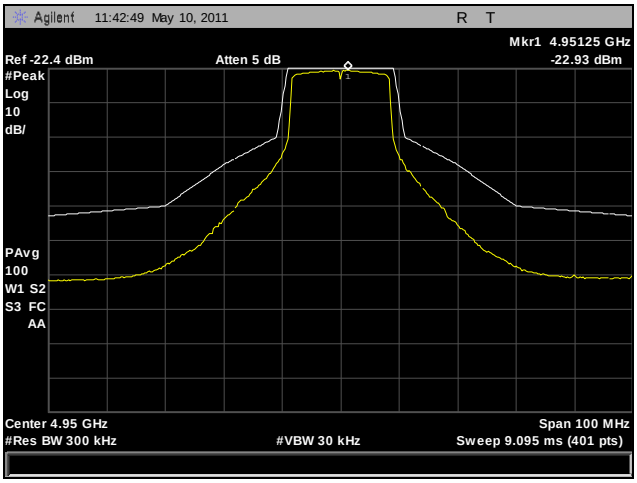
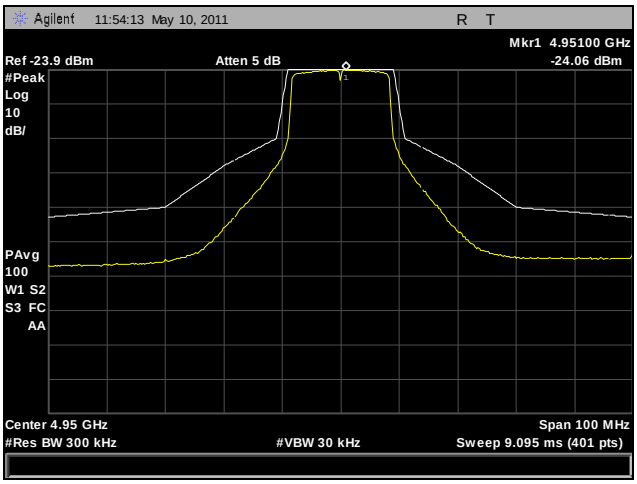


Figure 4. Occupied Bandwidth Test Setup

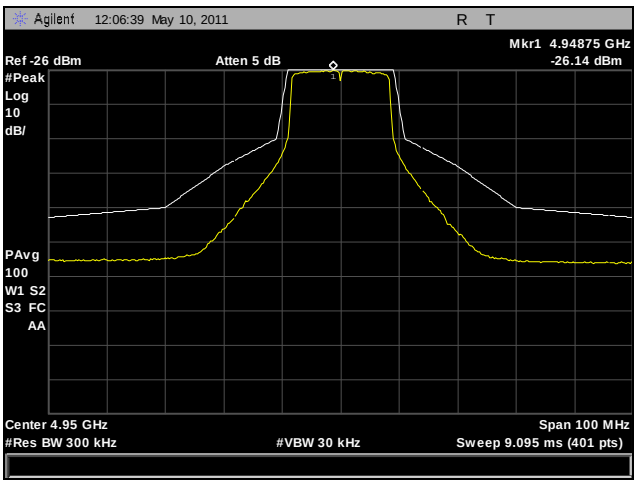
Emission Mask



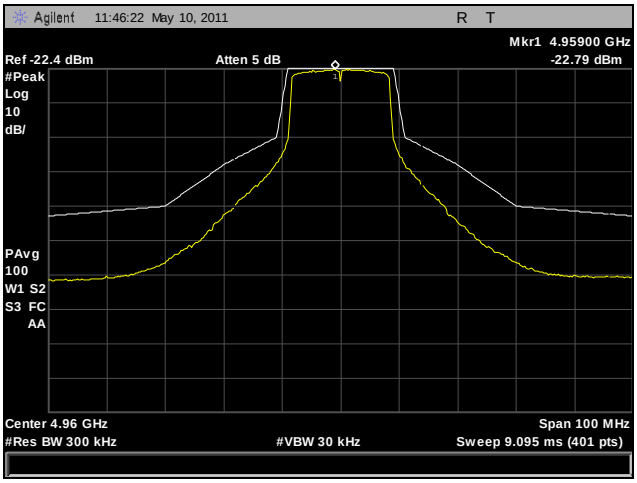
Plot 33. Emission Mask, 802.11a, 4950 MHz, Port A (3x3)



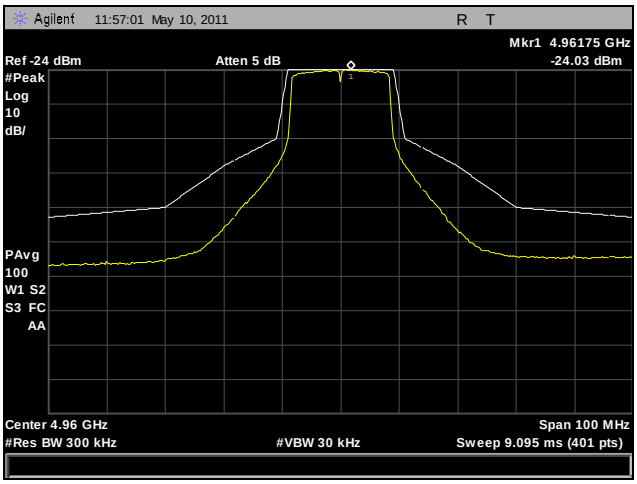
Plot 34. Emission Mask, 802.11a, 4950 MHz, Port B (3x3)



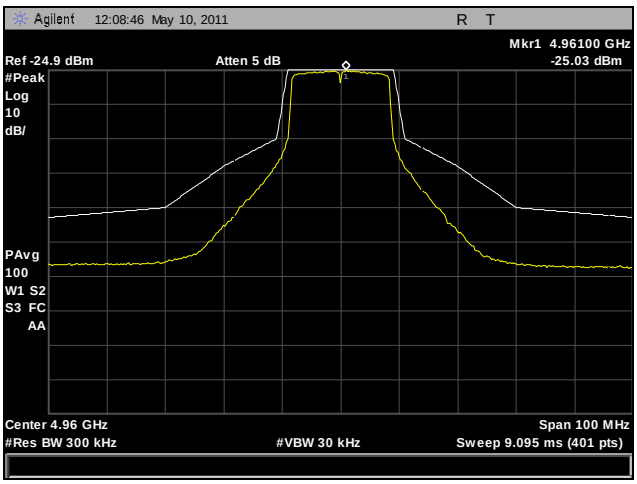
Plot 35. Emission Mask, 802.11a, 4950 MHz, Port C (3x3)



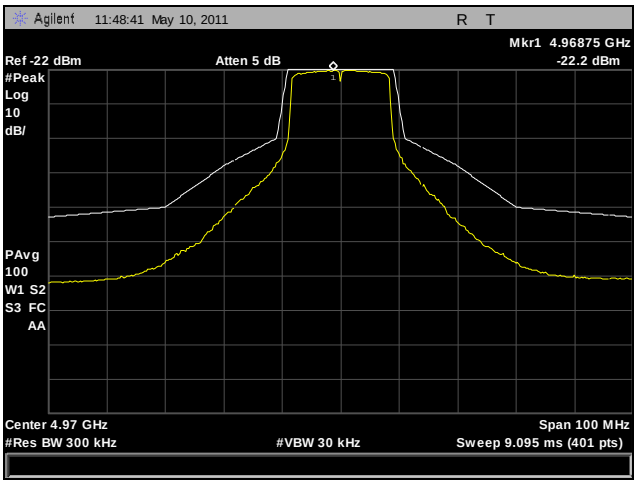
Plot 36. Emission Mask, 802.11a, 4960 MHz, Port A (3x3)



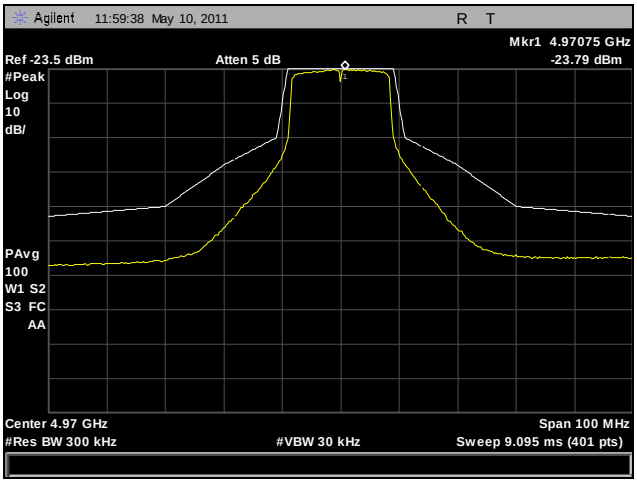
Plot 37. Emission Mask, 802.11a, 4960 MHz, Port B (3x3)



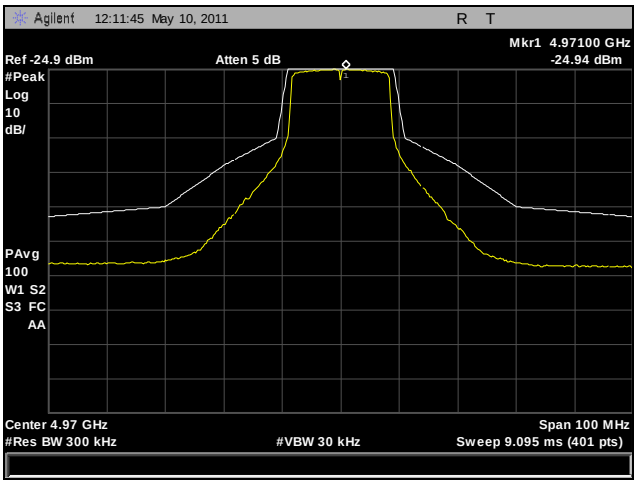
Plot 38. Emission Mask, 802.11a, 4960 MHz, Port C (3x3)



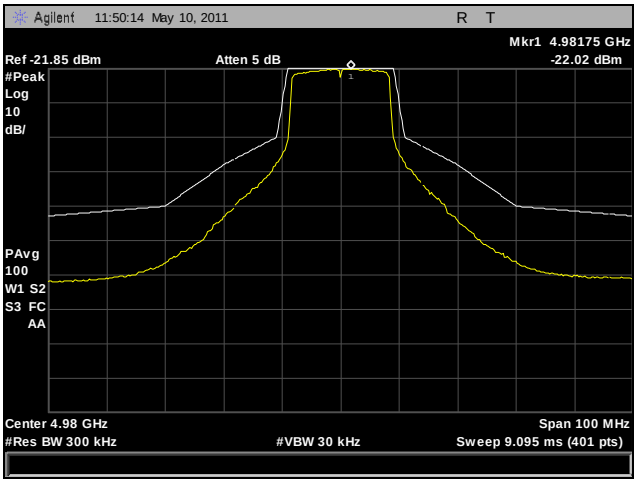
Plot 39. Emission Mask, 802.11a, 4970 MHz, Port A (3x3)



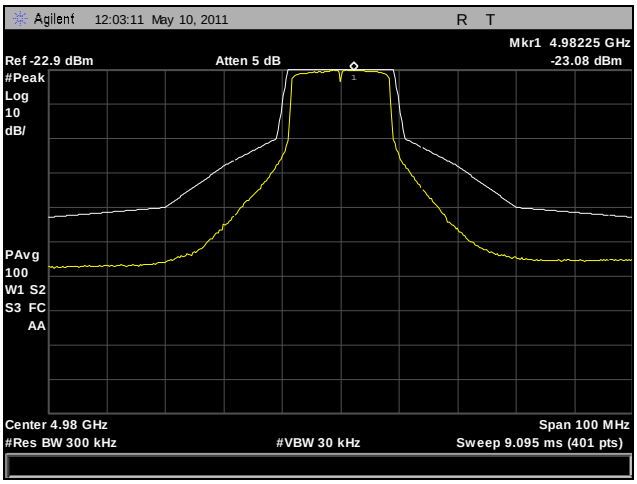
Plot 40. Emission Mask, 802.11a, 4970 MHz, Port B (3x3)



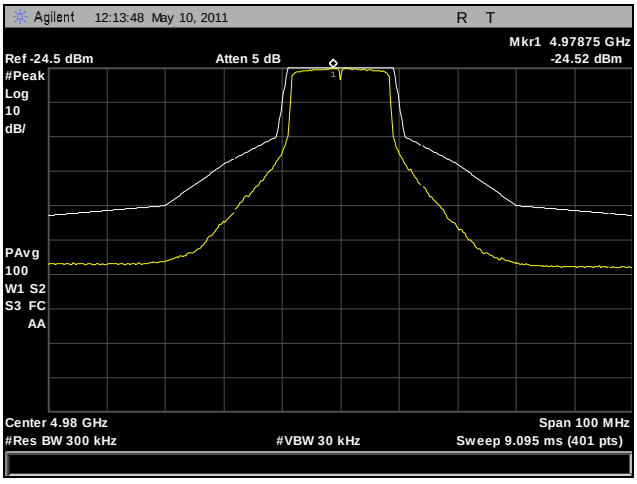
Plot 41. Emission Mask, 802.11a, 4970 MHz, Port C (3x3)



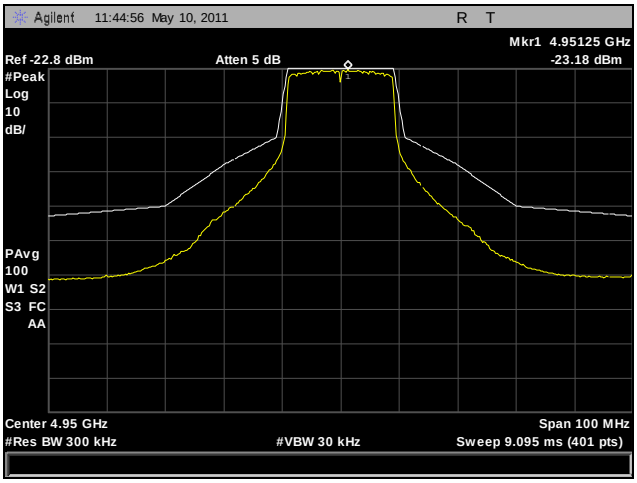
Plot 42. Emission Mask, 802.11a, 4980 MHz, Port A (3x3)



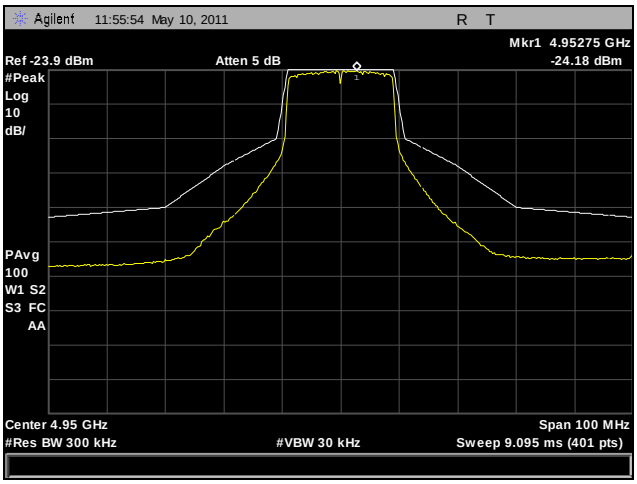
Plot 43. Emission Mask, 802.11a, 4980 MHz, Port B (3x3)



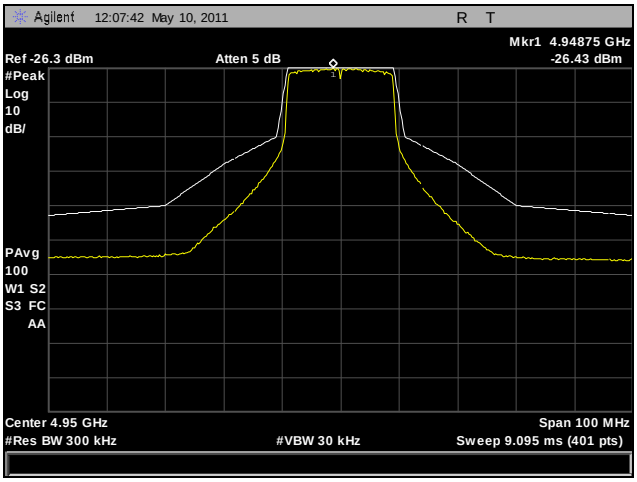
Plot 44. Emission Mask, 802.11a, 4980 MHz, Port C (3x3)



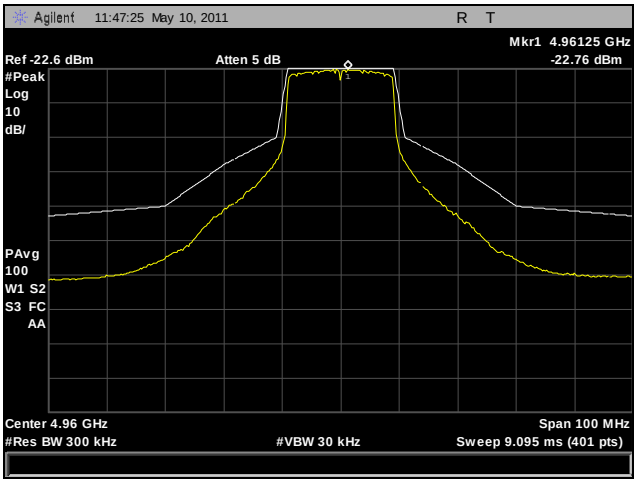
Plot 45. Emission Mask, 802.11n HT20, 4950 MHz, Port A (3x3)



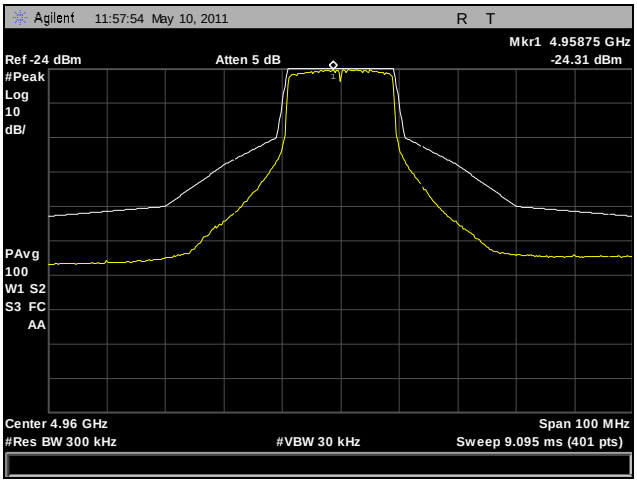
Plot 46. Emission Mask, 802.11n HT20, 4950 MHz, Port B (3x3)



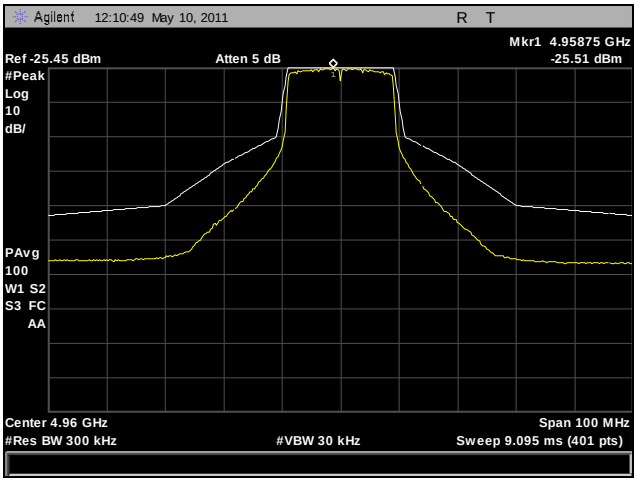
Plot 47. Emission Mask, 802.11n HT20, 4950 MHz, Port C (3x3)



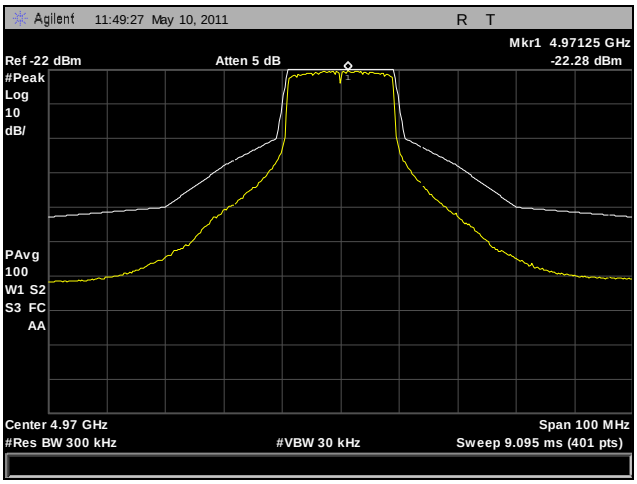
Plot 48. Emission Mask, 802.11n HT20, 4960 MHz, Port A (3x3)



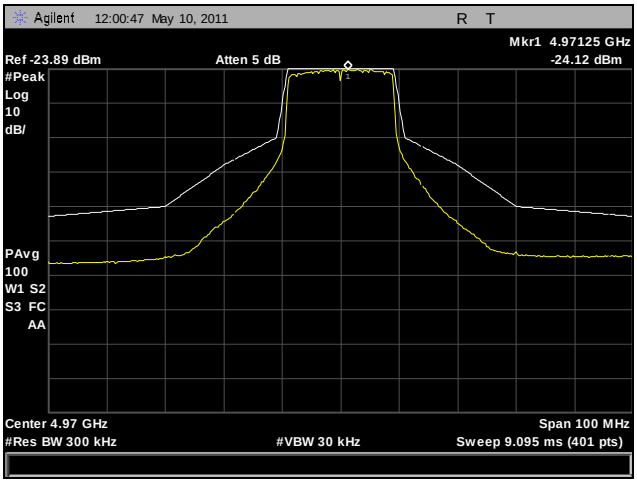
Plot 49. Emission Mask, 802.11n HT20, 4960 MHz, Port B (3x3)



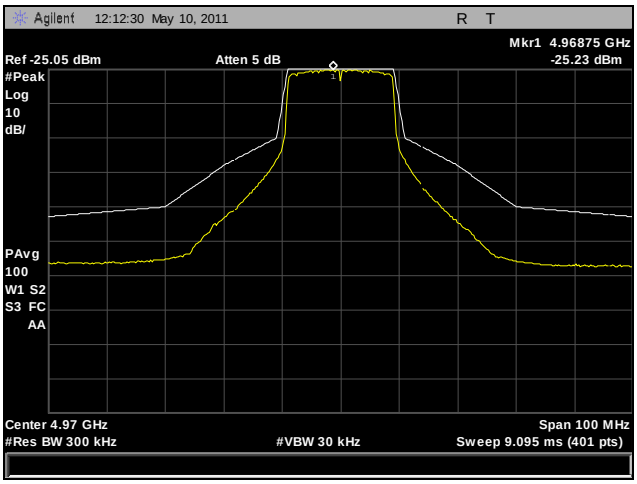
Plot 50. Emission Mask, 802.11n HT20, 4960 MHz, Port C (3x3)



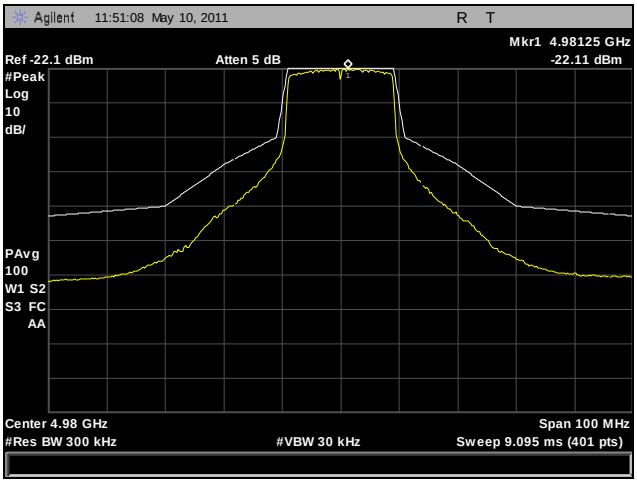
Plot 51. Emission Mask, 802.11n HT20, 4970 MHz, Port A (3x3)



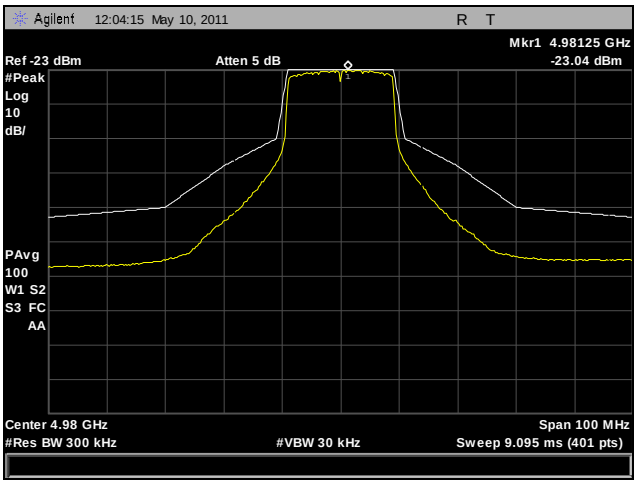
Plot 52. Emission Mask, 802.11n HT20, 4970 MHz, Port B (3x3)



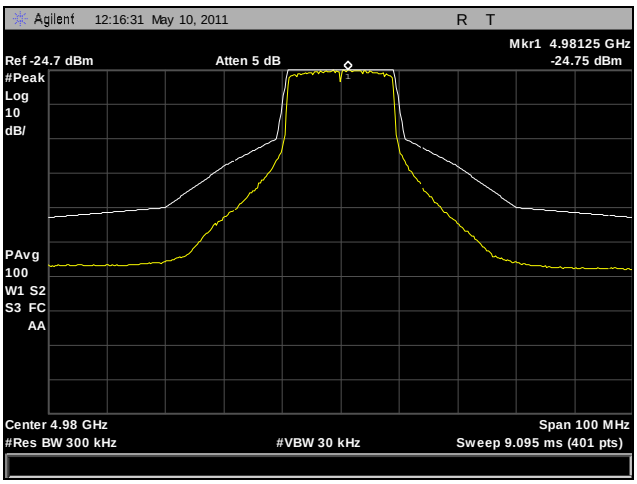
Plot 53. Emission Mask, 802.11n HT20, 4970 MHz, Port C (3x3)



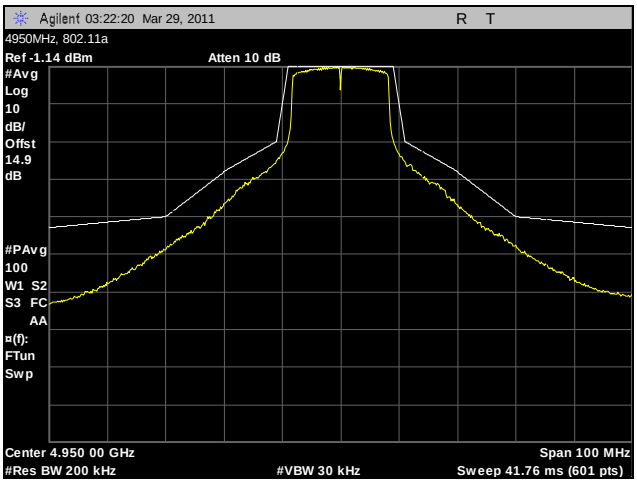
Plot 54. Emission Mask, 802.11n HT20, 4980 MHz, Port A (3x3)



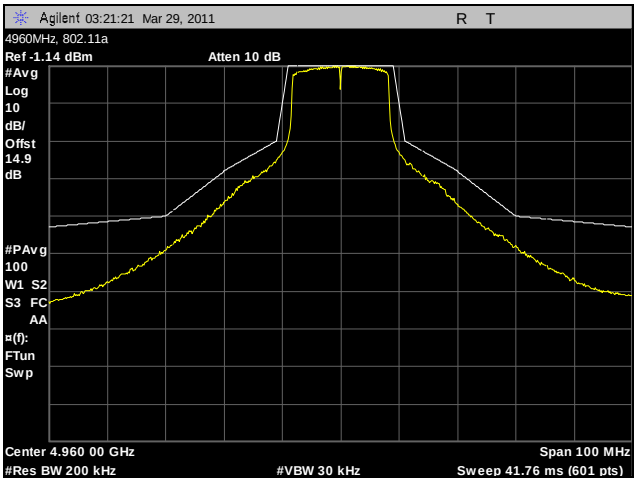
Plot 55. Emission Mask, 802.11n HT20, 4980 MHz, Port B (3x3)



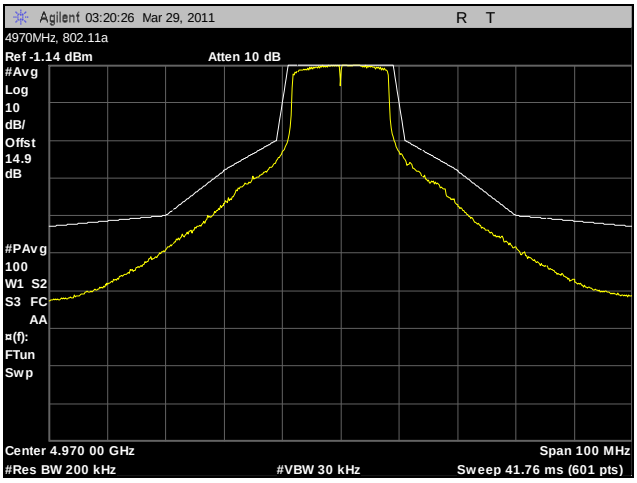
Plot 56. Emission Mask, 802.11n HT20, 4980 MHz, Port C (3x3)



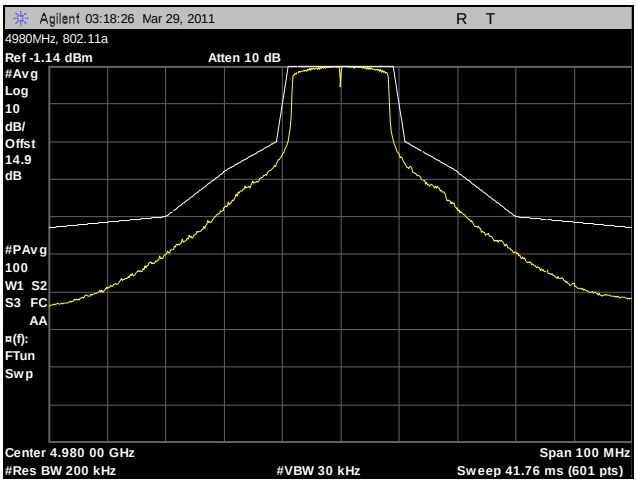
Plot 57. Emission Mask, 802.11a, 4950 MHz (1x1)



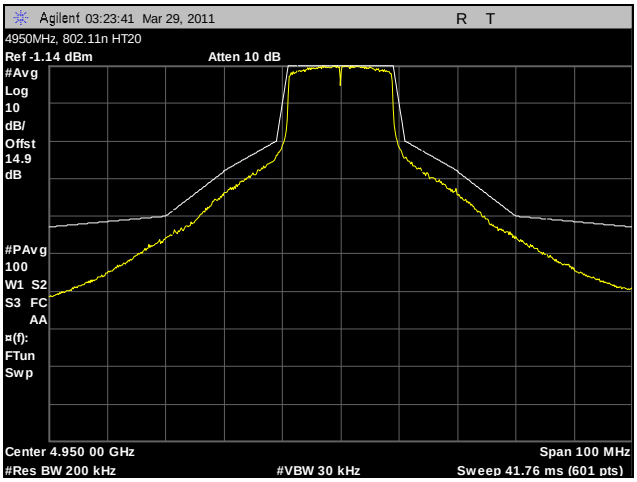
Plot 58. Emission Mask, 802.11a, 4960 MHz (1x1)



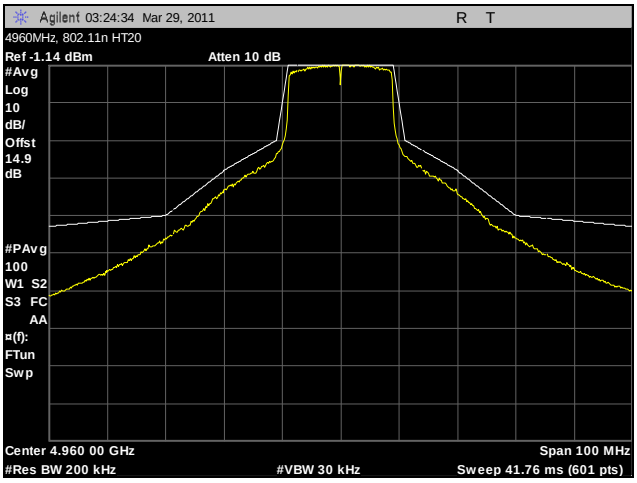
Plot 59. Emission Mask, 802.11a, 4970 MHz (1x1)



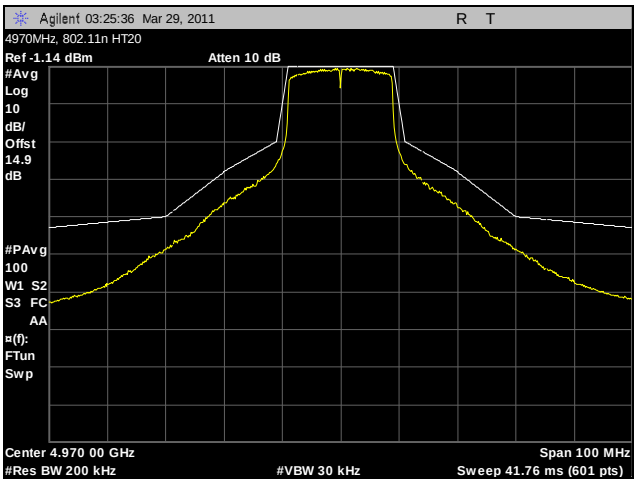
Plot 60. Emission Mask, 802.11a, 4980 MHz (1x1)



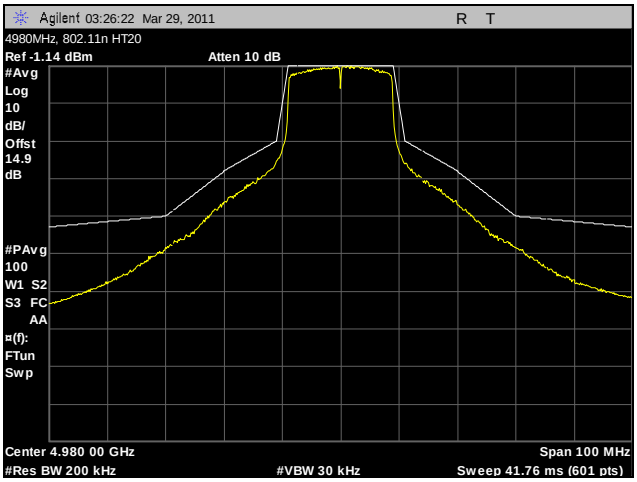
Plot 61. Emission Mask, 802.11n HT20, 4950 MHz (1x1)



Plot 62. Emission Mask, 802.11n HT20, 4960 MHz (1x1)



Plot 63. Emission Mask, 802.11n HT20, 4970 MHz (1x1)



Plot 64. Emission Mask, 802.11n HT20, 4980 MHz (1x1)

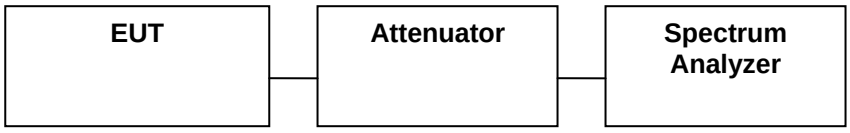


Figure 5. Occupied Bandwidth (Emission Mask) Test Setup

5. Electromagnetic Compatibility Spurious Emissions at Antenna Terminal Requirements

5.1. Spurious Emissions at Antenna Terminals

Test Requirement(s): **§2.1051 and §90.210(L) with FCC 04-265**

Test Procedures: As required by 47 CFR 2.1051, *spurious emissions at antenna terminal measurements* were made at the RF output terminals using a Spectrum Analyzer.

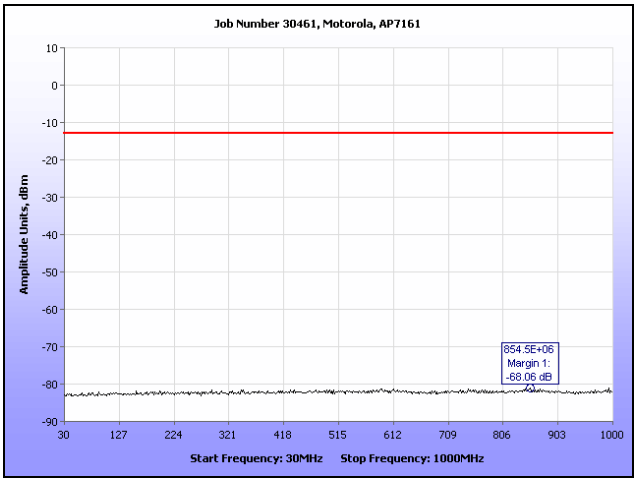
A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected to a Spectrum Analyzer and a Power Meter to monitor the output power level. The Spectrum Analyzer was set to sweep 30 MHz and up to 10th harmonic of the fundamental or 40GHz whichever is the lesser. Measurements were made at the low, mid and high channels.

The Conducted Spurious Emissions *Limit* is obtained by the following plots.

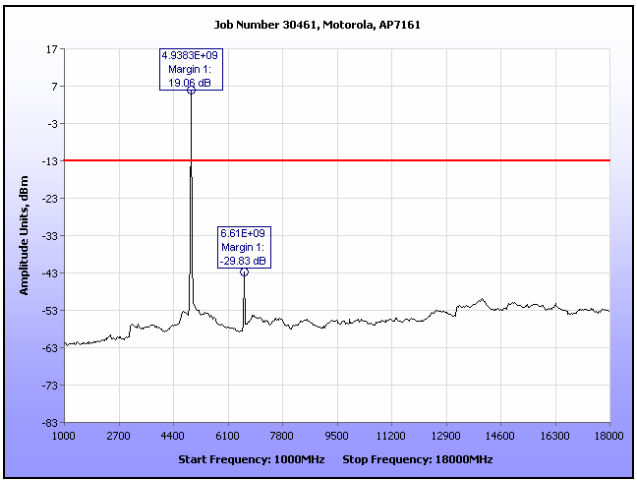
Test Results: Equipment complies with Section 2.1051 and 90.210(L) with FCC 04-265.

Test Engineer(s): Jeff Pratt

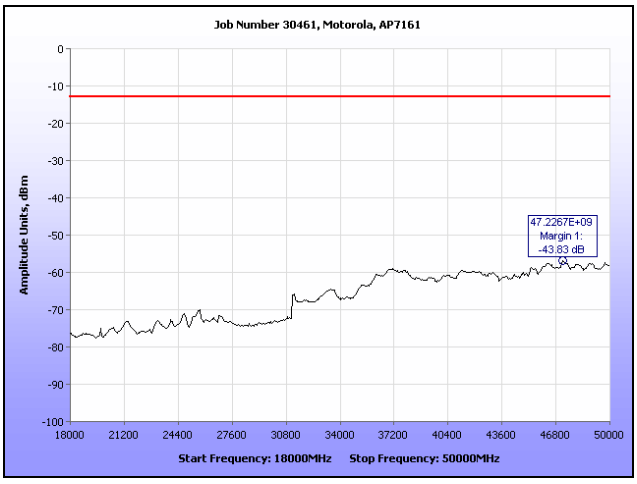
Test Date(s): 03/11/11



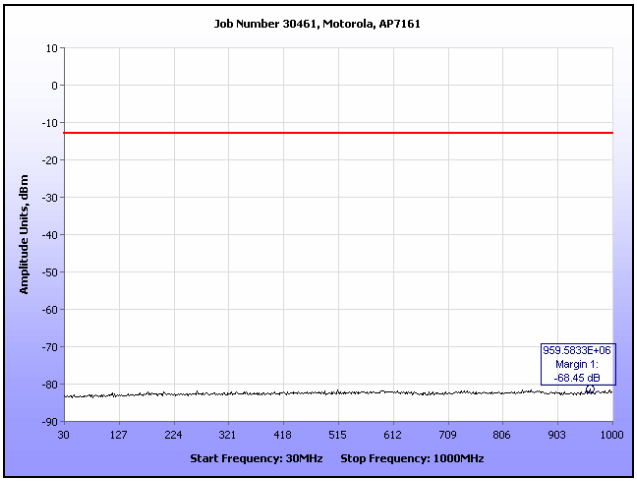
Plot 65. Conducted Spurious Emissions, 802.11a, 4950 MHz (30 MHz – 1 GHz), R3-A



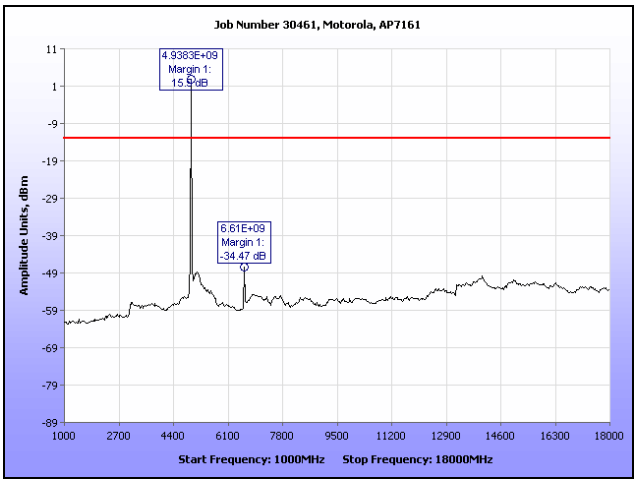
Plot 66. Conducted Spurious Emissions, 802.11a, 4950 MHz (1 GHz – 18 GHz), R3-A



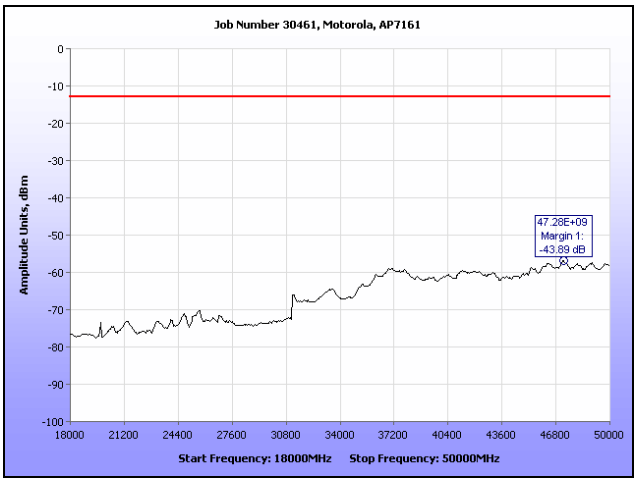
Plot 67. Conducted Spurious Emissions, 802.11a, 4950 MHz (18 GHz – 50 GHz), R3-A



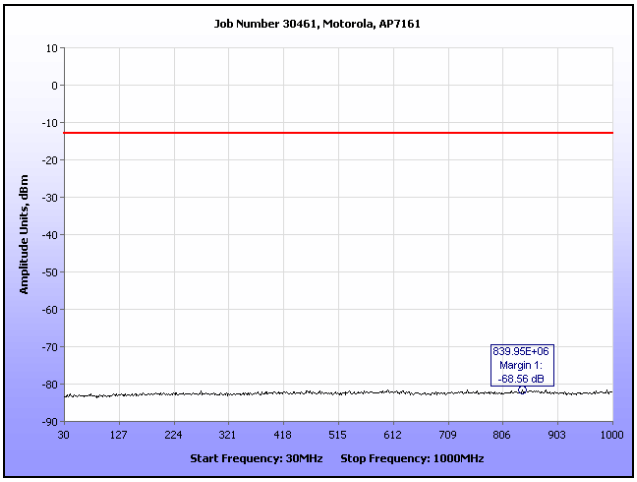
Plot 68. Conducted Spurious Emissions, 802.11a, 4950 MHz (30 MHz - 1 GHz), R3-B



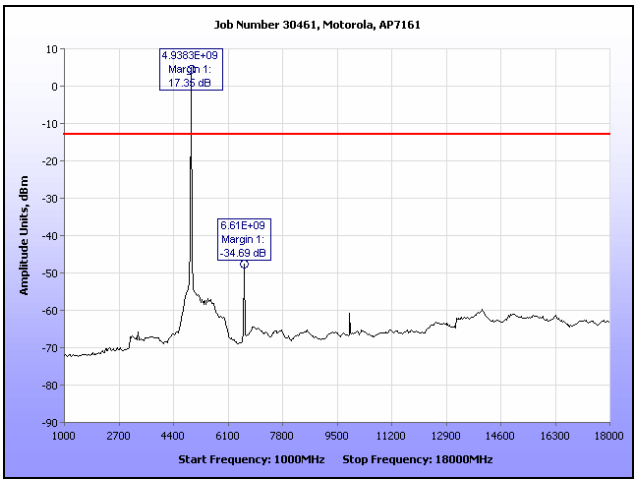
Plot 69. Conducted Spurious Emissions, 802.11a, 4950 MHz (1 GHz – 18 GHz), R3-B



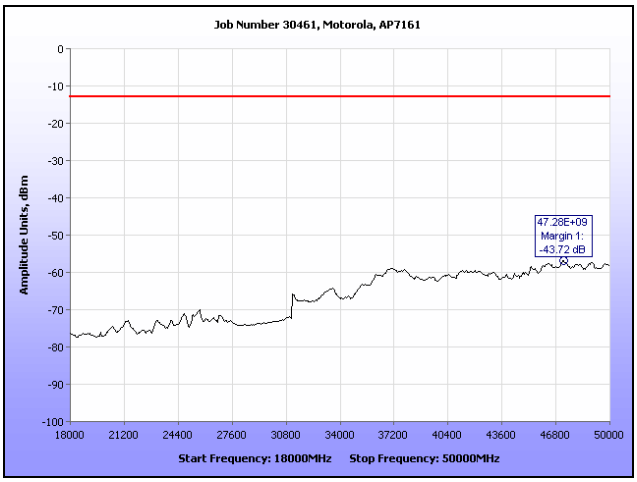
Plot 70. Conducted Spurious Emissions, 802.11a, 4950 MHz (18 GHz – 50 GHz), R3-B



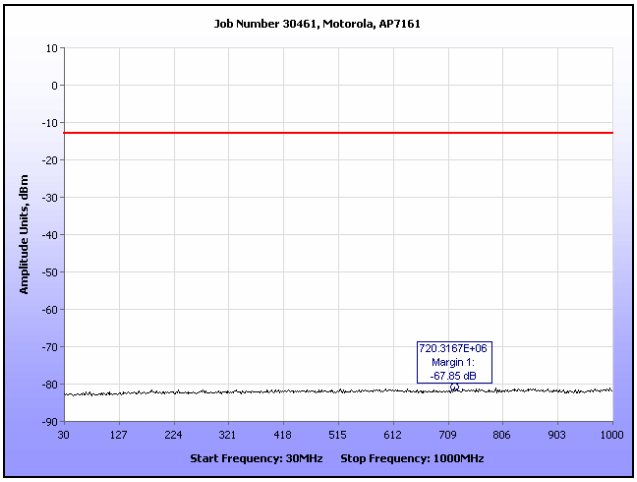
Plot 71. Conducted Spurious Emissions, 802.11a, 4950 MHz (30 MHz – 1 GHz), R3-C



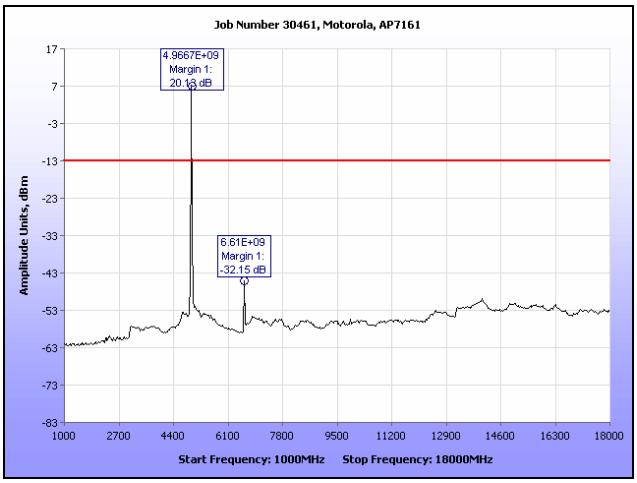
Plot 72. Conducted Spurious Emissions, 802.11a, 4950 MHz (1 GHz – 18 GHz), R3-C



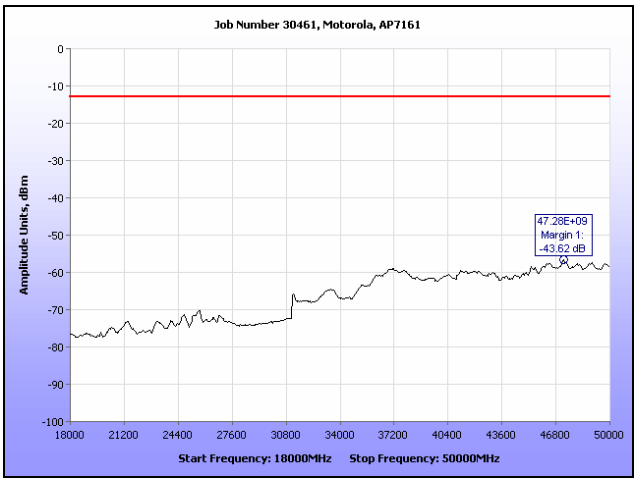
Plot 73. Conducted Spurious Emissions, 802.11a, 4950 MHz (18 GHz – 50 GHz), R3-C



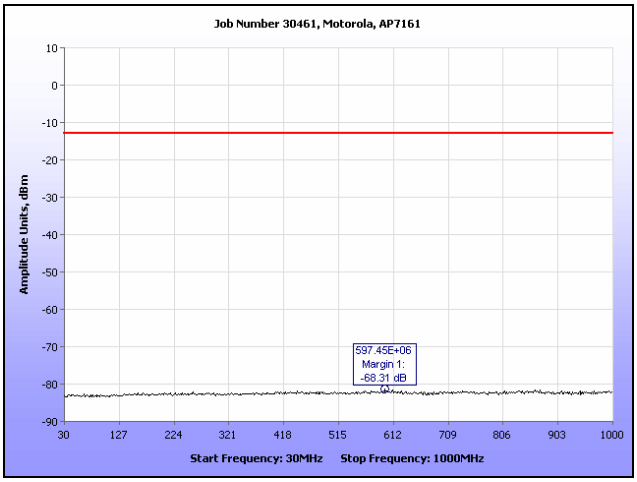
Plot 74. Conducted Spurious Emissions, 802.11a, 4960 MHz (30 MHz – 1 GHz), R3-A



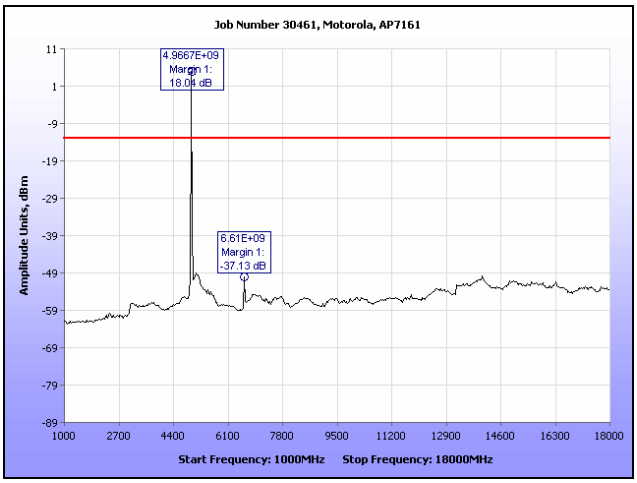
Plot 75. Conducted Spurious Emissions, 802.11a, 4960 MHz (1 GHz – 18 GHz), R3-A



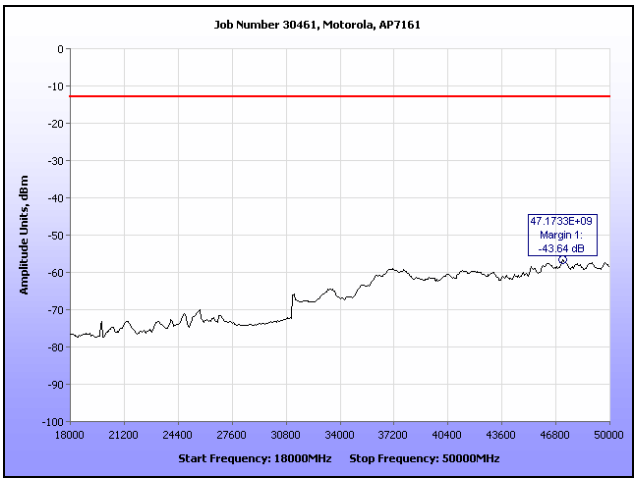
Plot 76. Conducted Spurious Emissions, 802.11a, 4960 MHz (18 GHz – 50 GHz), R3-A



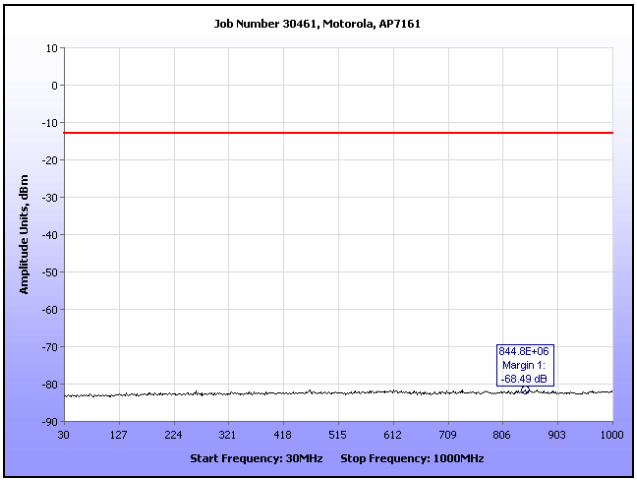
Plot 77. Conducted Spurious Emissions, 802.11a, 4960 MHz (30 MHz - 1 GHz), R3-B



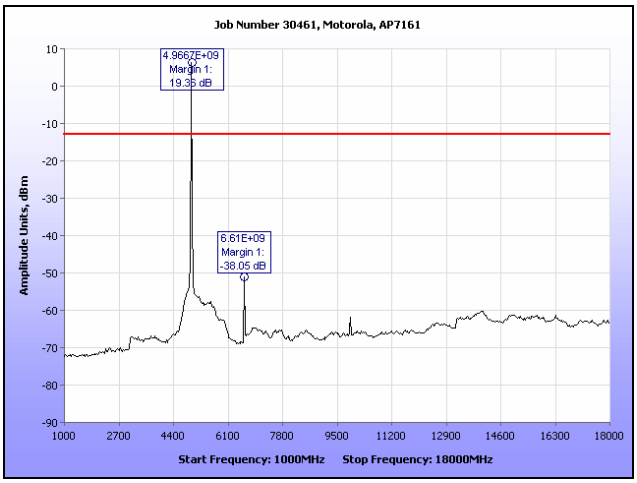
Plot 78. Conducted Spurious Emissions, 802.11a, 4960 MHz (1 GHz – 18 GHz), R3-B



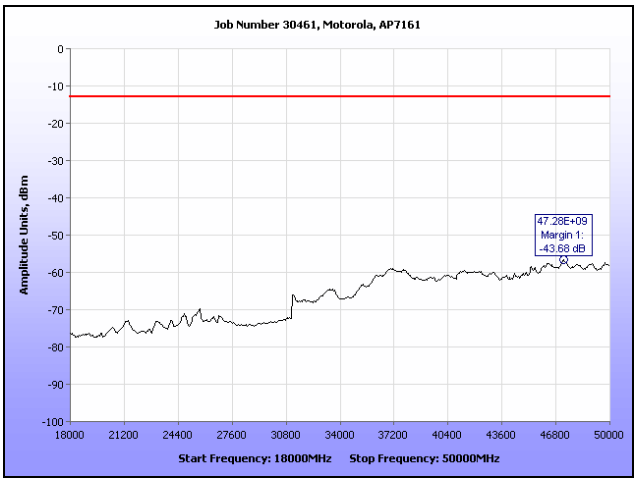
Plot 79. Conducted Spurious Emissions, 802.11a, 4960 MHz (18 GHz – 50 GHz), R3-B



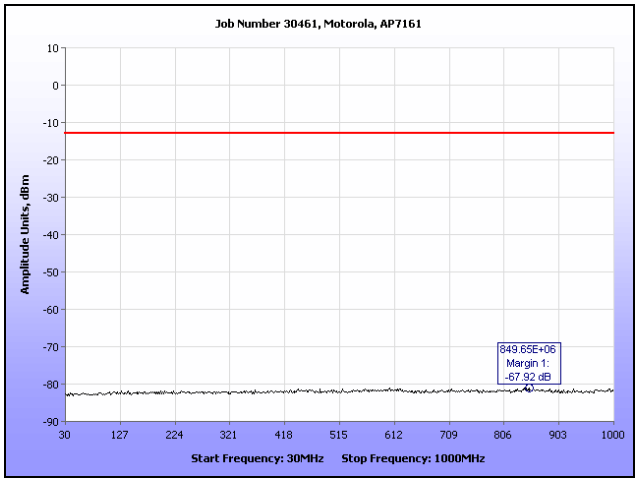
Plot 80. Conducted Spurious Emissions, 802.11a, 4960 MHz (30 MHz – 1 GHz), R3-C



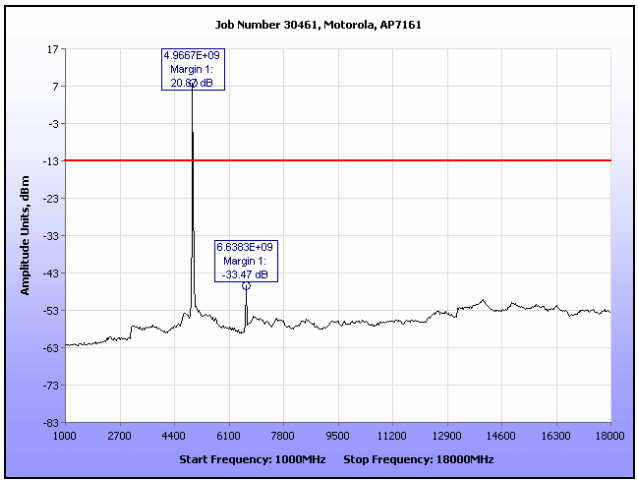
Plot 81. Conducted Spurious Emissions, 802.11a, 4960 MHz (1 GHz – 18 GHz), R3-C



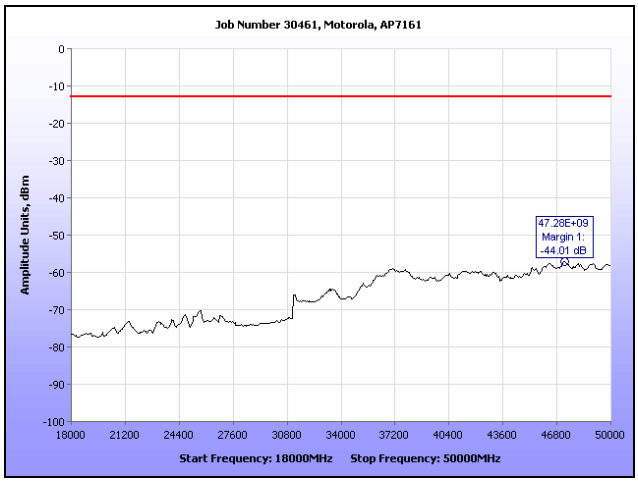
Plot 82. Conducted Spurious Emissions, 802.11a, 4960 MHz (18 GHz – 50 GHz), R3-C



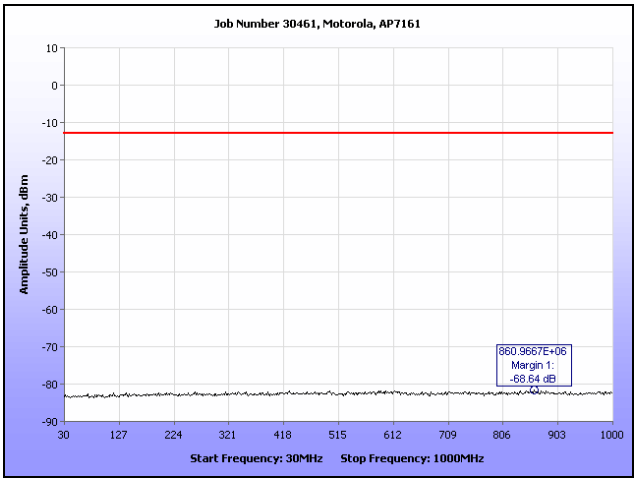
Plot 83. Conducted Spurious Emissions, 802.11a, 4970 MHz (30 MHz – 1 GHz), R3-A



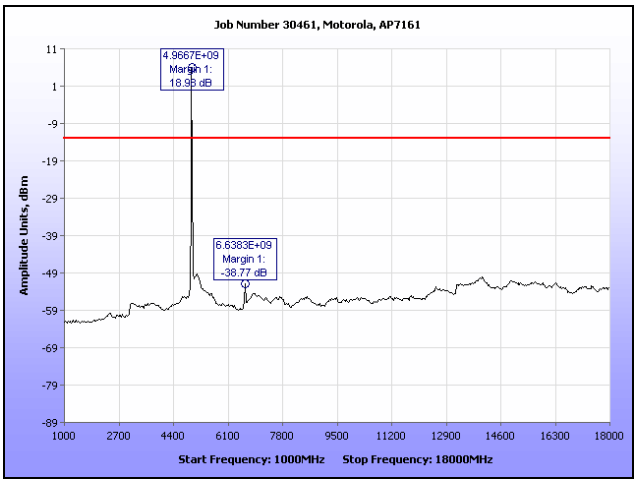
Plot 84. Conducted Spurious Emissions, 802.11a, 4970 MHz (1 GHz – 18 GHz), R3-A



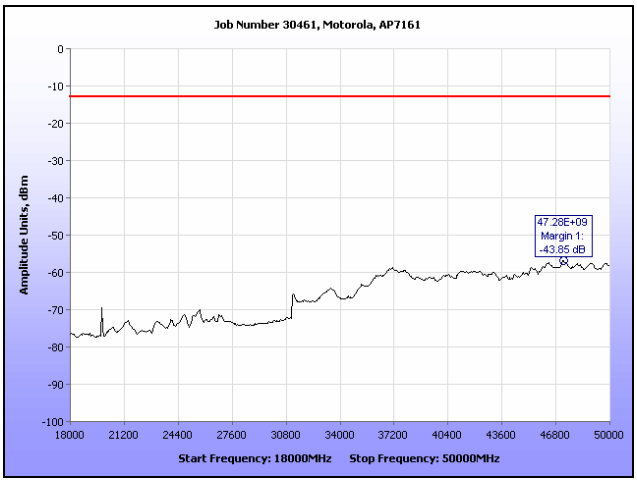
Plot 85. Conducted Spurious Emissions, 802.11a, 4970 MHz (18 GHz – 50 GHz), R3-A



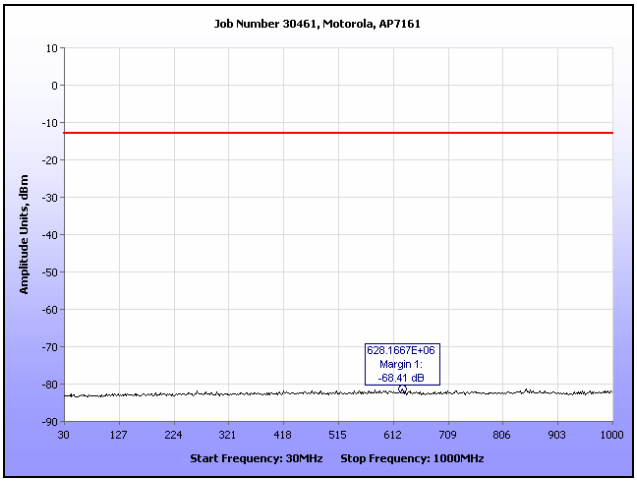
Plot 86. Conducted Spurious Emissions, 802.11a, 4970 MHz (30 MHz - 1 GHz), R3-B



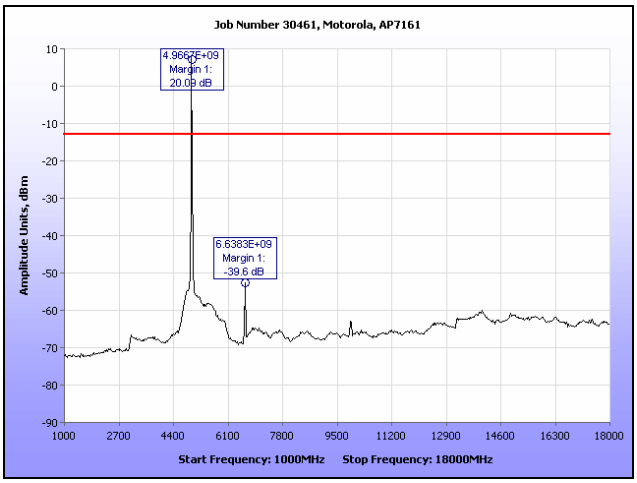
Plot 87. Conducted Spurious Emissions, 802.11a, 4970 MHz (1 GHz – 18 GHz), R3-B



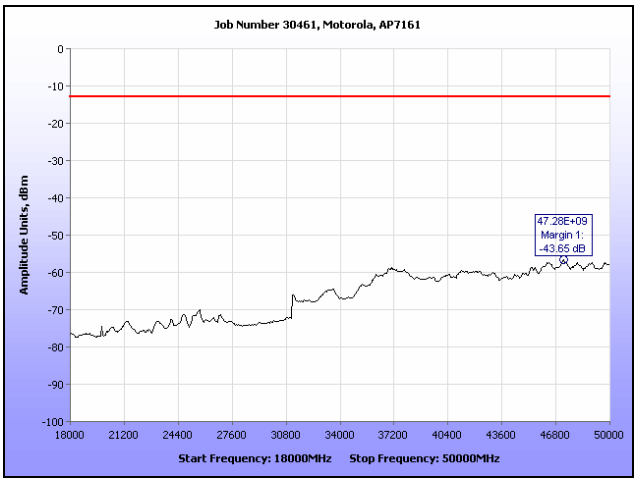
Plot 88. Conducted Spurious Emissions, 802.11a, 4970 MHz (18 GHz – 50 GHz), R3-B



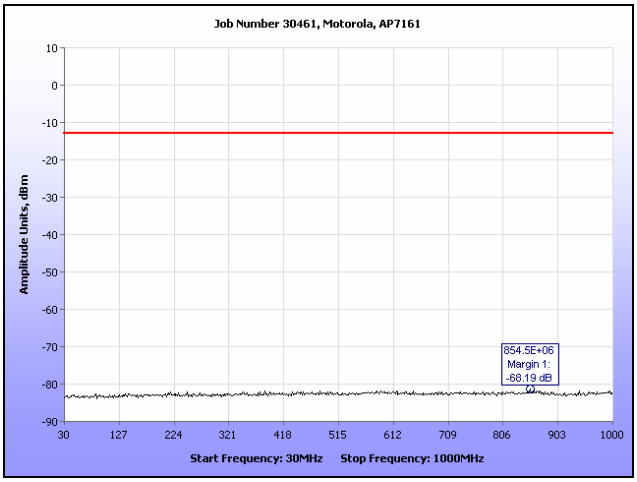
Plot 89. Conducted Spurious Emissions, 802.11a, 4970 MHz (30 MHz – 1 GHz), R3-C



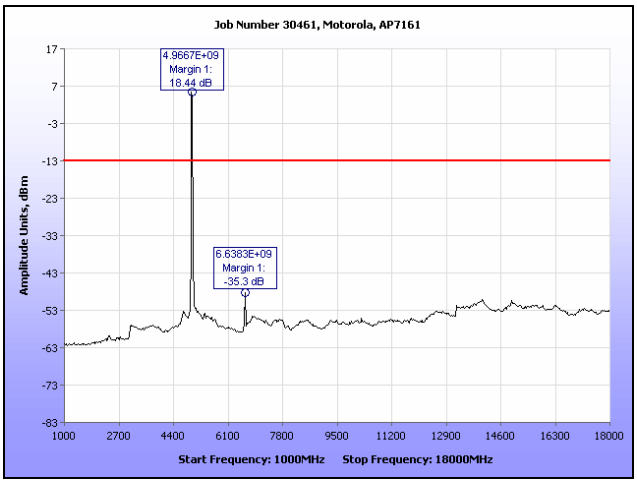
Plot 90. Conducted Spurious Emissions, 802.11a, 4970 MHz (1 GHz – 18 GHz), R3-C



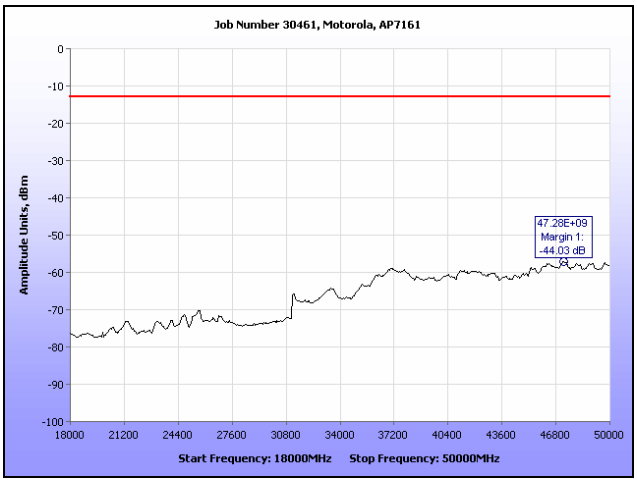
Plot 91. Conducted Spurious Emissions, 802.11a, 4970 MHz (18 GHz – 50 GHz), R3-C



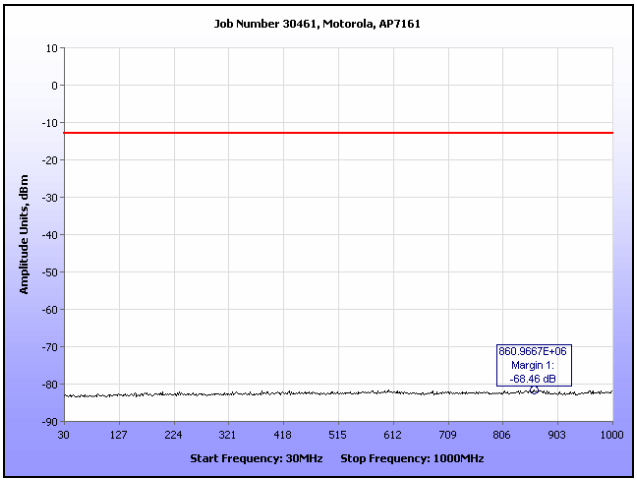
Plot 92. Conducted Spurious Emissions, 802.11a, 4980 MHz (30 MHz – 1 GHz), R3-A



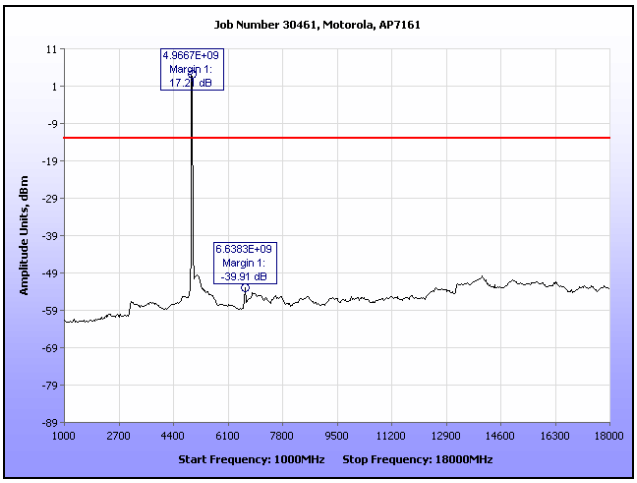
Plot 93. Conducted Spurious Emissions, 802.11a, 4980 MHz (1 GHz – 18 GHz), R3-A



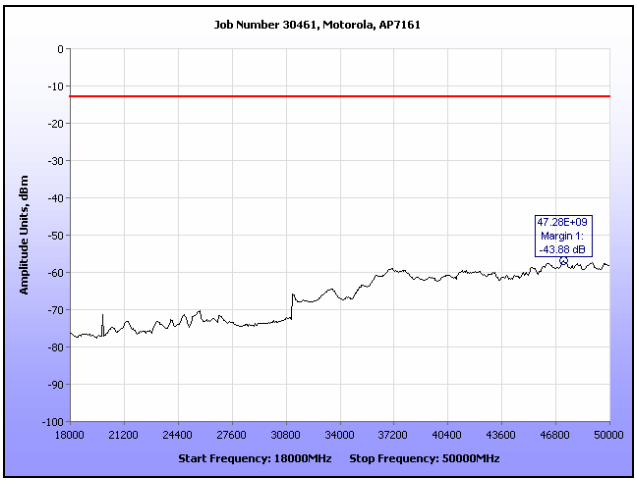
Plot 94. Conducted Spurious Emissions, 802.11a, 4980 MHz (18 GHz – 50 GHz), R3-A



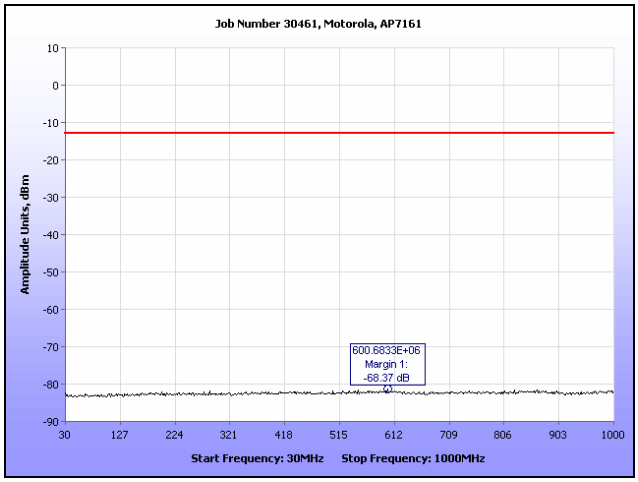
Plot 95. Conducted Spurious Emissions, 802.11a, 4980 MHz (30 MHz – 1 GHz), R3-B



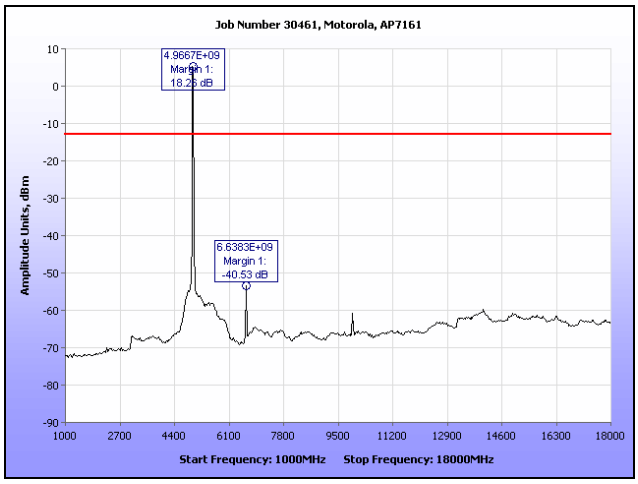
Plot 96. Conducted Spurious Emissions, 802.11a, 4980 MHz (1 GHz – 18 GHz), R3-B



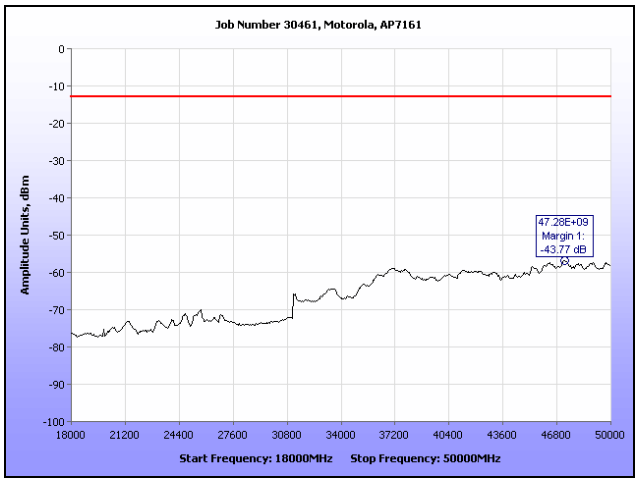
Plot 97. Conducted Spurious Emissions, 802.11a, 4980 MHz (18 GHz – 50 GHz), R3-B



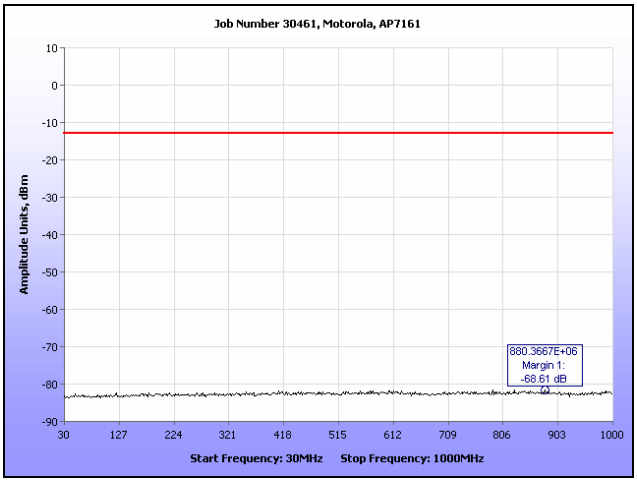
Plot 98. Conducted Spurious Emissions, 802.11a, 4980 MHz (30 MHz – 1 GHz), R3-C



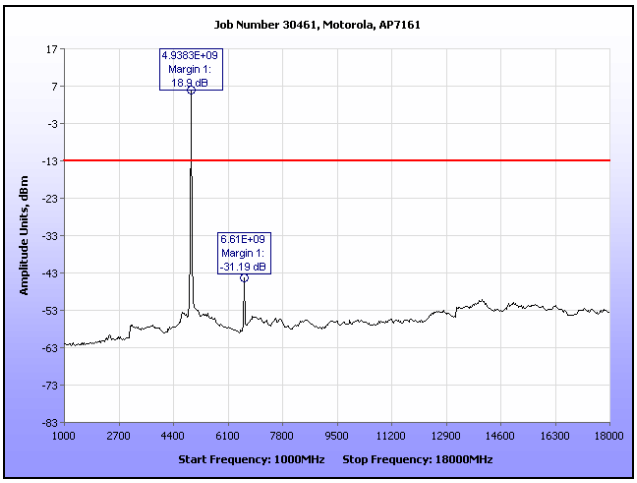
Plot 99. Conducted Spurious Emissions, 802.11a, 4980 MHz (1 GHz – 18 GHz), R3-C



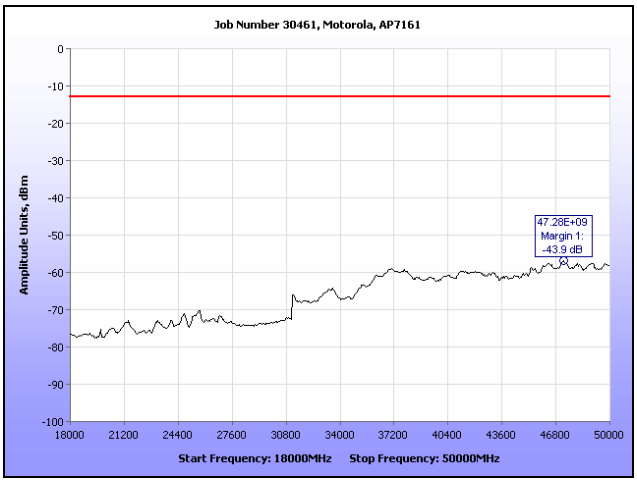
Plot 100. Conducted Spurious Emissions, 802.11a, 4980 MHz (18 GHz – 50 GHz), R3-C



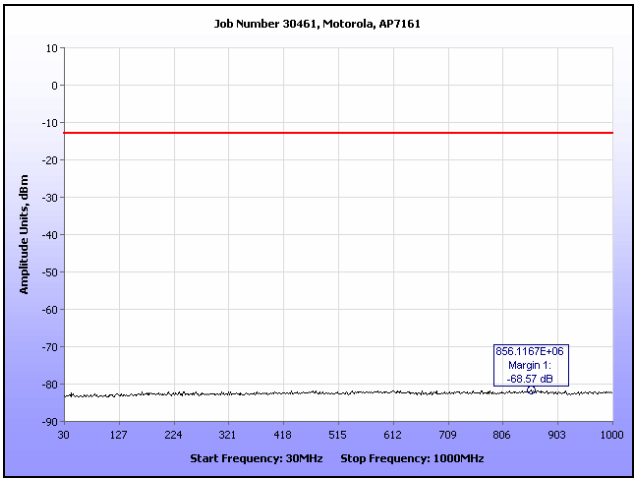
Plot 101. Conducted Spurious Emissions, 802.11n HT20, 4950 MHz (30 MHz – 1 GHz), R3-A



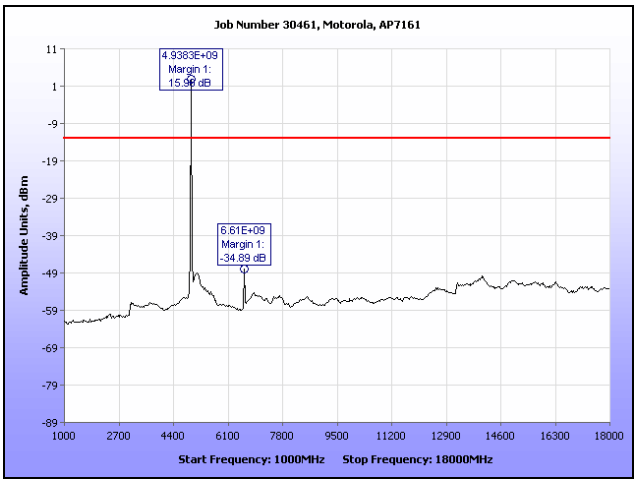
Plot 102. Conducted Spurious Emissions, 802.11n HT20, 4950 MHz (1 GHz – 18 GHz), R3-A



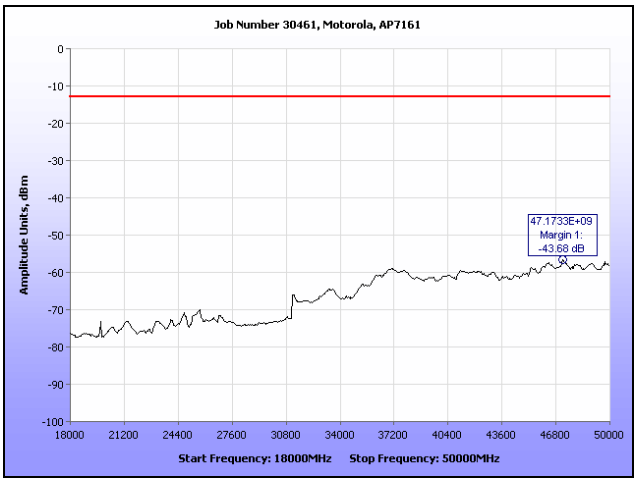
Plot 103. Conducted Spurious Emissions, 802.11n HT20, 4950 MHz (18 GHz – 50 GHz), R3-A



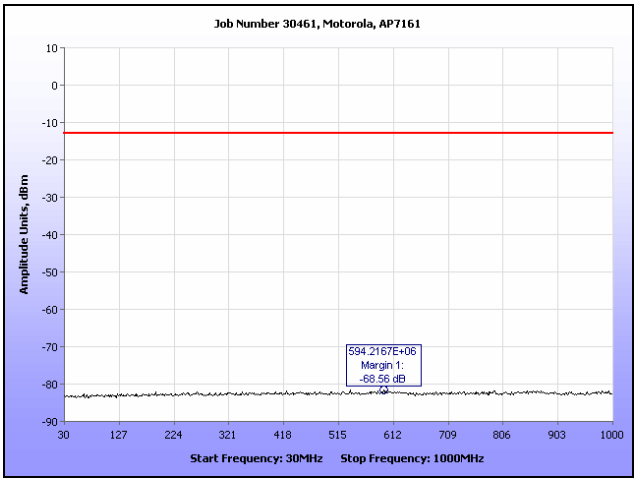
Plot 104. Conducted Spurious Emissions, 802.11n HT20, 4950 MHz (30 MHz - 1 GHz), R3-B



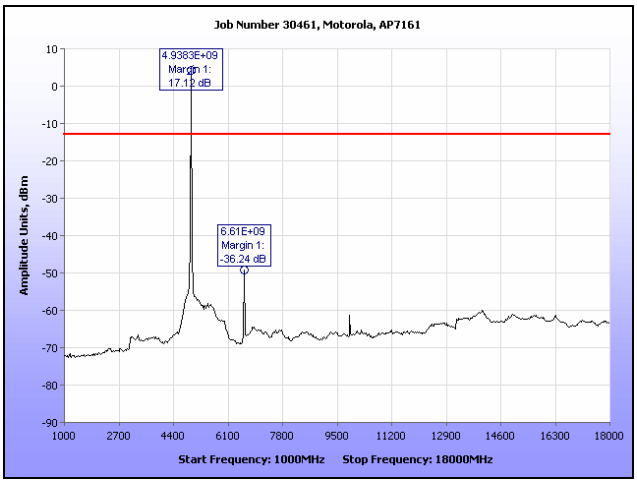
Plot 105. Conducted Spurious Emissions, 802.11n HT20, 4950 MHz (1 GHz – 18 GHz), R3-B



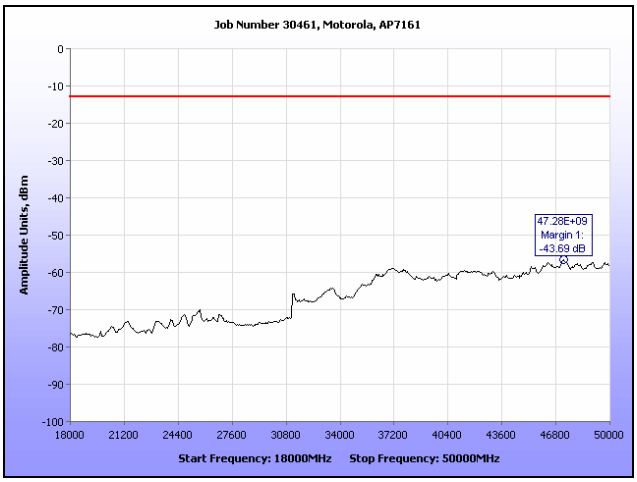
Plot 106. Conducted Spurious Emissions, 802.11n HT20, 4950 MHz (18 GHz – 50 GHz), R3-B



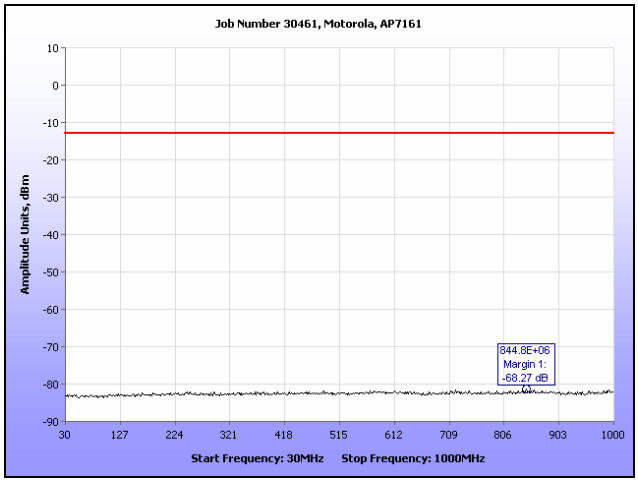
Plot 107. Conducted Spurious Emissions, 802.11n HT20, 4950 MHz (30 MHz – 1 GHz), R3-C



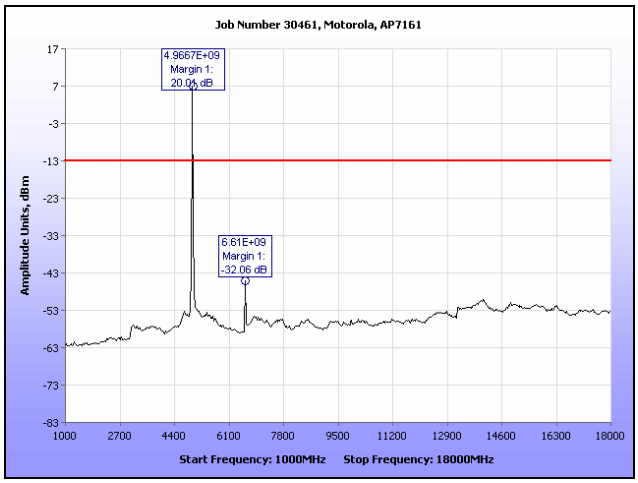
Plot 108. Conducted Spurious Emissions, 802.11n HT20, 4950 MHz (1 GHz – 18 GHz), R3-C



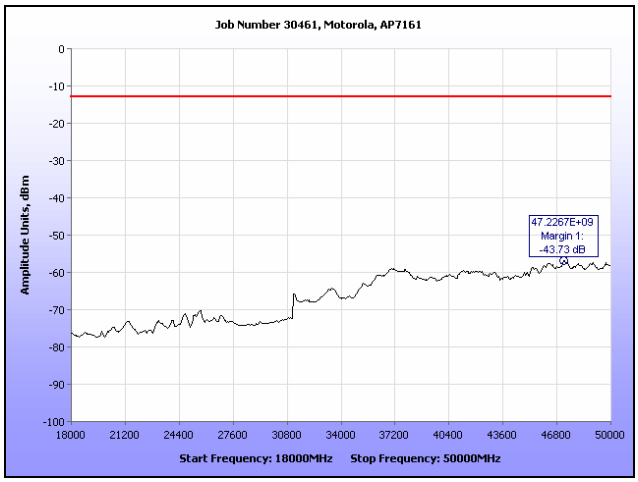
Plot 109. Conducted Spurious Emissions, 802.11n HT20, 4950 MHz (18 GHz – 50 GHz), R3-C



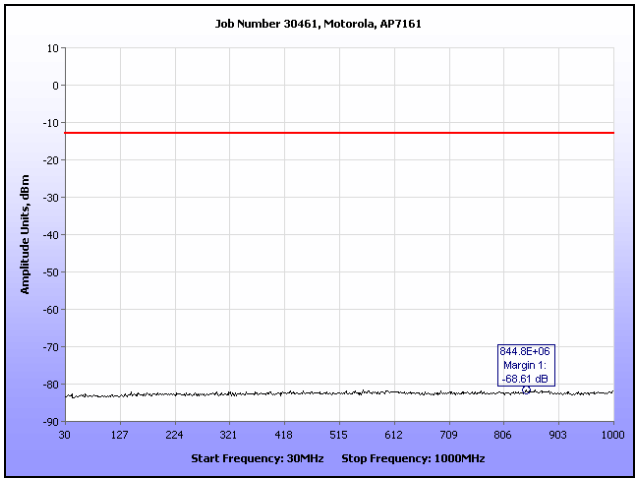
Plot 110. Conducted Spurious Emissions, 802.11n HT20, 4960 MHz (30 MHz – 1 GHz), R3-A



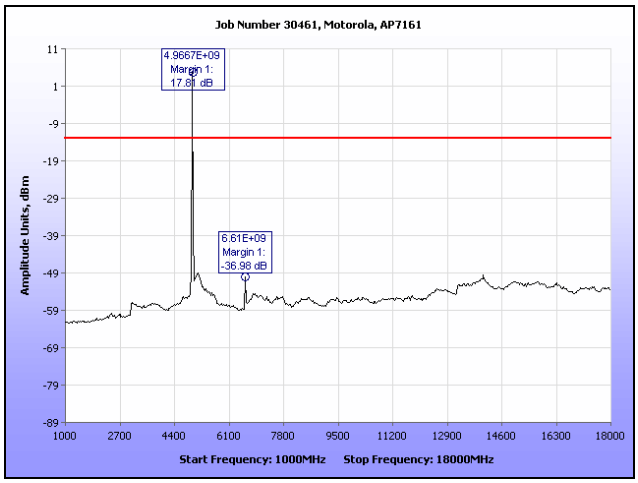
Plot 111. Conducted Spurious Emissions, 802.11n HT20, 4960 MHz (1 GHz – 18 GHz), R3-A



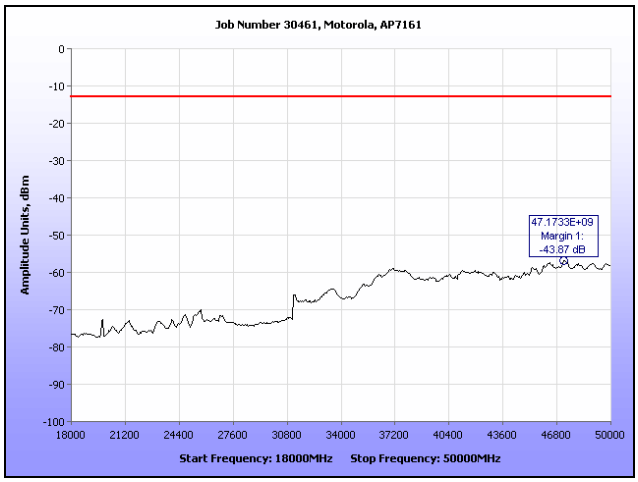
Plot 112. Conducted Spurious Emissions, 802.11n HT20, 4960 MHz (18 GHz – 50 GHz), R3-A



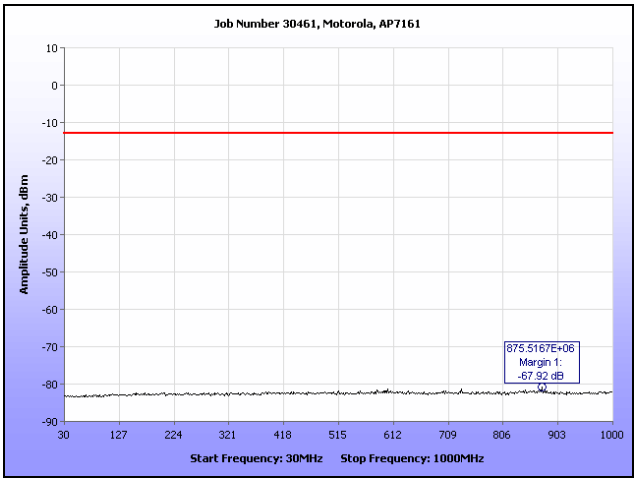
Plot 113. Conducted Spurious Emissions, 802.11n HT20, 4960 MHz (30 MHz - 1 GHz), R3-B



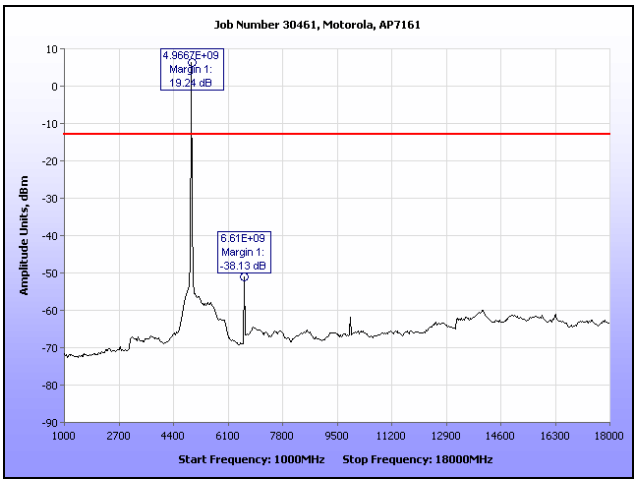
Plot 114. Conducted Spurious Emissions, 802.11n HT20, 4960 MHz (1 GHz – 18 GHz), R3-B



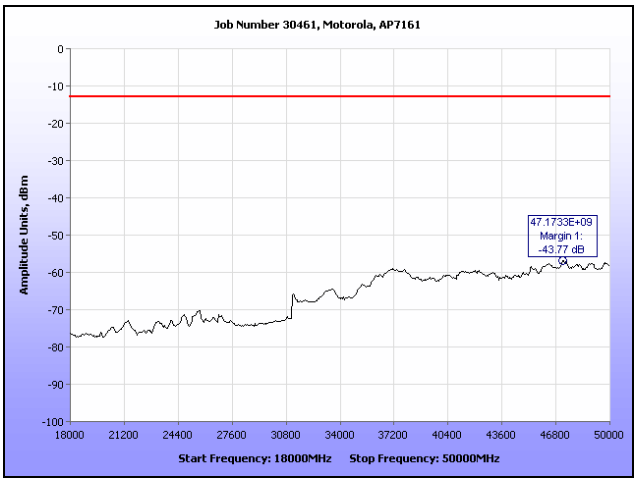
Plot 115. Conducted Spurious Emissions, 802.11n HT20, 4960 MHz (18 GHz – 50 GHz), R3-B



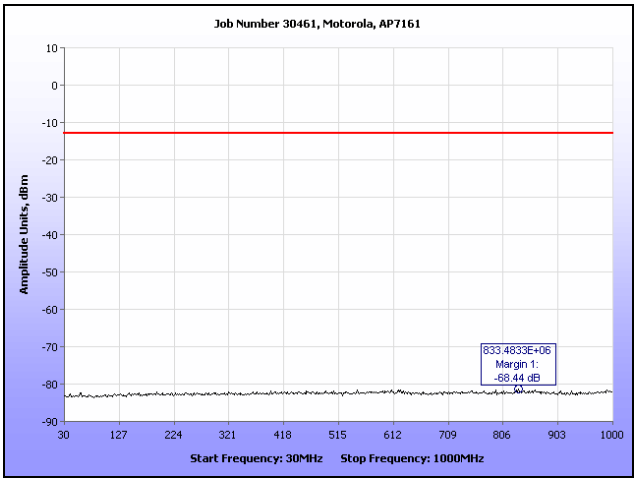
Plot 116. Conducted Spurious Emissions, 802.11n HT20, 4960 MHz (30 MHz – 1 GHz), R3-C



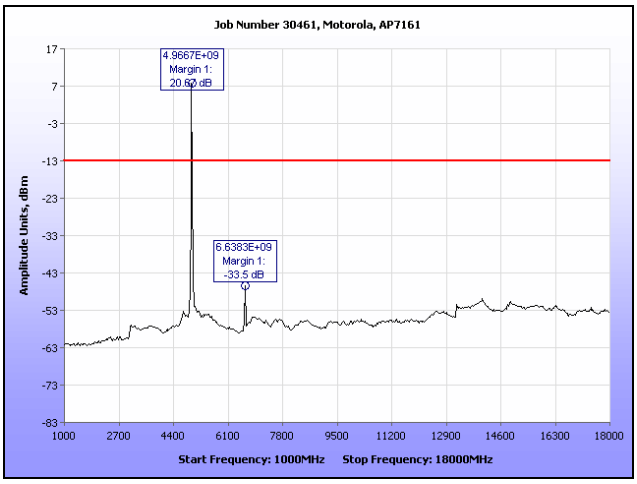
Plot 117. Conducted Spurious Emissions, 802.11n HT20, 4960 MHz (1 GHz – 18 GHz), R3-C



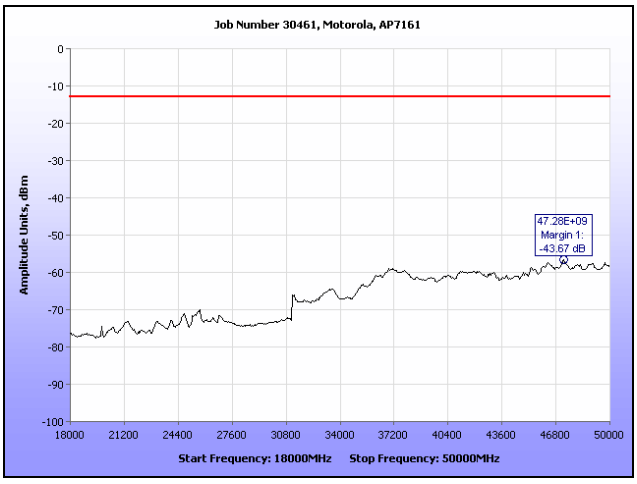
Plot 118. Conducted Spurious Emissions, 802.11n HT20, 4960 MHz (18 GHz – 50 GHz), R3-C



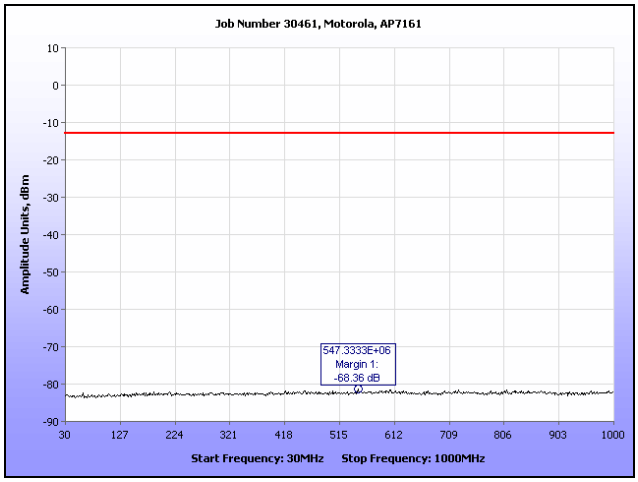
Plot 119. Conducted Spurious Emissions, 802.11n HT20, 4970 MHz (30 MHz – 1 GHz), R3-A



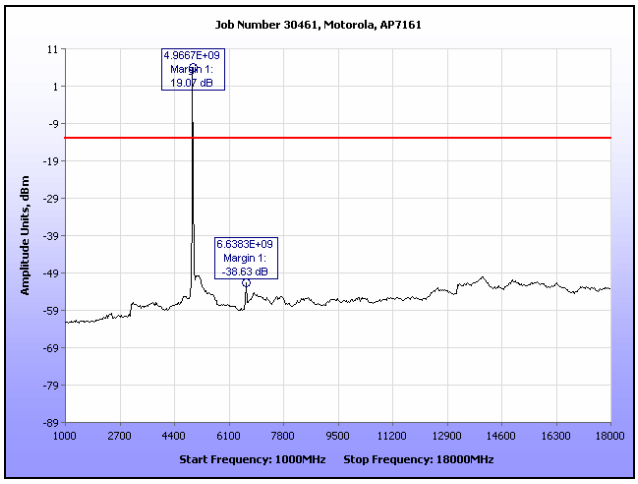
Plot 120. Conducted Spurious Emissions, 802.11n HT20, 4970 MHz (1 GHz – 18 GHz), R3-A



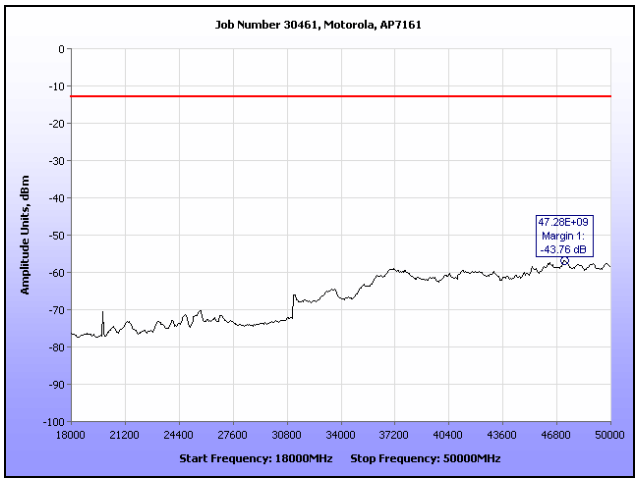
Plot 121. Conducted Spurious Emissions, 802.11n HT20, 4970 MHz (18 GHz – 50 GHz), R3-A



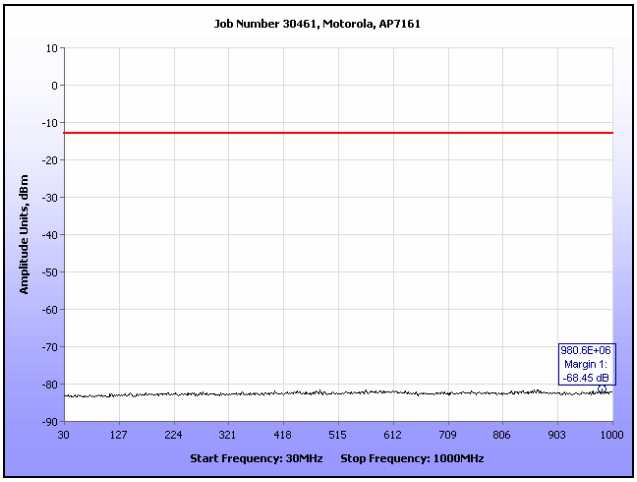
Plot 122. Conducted Spurious Emissions, 802.11n HT20, 4970 MHz (30 MHz - 1 GHz), R3-B



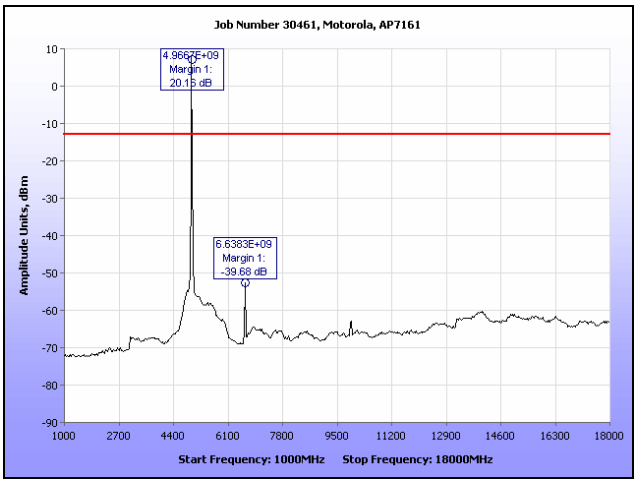
Plot 123. Conducted Spurious Emissions, 802.11n HT20, 4970 MHz (1 GHz – 18 GHz), R3-B



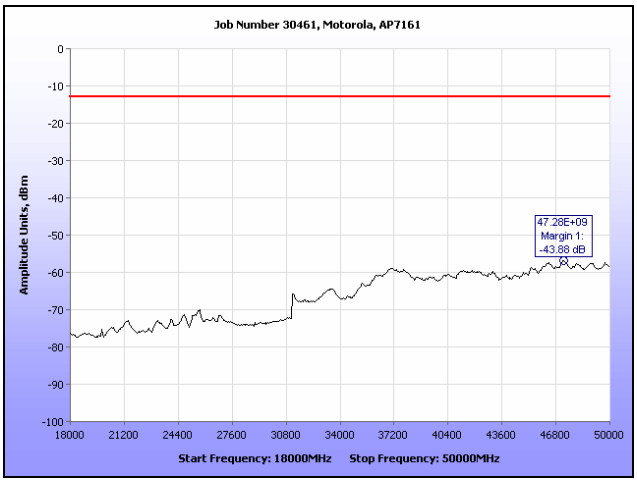
Plot 124. Conducted Spurious Emissions, 802.11n HT20, 4970 MHz (18 GHz – 50 GHz), R3-B



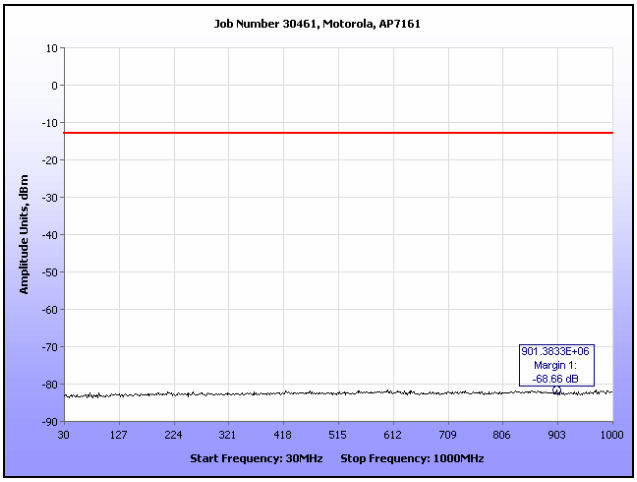
Plot 125. Conducted Spurious Emissions, 802.11n HT20, 4970 MHz (30 MHz – 1 GHz), R3-C



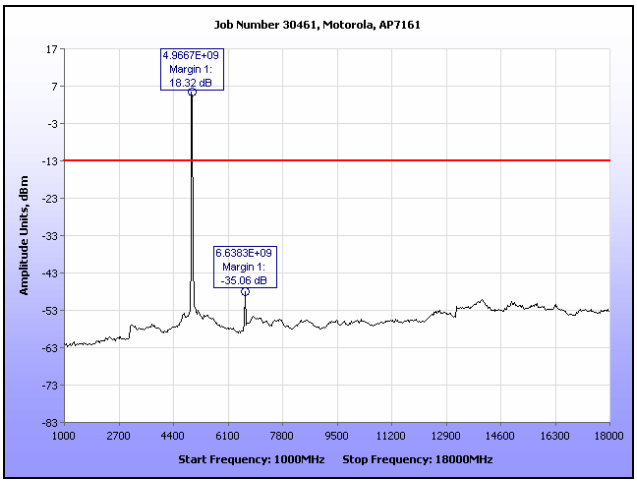
Plot 126. Conducted Spurious Emissions, 802.11n HT20, 4970 MHz (1 GHz – 18 GHz), R3-C



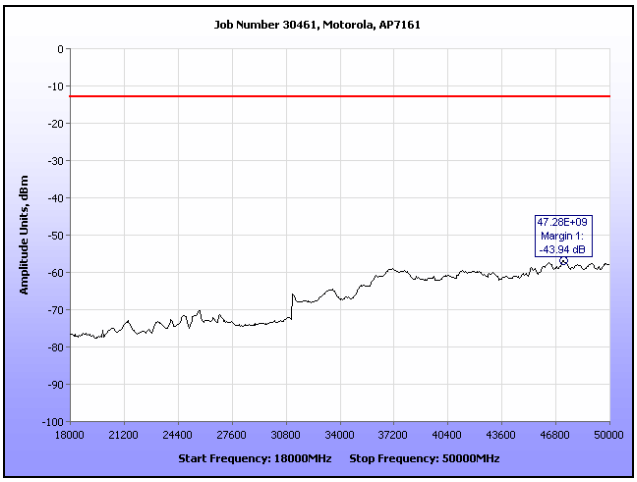
Plot 127. Conducted Spurious Emissions, 802.11n HT20, 4970 MHz (18 GHz – 50 GHz), R3-C



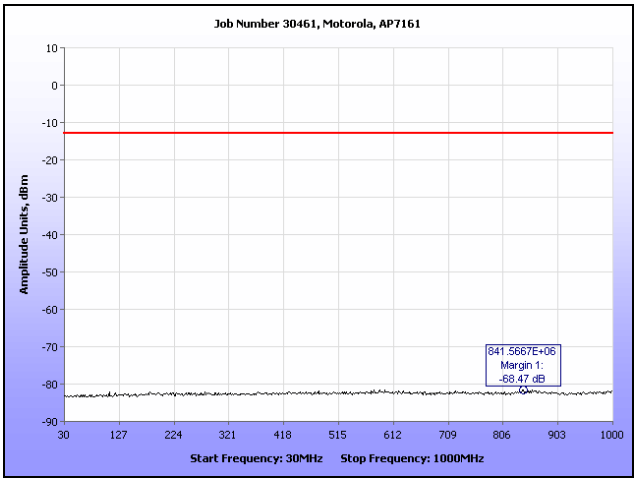
Plot 128. Conducted Spurious Emissions, 802.11n HT20, 4980 MHz (30 MHz – 1 GHz), R3-A



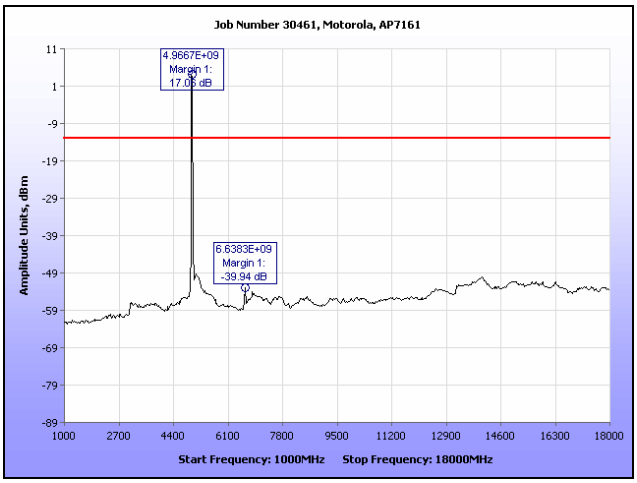
Plot 129. Conducted Spurious Emissions, 802.11n HT20, 4980 MHz (1 GHz – 18 GHz), R3-A



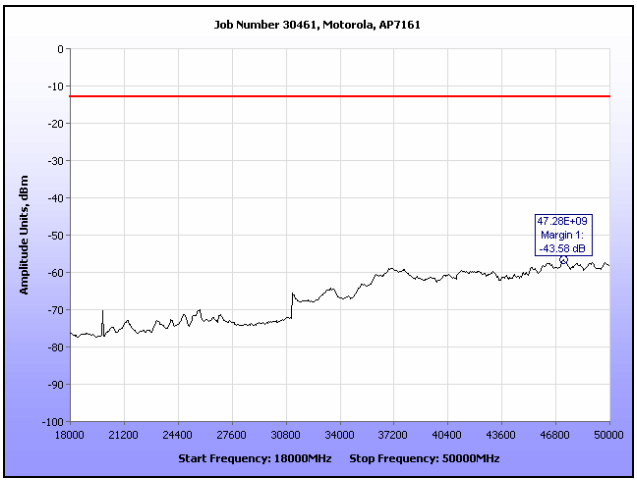
Plot 130. Conducted Spurious Emissions, 802.11n HT20, 4980 MHz (18 GHz – 50 GHz), R3-A



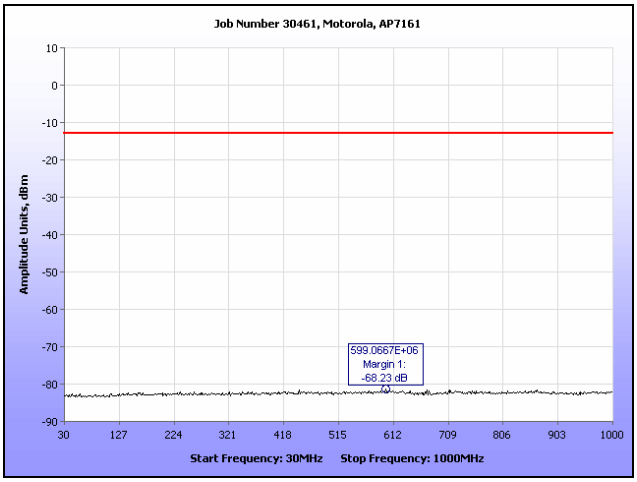
Plot 131. Conducted Spurious Emissions, 802.11n HT20, 4980 MHz (30 MHz - 1 GHz), R3-B



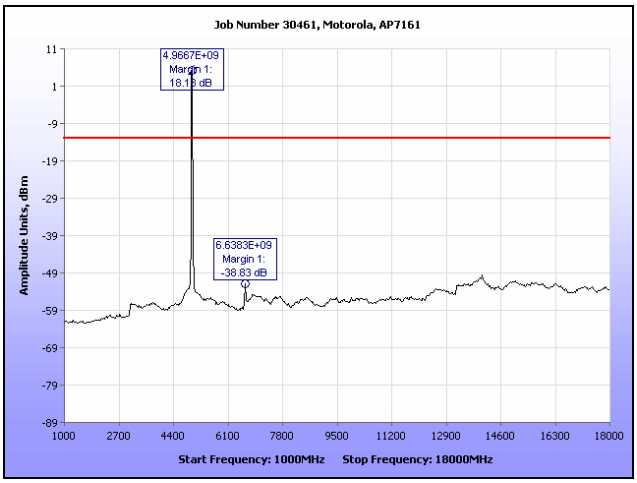
Plot 132. Conducted Spurious Emissions, 802.11n HT20, 4980 MHz (1 GHz – 18 GHz), R3-B



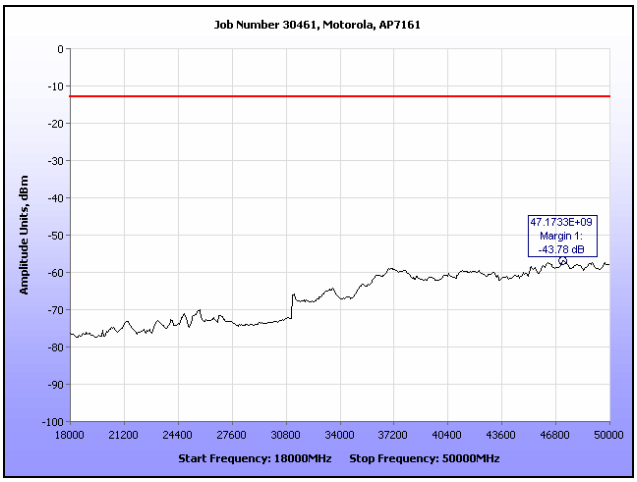
Plot 133. Conducted Spurious Emissions, 802.11n HT20, 4980 MHz (18 GHz – 50 GHz), R3-B



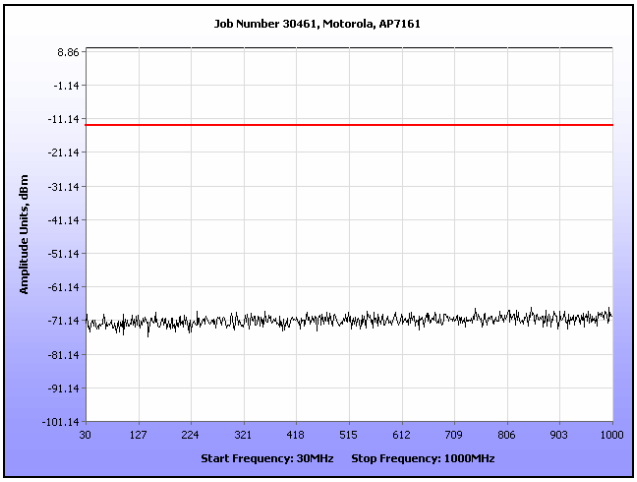
Plot 134. Conducted Spurious Emissions, 802.11n HT20, 4980 MHz (30 MHz – 1 GHz), R3-C



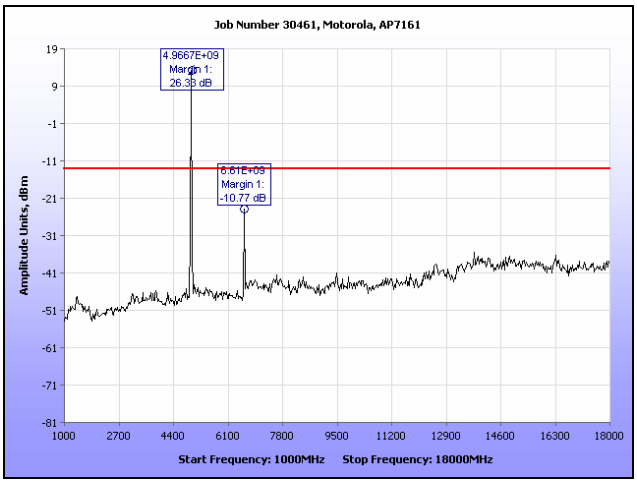
Plot 135. Conducted Spurious Emissions, 802.11n HT20, 4980 MHz (1 GHz – 18 GHz), R3-C



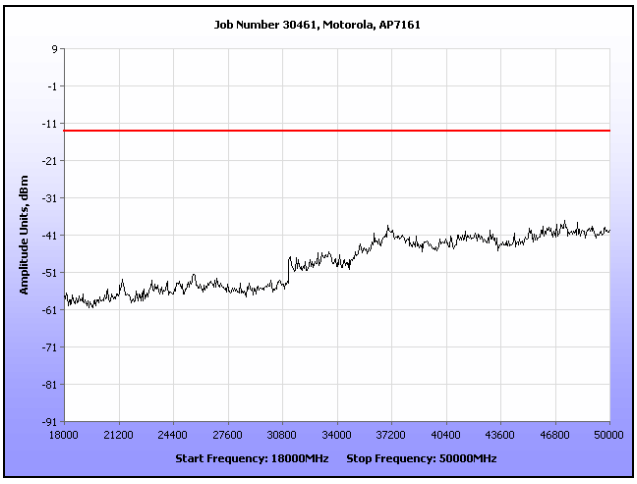
Plot 136. Conducted Spurious Emissions, 802.11n HT20, 4980 MHz (18 GHz – 50 GHz), R3-C



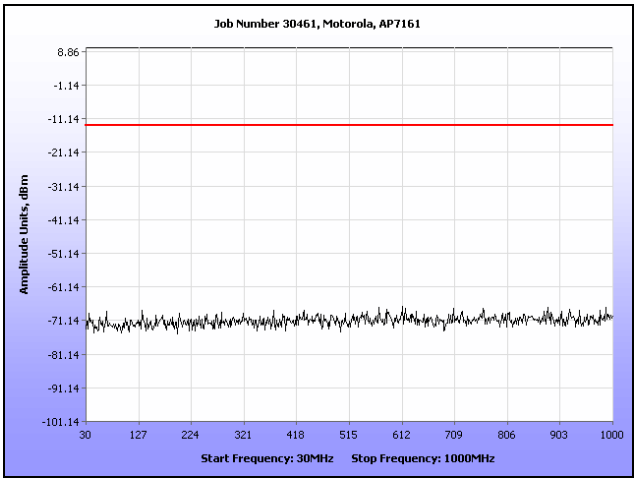
Plot 137. Conducted Spurious Emissions, 802.11a, 4950 MHz (30 MHz – 1 GHz), (1x1)



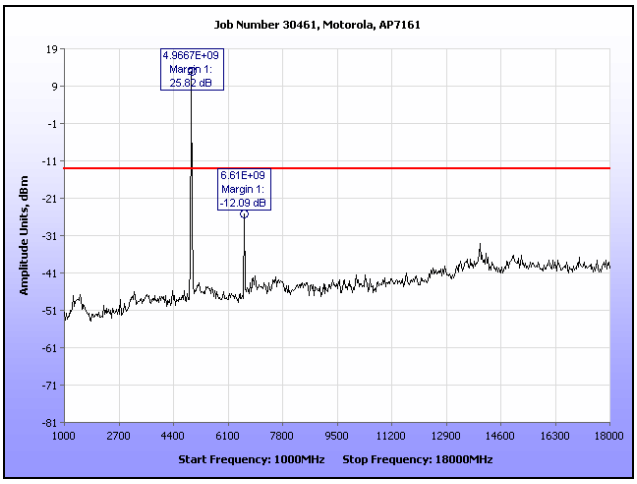
Plot 138. Conducted Spurious Emissions, 802.11a, 4950 MHz (1 GHz – 18 GHz), (1x1)



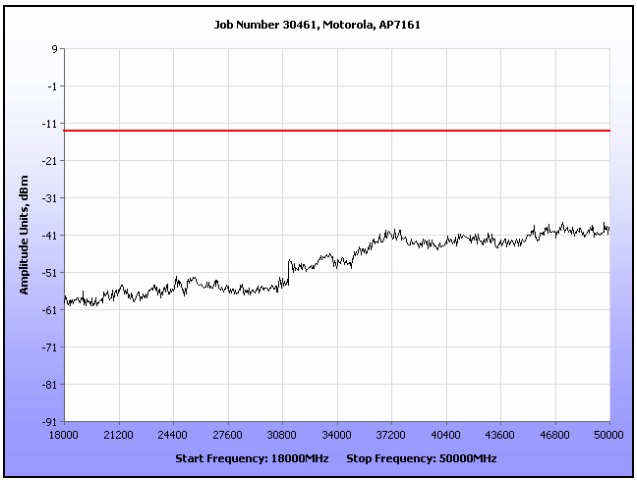
Plot 139. Conducted Spurious Emissions, 802.11a, 4950 MHz (18 GHz – 50 GHz), (1x1)



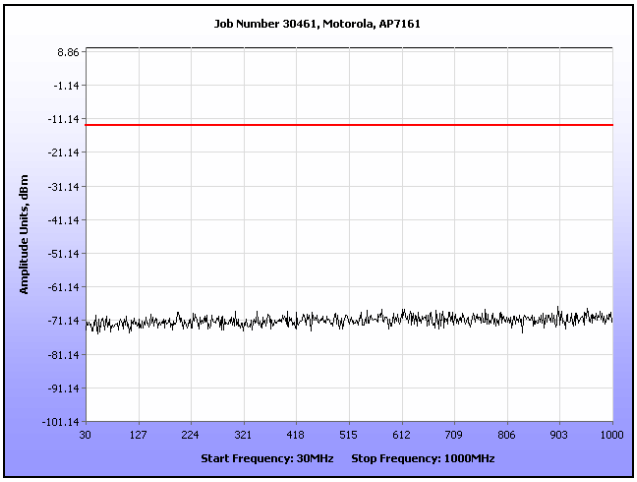
Plot 140. Conducted Spurious Emissions, 802.11a, 4960 MHz (30 MHz – 1 GHz), (1x1)



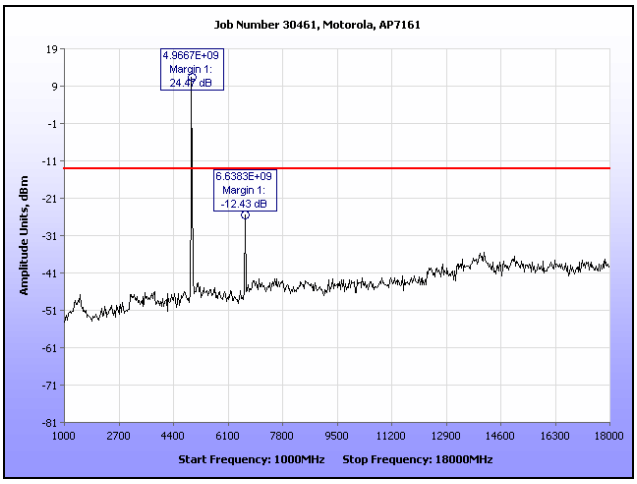
Plot 141. Conducted Spurious Emissions, 802.11a, 4960 MHz (1 GHz – 18 GHz), (1x1)



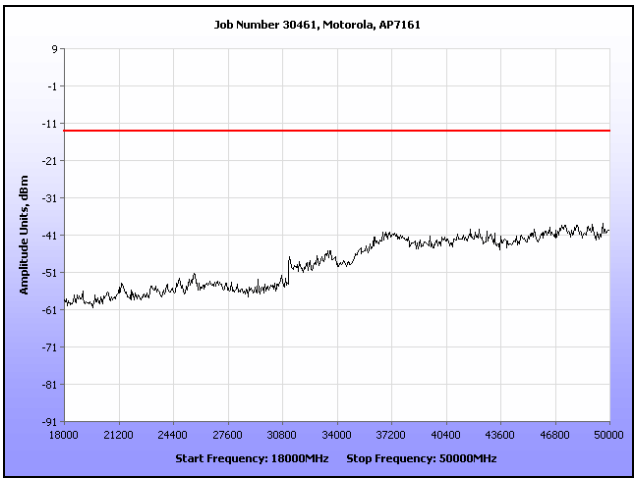
Plot 142. Conducted Spurious Emissions, 802.11a, 4960 MHz (18 GHz – 50 GHz), (1x1)



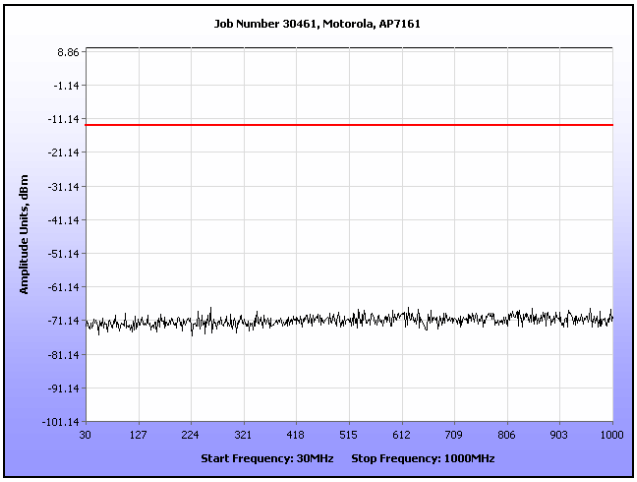
Plot 143. Conducted Spurious Emissions, 802.11a, 4970 MHz (30 MHz – 1 GHz), (1x1)



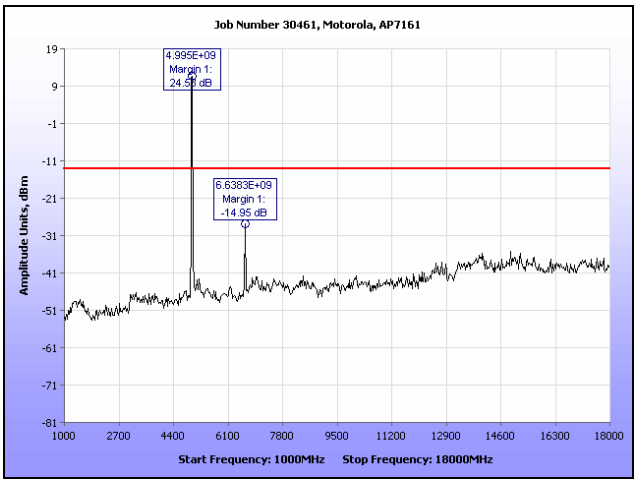
Plot 144. Conducted Spurious Emissions, 802.11a, 4970 MHz (1 GHz – 18 GHz), (1x1)



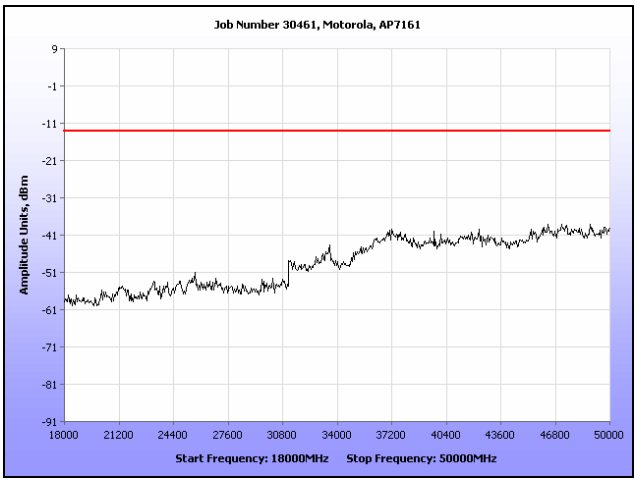
Plot 145. Conducted Spurious Emissions, 802.11a, 4970 MHz (18 GHz – 50 GHz), (1x1)



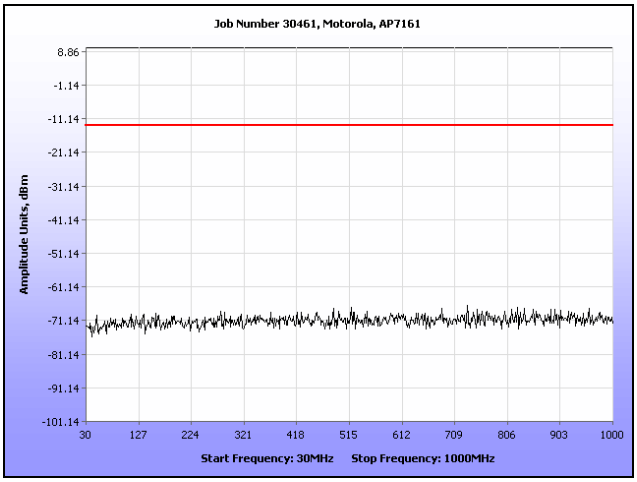
Plot 146. Conducted Spurious Emissions, 802.11a, 4980 MHz (30 MHz – 1 GHz), (1x1)



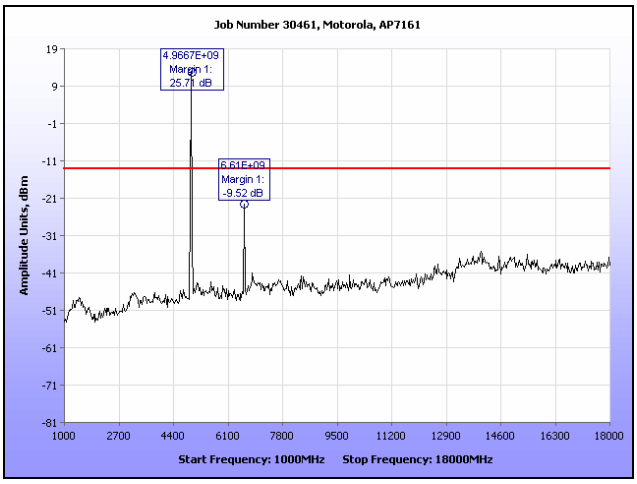
Plot 147. Conducted Spurious Emissions, 802.11a, 4980 MHz (1 GHz – 18 GHz), (1x1)



Plot 148. Conducted Spurious Emissions, 802.11a, 4980 MHz (18 GHz – 50 GHz), (1x1)

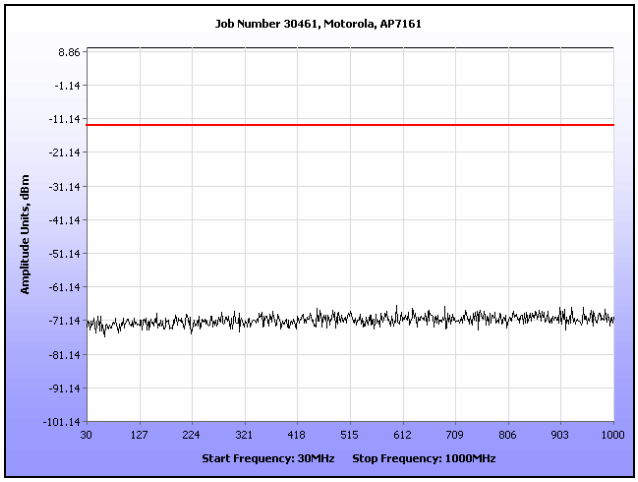


Plot 149. Conducted Spurious Emissions, 802.11n HT20, 4950 MHz (30 MHz – 1 GHz), (1x1)

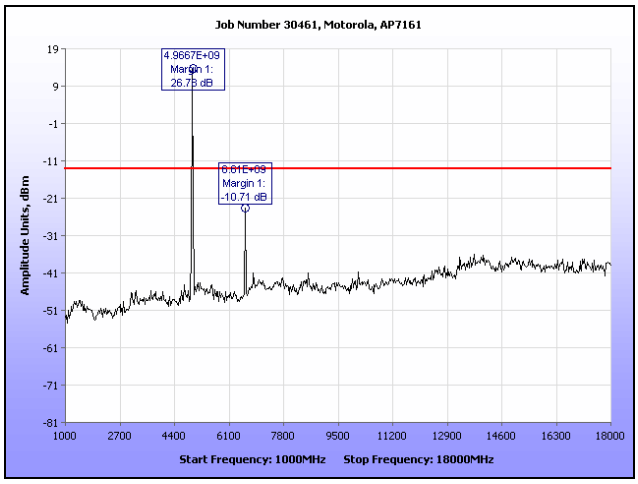


Plot 150. Conducted Spurious Emissions, 802.11n HT20, 4950 MHz (1 GHz – 18 GHz), (1x1)

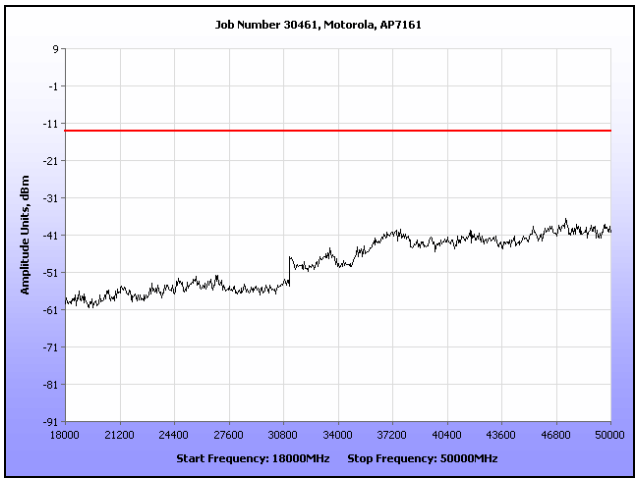
Plot 151. Conducted Spurious Emissions, 802.11n HT20, 4950 MHz (18 GHz – 50 GHz), (1x1)



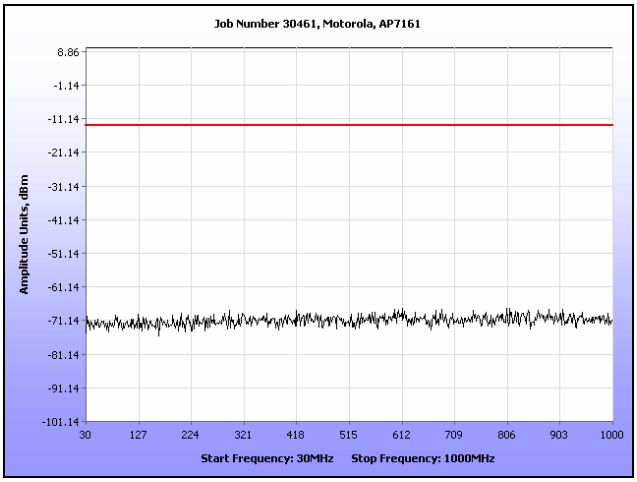
Plot 152. Conducted Spurious Emissions, 802.11n HT20, 4960 MHz (30 MHz – 1 GHz), (1x1)



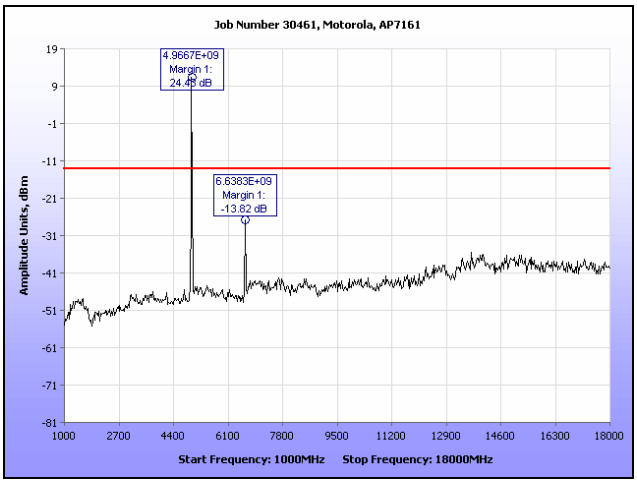
Plot 153. Conducted Spurious Emissions, 802.11n HT20, 4960 MHz (1 GHz – 18 GHz), (1x1)



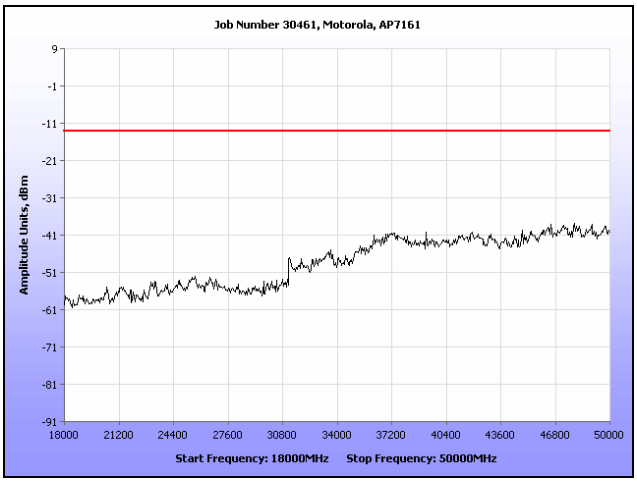
Plot 154. Conducted Spurious Emissions, 802.11n HT20, 4960 MHz (18 GHz – 50 GHz), (1x1)



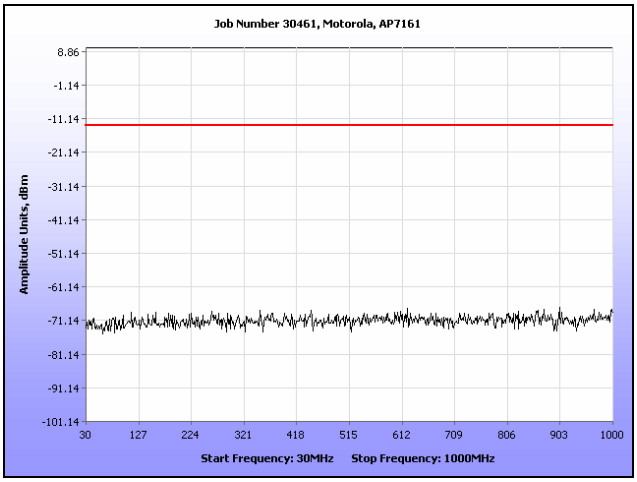
Plot 155. Conducted Spurious Emissions, 802.11n HT20, 4970 MHz (30 MHz – 1 GHz), (1x1)



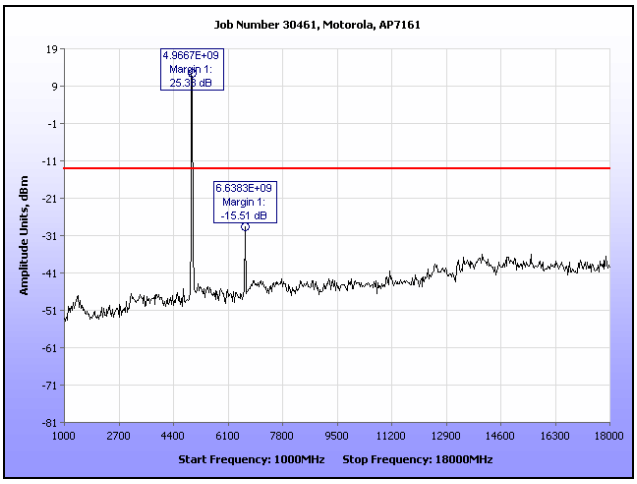
Plot 156. Conducted Spurious Emissions, 802.11n HT20, 4970 MHz (1 GHz – 18 GHz), (1x1)



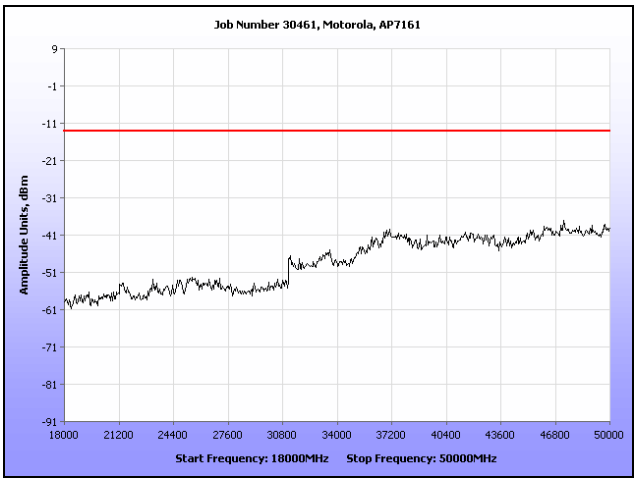
Plot 157. Conducted Spurious Emissions, 802.11n HT20, 4970 MHz (18 GHz – 50 GHz), (1x1)



Plot 158. Conducted Spurious Emissions, 802.11n HT20, 4980 MHz (30 MHz – 1 GHz), (1x1)



Plot 159. Conducted Spurious Emissions, 802.11n HT20, 4980 MHz (1 GHz – 18 GHz), (1x1)



Plot 160. Conducted Spurious Emissions, 802.11n HT20, 4980 MHz (18 GHz – 50 GHz), (1x1)

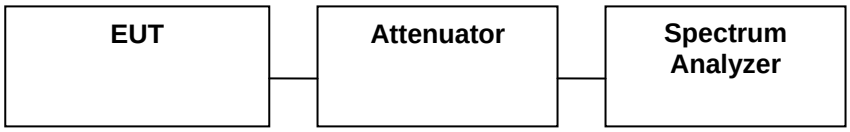


Figure 6. Spurious Emissions at Antenna Terminals Test Setup

Electromagnetic Compatibility Radiated Emissions Requirements

5.2. Radiated Emissions

Test Requirement(s): **§2.1053 and §90.210**

Test Procedures: As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of TIA/EIA-603-A-2001 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements were performed inside a 10 meter semi-anechoic chamber. The EUT was set at a distance of 3m from the receiving antenna. The EUT's RF ports were terminated to 50ohm load. The EUT was set to transmit at the low, mid and high channels of the transmitter frequency range at its maximum power level. The EUT was rotated about 360^0 and the receiving antenna scanned from 1-4m in order to capture the maximum emission. A calibrated antenna source was positioned in place of the EUT and the previously recorded signal was duplicated. The maximum EIRP of the emission was calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps were carried out with the receiving antenna in both vertical and horizontal polarization. Harmonic emissions up to the 10^{th} or 40GHz, which ever was the lesser, were investigated.

No peaks were found above 18 GHz.

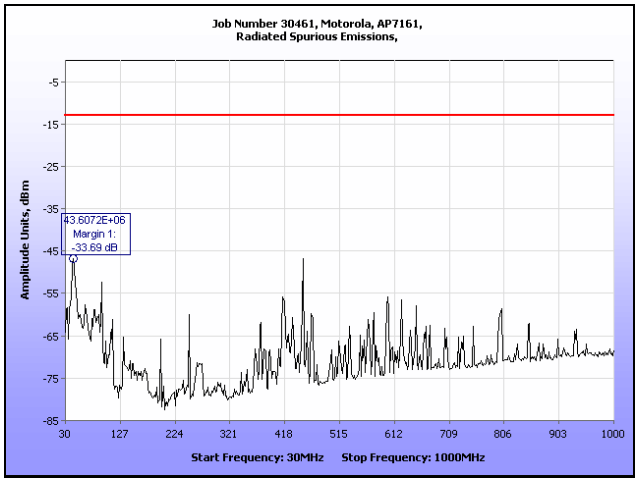
Note: Signal substitution was not performed due to the fact that only noise floor was detected from 30 MHz – 40 GHz.

Test Results: Equipment complies with Section 2.1053 and 90.210.

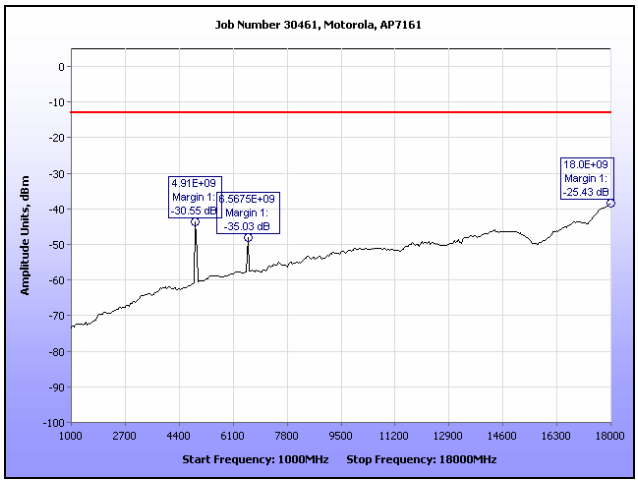
Test Engineer(s): Jeff Pratt

Test Date(s): 03/25/11

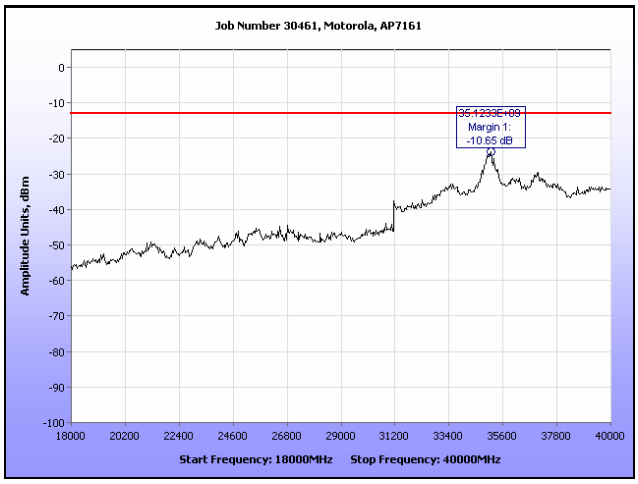
Radiated Emissions Test Results



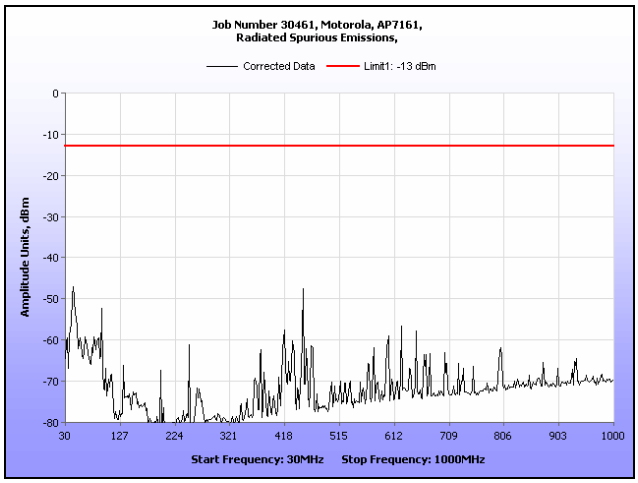
Plot 161. Radiated Spurious Emissions, 802.11a, 4950 MHz (30 MHz – 1 GHz)



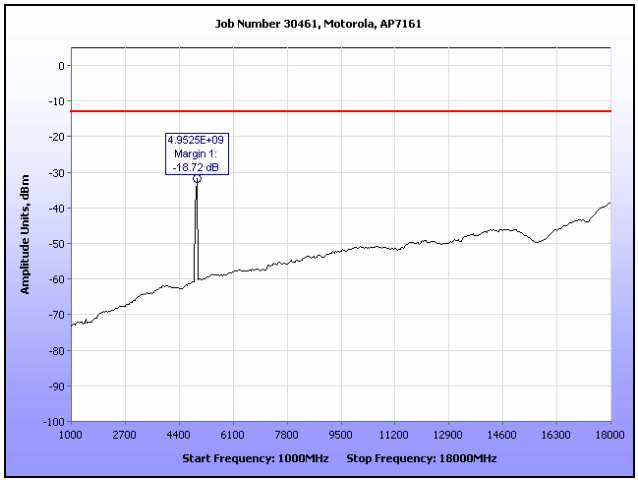
Plot 162. Radiated Spurious Emissions, 802.11a, 4950 MHz (1 GHz – 18 GHz)



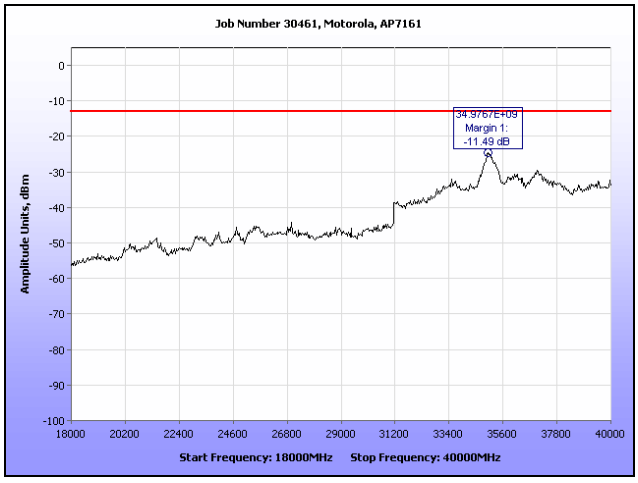
Plot 163. Radiated Spurious Emissions, 802.11a, 4950 MHz (18 GHz – 40 GHz)



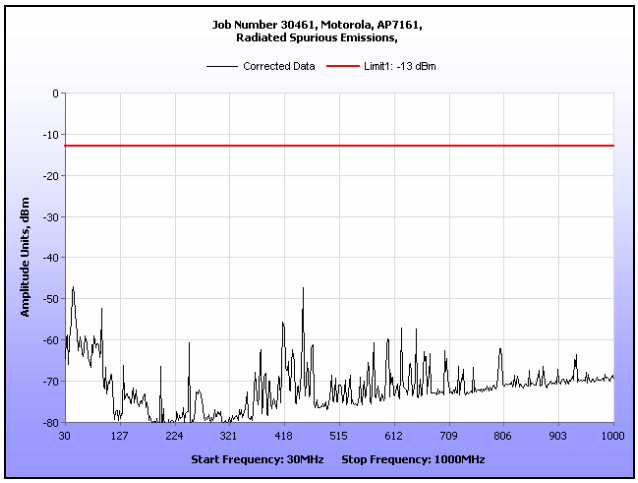
Plot 164. Radiated Spurious Emissions, 802.11a, 4960 MHz (30 MHz – 1 GHz)



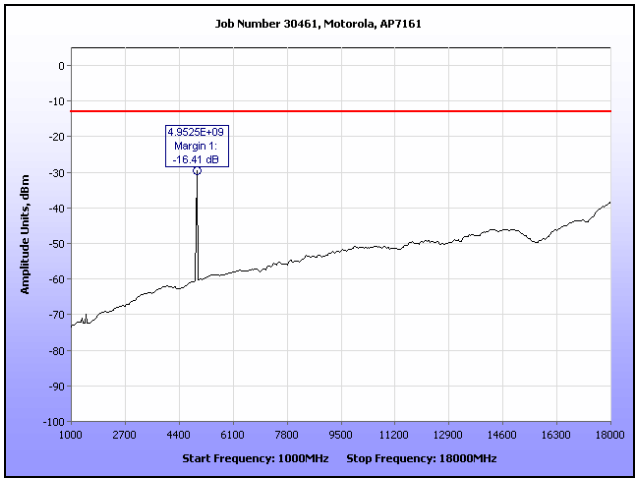
Plot 165. Radiated Spurious Emissions, 802.11a, 4960 MHz (1 GHz – 18 GHz)



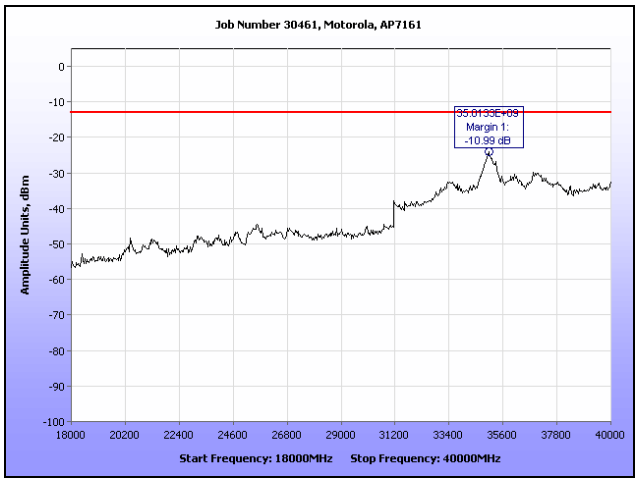
Plot 166. Radiated Spurious Emissions, 802.11a, 4960 MHz (18 GHz – 40 GHz)



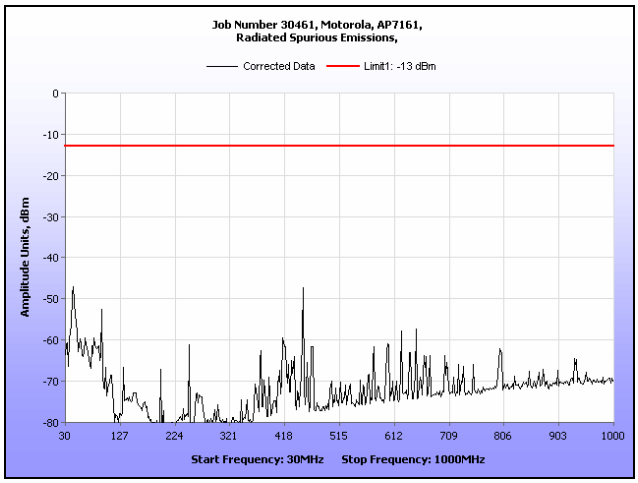
Plot 167. Radiated Spurious Emissions, 802.11a, 4970 MHz (30 MHz – 1 GHz)



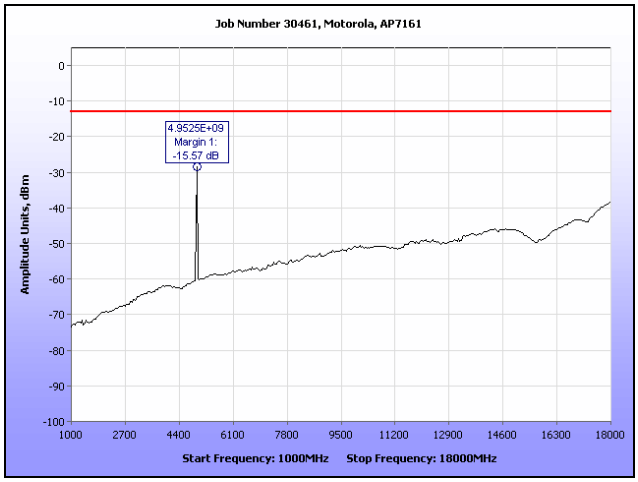
Plot 168. Radiated Spurious Emissions, 802.11a, 4970 MHz (1 GHz – 18 GHz)



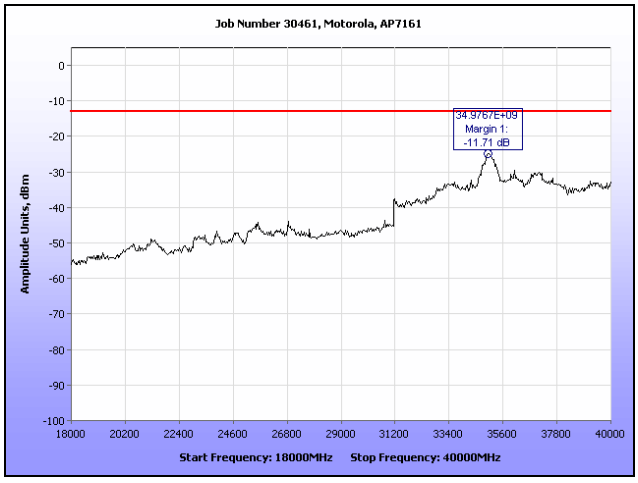
Plot 169. Radiated Spurious Emissions, 802.11a, 4970 MHz (18 GHz – 40 GHz)



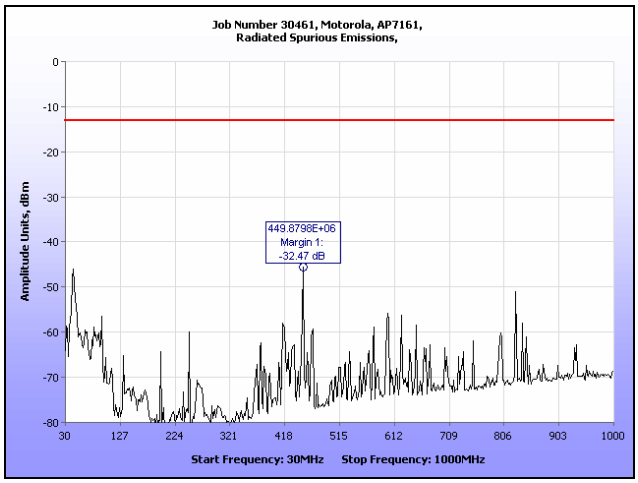
Plot 170. Radiated Spurious Emissions, 802.11a, 4980 MHz (30 MHz – 1 GHz)



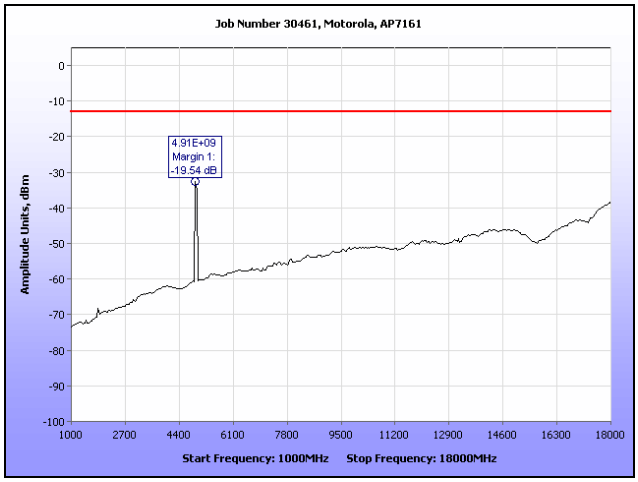
Plot 171. Radiated Spurious Emissions, 802.11a, 4980 MHz (1 GHz – 18 GHz)



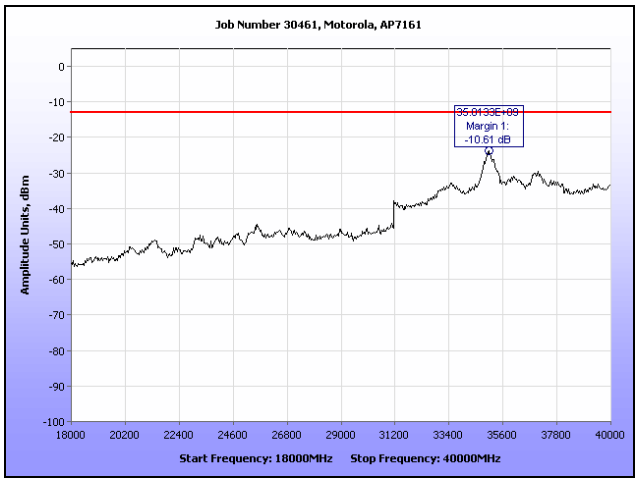
Plot 172. Radiated Spurious Emissions, 802.11a, 4980 MHz (18 GHz – 40 GHz)



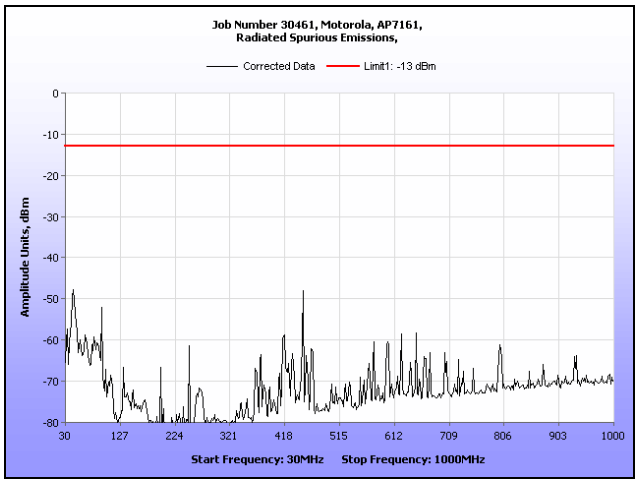
Plot 173. Radiated Spurious Emissions, 802.11n HT20, 4950 MHz (30 MHz – 1 GHz)



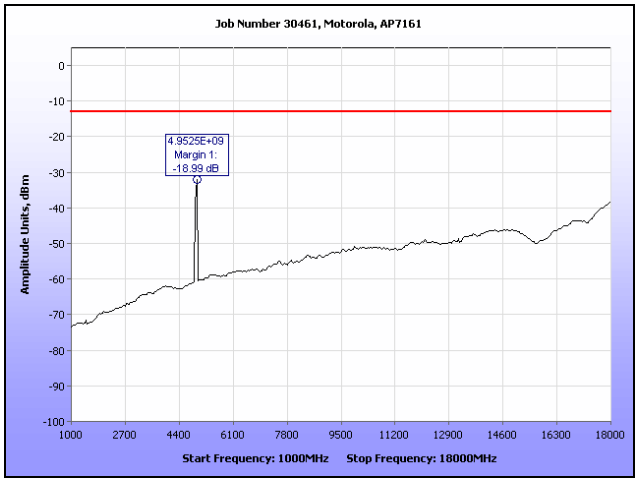
Plot 174. Radiated Spurious Emissions, 802.11n HT20, 4950 MHz (1 GHz – 18 GHz)



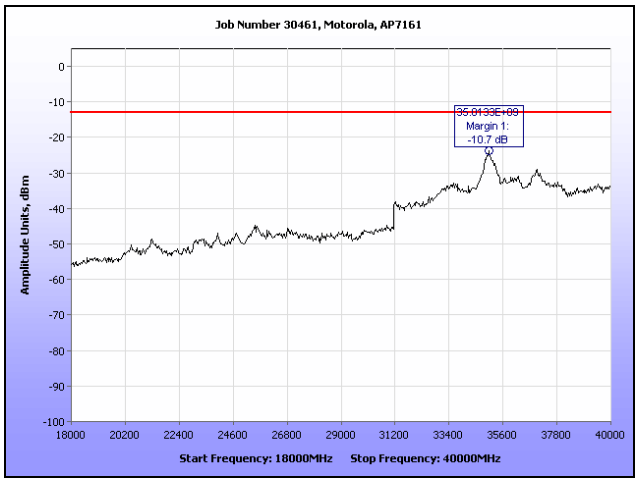
Plot 175. Radiated Spurious Emissions, 802.11n HT20, 4950 MHz (18 GHz – 40 GHz)



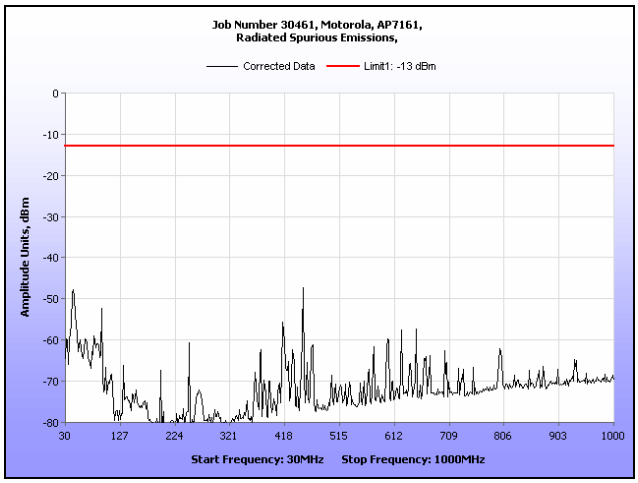
Plot 176. Radiated Spurious Emissions, 802.11n HT20, 4960 MHz (30 MHz – 1 GHz)



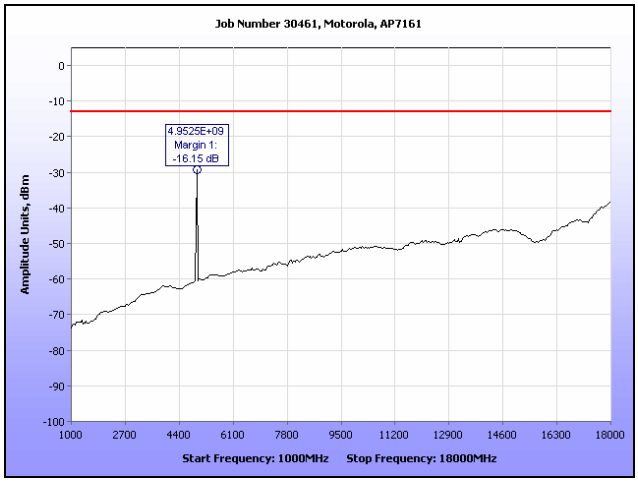
Plot 177. Radiated Spurious Emissions, 802.11n HT20, 4960 MHz (1 GHz – 18 GHz)



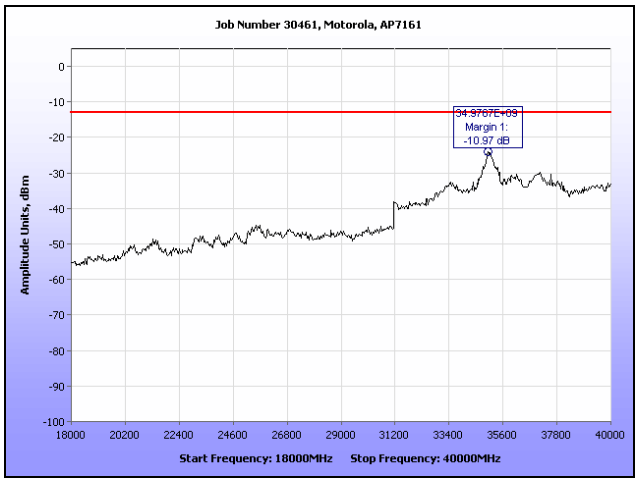
Plot 178. Radiated Spurious Emissions, 802.11n HT20, 4960 MHz (18 GHz – 40 GHz)



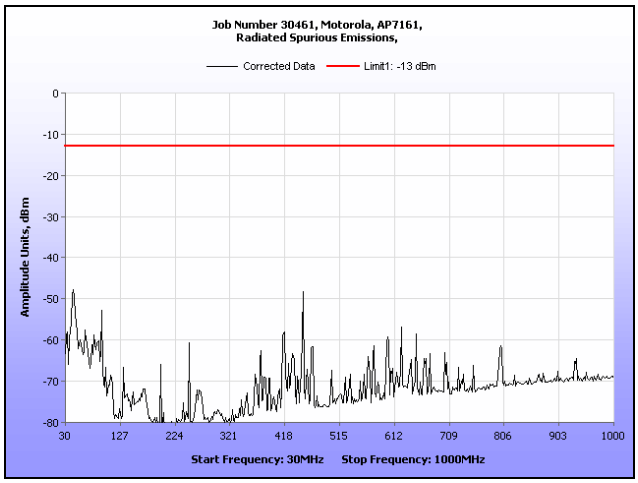
Plot 179. Radiated Spurious Emissions, 802.11n HT20, 4970 MHz (30 MHz – 1 GHz)



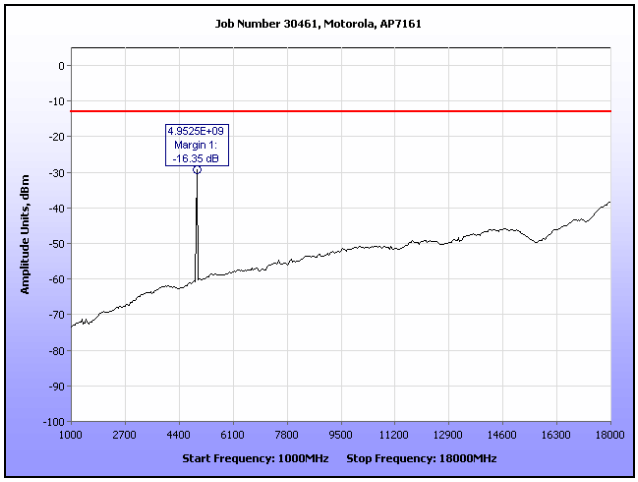
Plot 180. Radiated Spurious Emissions, 802.11n HT20, 4970 MHz (1 GHz – 18 GHz)



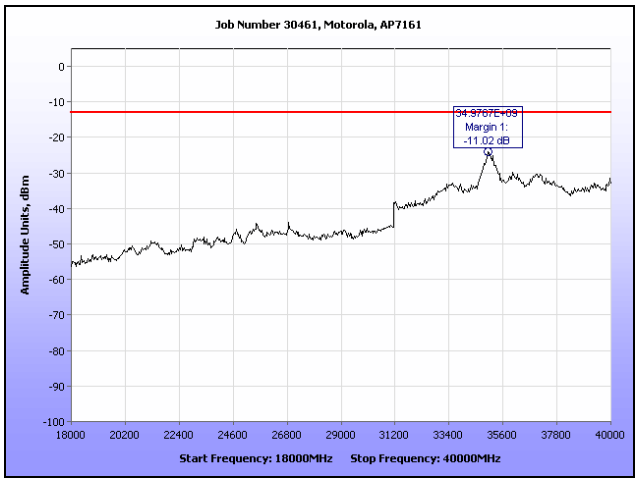
Plot 181. Radiated Spurious Emissions, 802.11n HT20, 4970 MHz (18 GHz – 40 GHz)



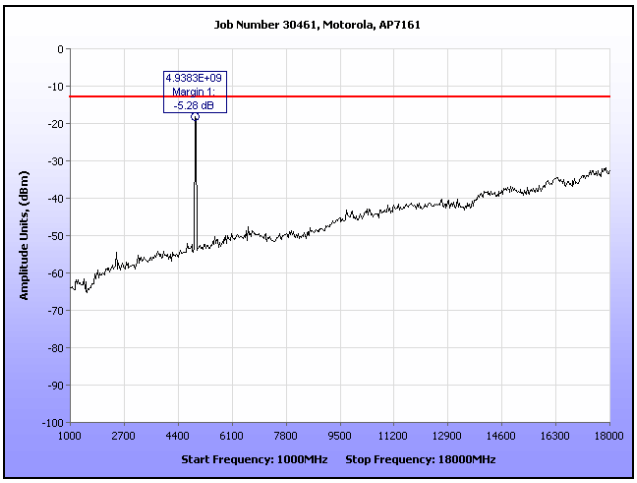
Plot 182. Radiated Spurious Emissions, 802.11n HT20, 4980 MHz (30 MHz – 1 GHz)



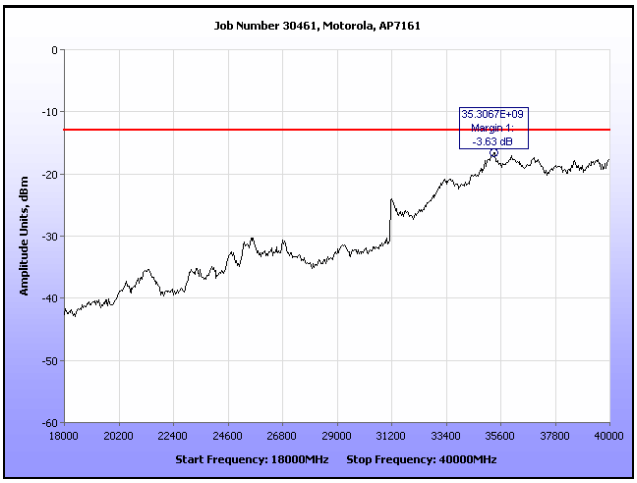
Plot 183. Radiated Spurious Emissions, 802.11n HT20, 4980 MHz (1 GHz – 18 GHz)



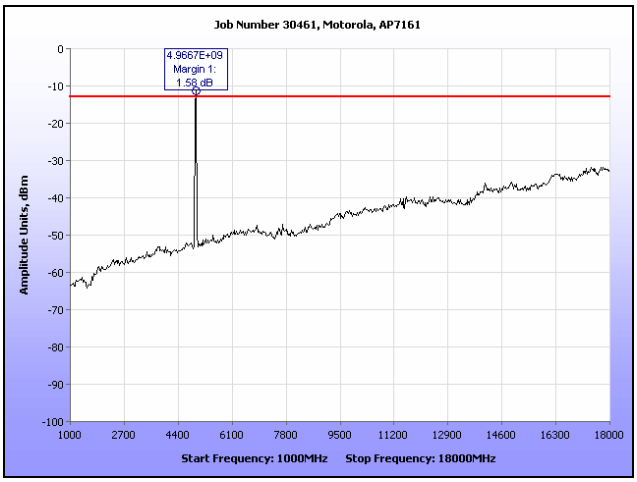
Plot 184. Radiated Spurious Emissions, 802.11n HT20, 4980 MHz (18 GHz – 40 GHz)



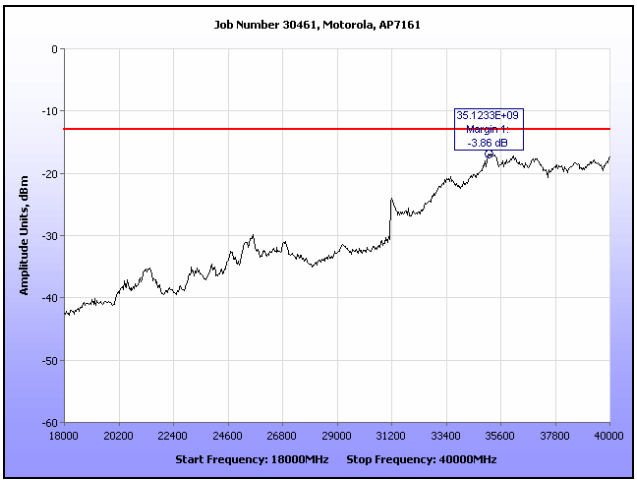
Plot 185. Radiated Spurious Emissions, 802.11a, 4950 MHz (1 GHz – 18 GHz), (1x1)



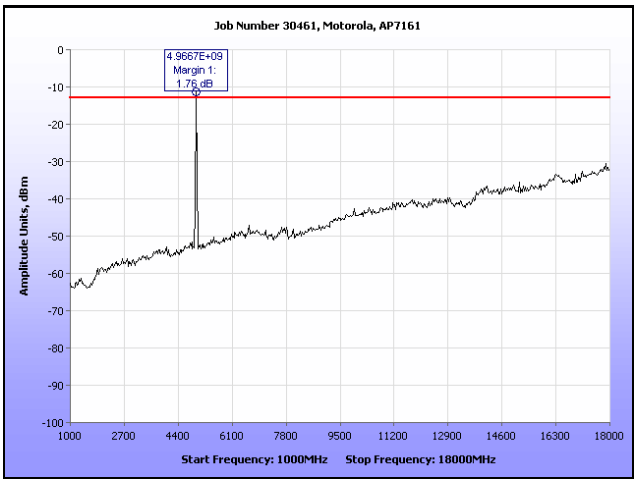
Plot 186. Radiated Spurious Emissions, 802.11a, 4950 MHz (18 GHz – 40 GHz), (1x1)



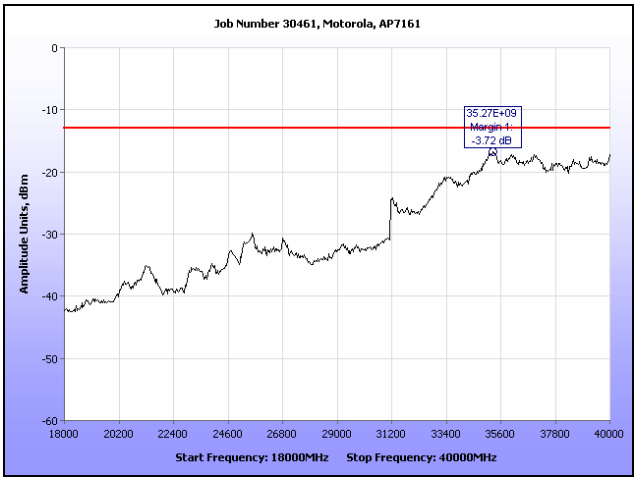
Plot 187. Radiated Spurious Emissions, 802.11a, 4960 MHz (1 GHz – 18 GHz), (1x1)



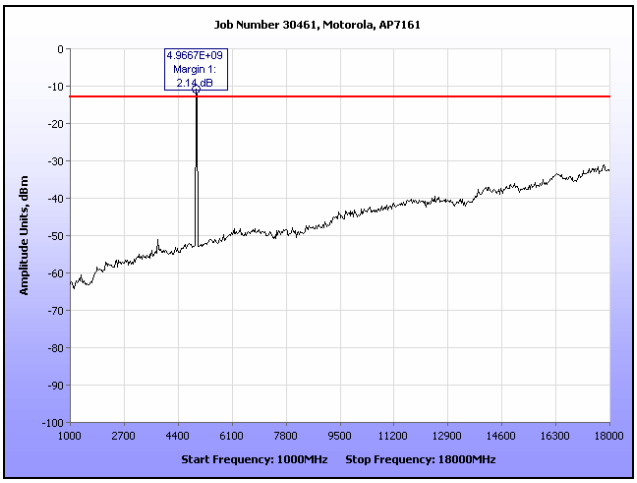
Plot 188. Radiated Spurious Emissions, 802.11a, 4960 MHz (18 GHz – 40 GHz), (1x1)



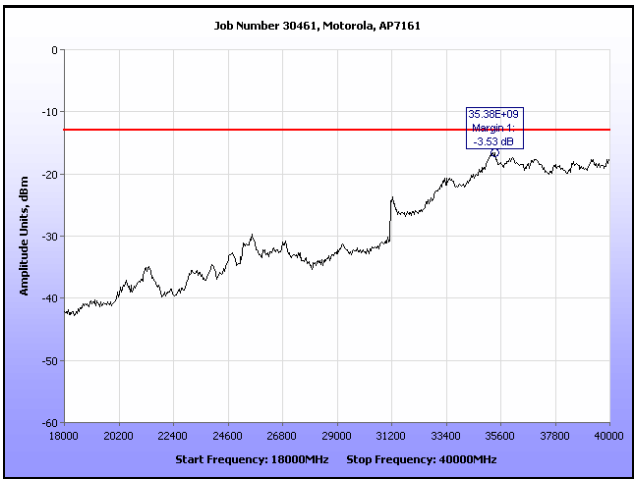
Plot 189. Radiated Spurious Emissions, 802.11a, 4970 MHz (1 GHz – 18 GHz), (1x1)



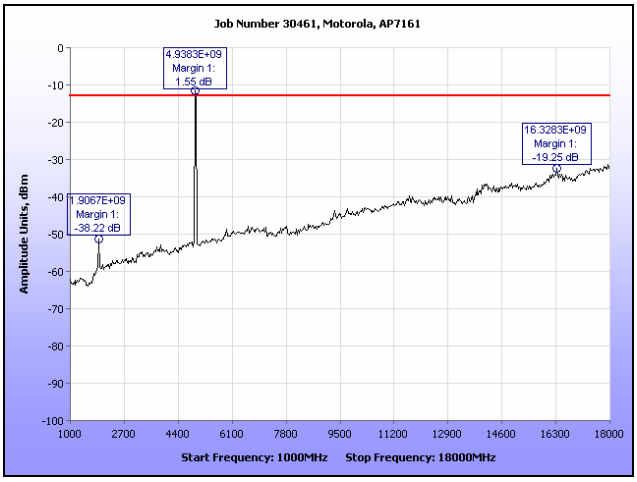
Plot 190. Radiated Spurious Emissions, 802.11a, 4970 MHz (18 GHz – 40 GHz), (1x1)



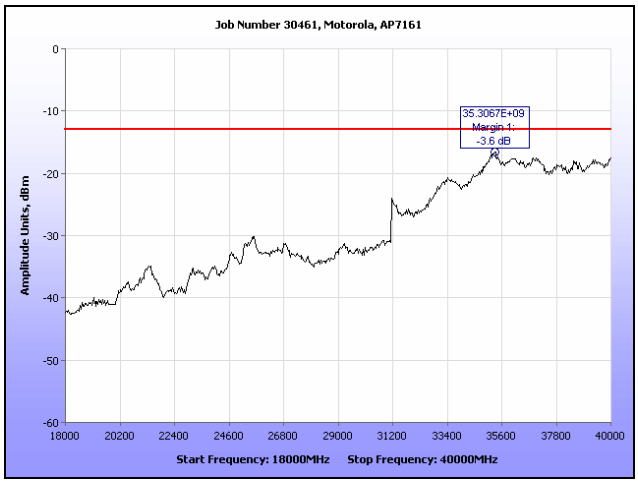
Plot 191. Radiated Spurious Emissions, 802.11a, 4980 MHz (1 GHz – 18 GHz), (1x1)



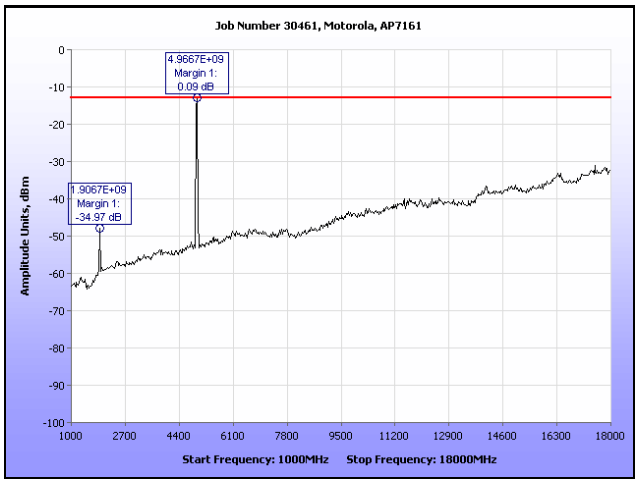
Plot 192. Radiated Spurious Emissions, 802.11a, 4980 MHz (18 GHz – 40 GHz), (1x1)



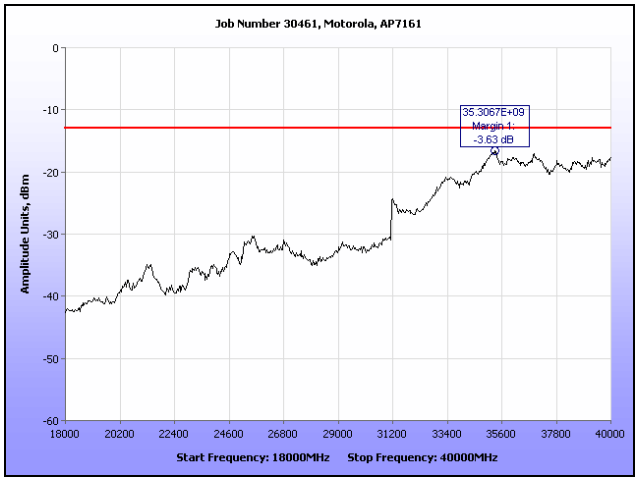
Plot 193. Radiated Spurious Emissions, 802.11n HT20, 4950 MHz (1 GHz – 18 GHz), (1x1)



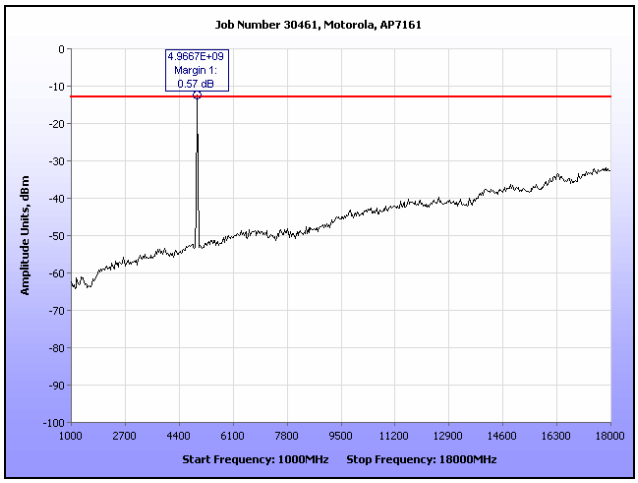
Plot 194. Radiated Spurious Emissions, 802.11n HT20, 4950 MHz (18 GHz – 40 GHz), (1x1)



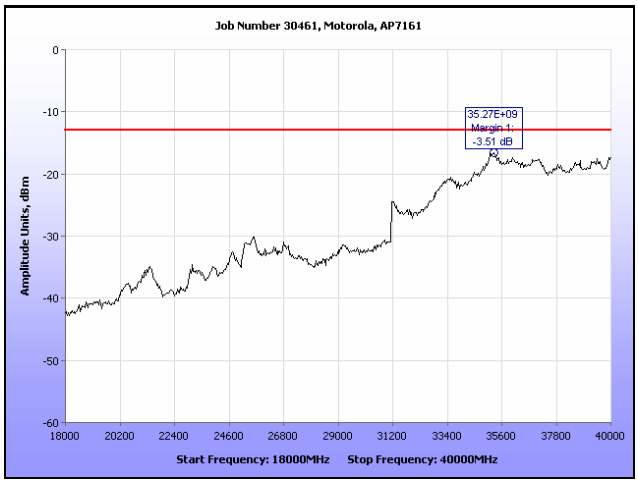
Plot 195. Radiated Spurious Emissions, 802.11n HT20, 4960 MHz (1 GHz – 18 GHz), (1x1)



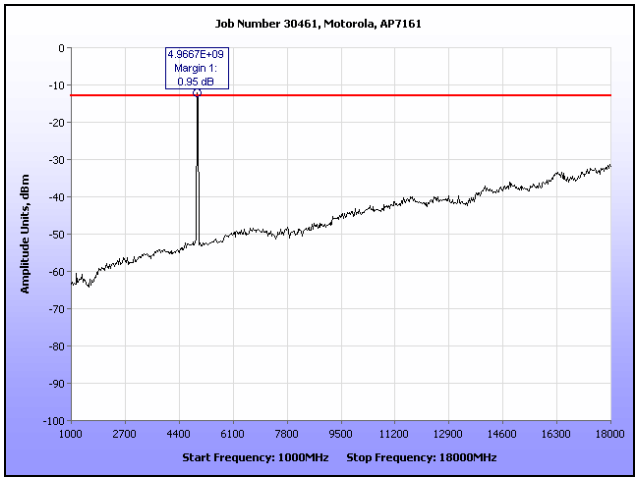
Plot 196. Radiated Spurious Emissions, 802.11n HT20, 4960 MHz (18 GHz – 40 GHz), (1x1)



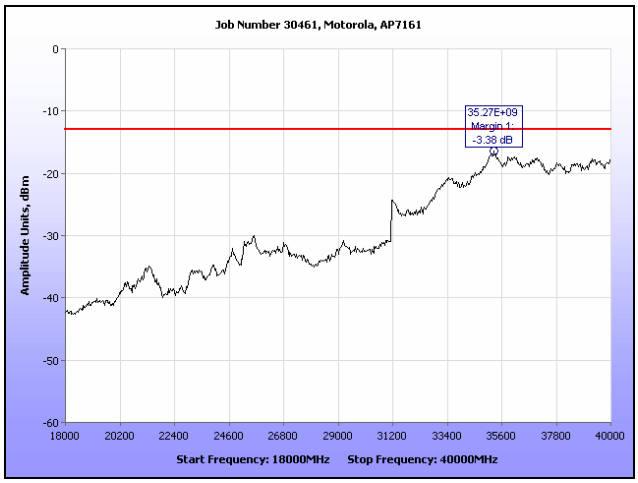
Plot 197. Radiated Spurious Emissions, 802.11n HT20, 4970 MHz (1 GHz – 18 GHz), (1x1)



Plot 198. Radiated Spurious Emissions, 802.11n HT20, 4970 MHz (18 GHz – 40 GHz), (1x1)



Plot 199. Radiated Spurious Emissions, 802.11n HT20, 4980 MHz (1 GHz – 18 GHz), (1x1)



Plot 200. Radiated Spurious Emissions, 802.11n HT20, 4980 MHz (18 GHz – 40 GHz), (1x1)

6. Electromagnetic Compatibility Frequency Stability Requirements

6.1. Frequency Stability

Test Requirement(s): **§2.1055 and §90.213**

Test Procedures: As required by 47 CFR 2.1055, *Frequency Stability measurements* were made at the RF output terminals using a Directional Coupler through a Spectrum Analyzer and Power Meter.

The EUT was placed in the Environmental Chamber and support equipments are outside the chamber on a table. The EUT was set to transmit a CW signal corresponding to the low, mid and high Channels for 5, 10, & 20MHz Bandwidths. The frequency counter option on the Spectrum Analyzer was used to measure frequency deviations. The frequency drift was investigated for every 10^{C} increment until the unit is stabilized then recorded the reading in tabular format with the temperature range of -40 to 60^{C}.

Voltage supplied to EUT is 120 VAC reference temperature was done at 20 ^{C}. The voltage was varied by ± 15 % of nominal.

Test Results: Equipment complies with Section 2.1055 and 90.213

Test Engineer(s): Dan Youngcourt

Test Date(s): 01/11/11

(Low Channel) (4950MHz)				
	Voltage (AC)	Temperature (C)	Frequency (MHz)	PPM
Reference: 120V @ 20C	120	70	4950.012642	8.342
	120	60	4949.982216	2.195
	120	50	4949.971408	0.012
	120	40	4949.968283	0.619
	120	30	4949.970302	0.212
	120	20	4949.971349	0.000
	120	10	4949.972869	0.307
4949.971349	120	0	4949.979583	1.663
	120	-10	4949.993221	4.419
	120	-20	4949.999889	5.766
	120	-30	4950.001684	6.128
	120	-40	4949.993799	4.535
	102	20	4949.971317	0.006
	138	20	4949.971306	0.009
(High Channel) (4980MHz)				
	Voltage (AC)	Temperature (C)	Frequency (MHz)	PPM
Reference: 120V @ 20C	120	70	4980.011862	8.141
	120	60	4979.981604	2.065
	120	50	4979.971695	0.075
	120	40	4979.967696	0.728
	120	30	4979.970033	0.258
	120	20	4979.971320	0.000
	120	10	4979.973406	0.419
4979.971320	120	0	4979.977612	1.263
	120	-10	4979.994637	4.682
	120	-20	4979.999003	5.559
	120	-30	4980.001650	6.090
	120	-40	4979.995244	4.804
	102	20	4979.971213	0.021
	138	20	4979.971196	0.025

Table 8. Frequency Stability, Test Results

7. RF Exposure Requirements

RF Exposure Requirements: **§1.1307(b)(1) and §1.1307(b)(2):** Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

RF Radiation Exposure Limit: **§1.1310:** As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

MPE Limit Calculation: EUT's operating frequencies @ 4940-4990 MHz; highest conducted power = *13.73dBm* (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

Gain of Antenna Elements @ 4.9GHz = 10 dBi
# of Antenna Elements = 3
EUT maximum antenna gain = 10dBi + 10*log(3)dBi = *14.77 dBi.*

Equation from page 18 of OET 65, Edition 97-01

$$S = PG / 4\pi R^2 \quad \text{or} \quad R = \sqrt{PG / 4\pi S}$$

where, S = Power Density (1 mW/cm^2)
P = Power Input to antenna (23.59mW)
G = Antenna Gain (29.99 numeric)

$R = (23.59*29.99/ 4*3.14*1.0)^{1/2} = (707.62/12.56)^{1/2} = 7.504$ cm

8. Electromagnetic Compatibility Receiver Spurious Requirements

8.1. Receiver Spurious Emissions

Test Requirement: The following receiver spurious emission limits shall be complied with:

a) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 9.

Spurious Frequency (MHz)	Field Strength (microvolt/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960	500

Table 9. Spurious Emission Limits for Receivers

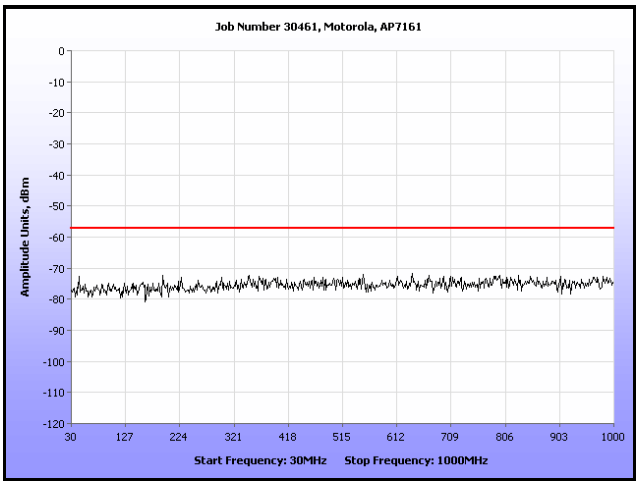
b) If a conducted measurement is made, no spurious output signals appearing at the antenna terminals shall exceed 2 nanowatts per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5 nanowatts above 1 GHz.

Test Procedure: The receiver spurious emissions were tested in compliance with the limits of Table 12. The testing was performed conducted.

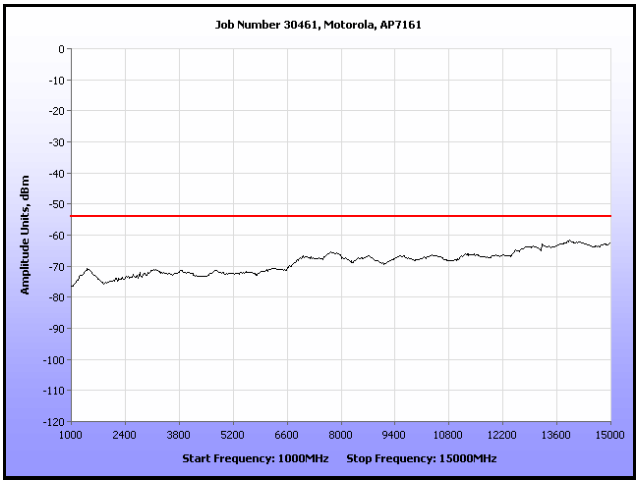
Test Results: The EUT was compliant with the Receiver Spurious Emission limits of this requirement.

Test Engineer(s): Jeff Pratt

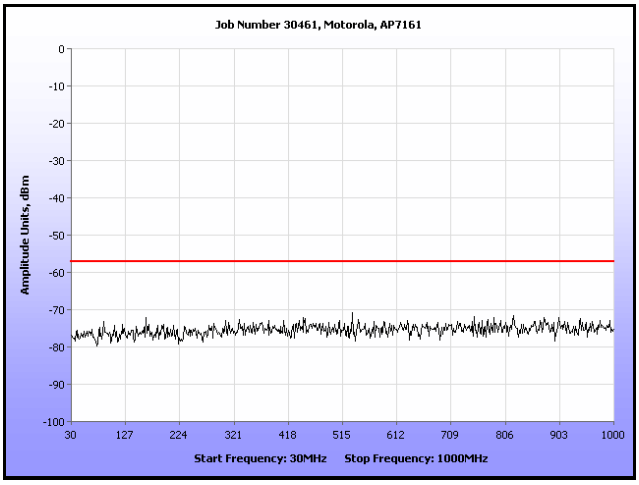
Test Date(s): 05/06/11



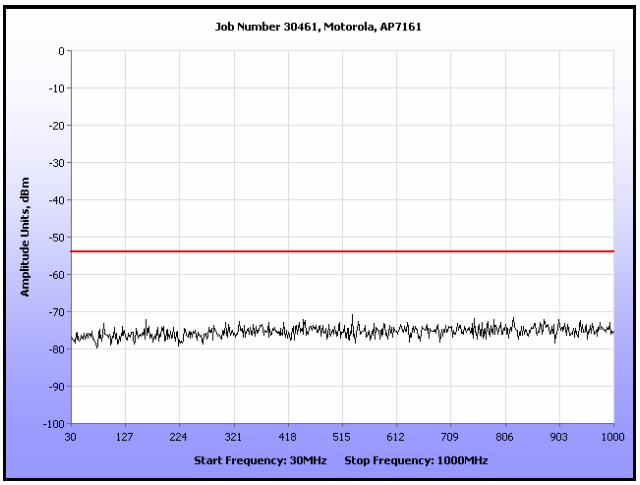
Plot 201. Receiver Spurious Emissions, 4.9 GHz, 30 MHz – 1 GHz, Port A



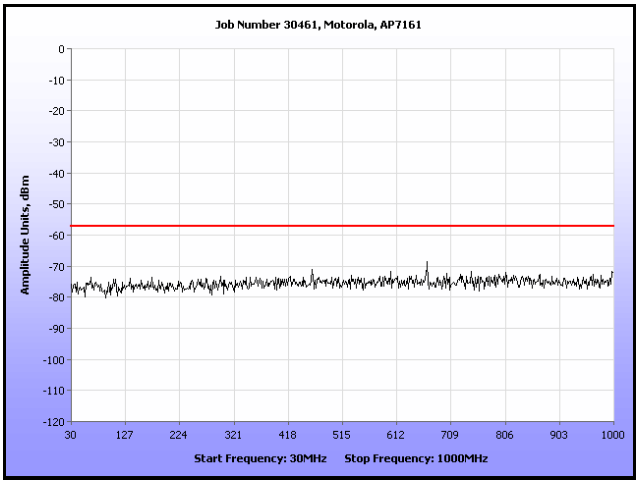
Plot 202. Receiver Spurious Emissions, 4.9 GHz, 1 GHz – 15 GHz, Port A



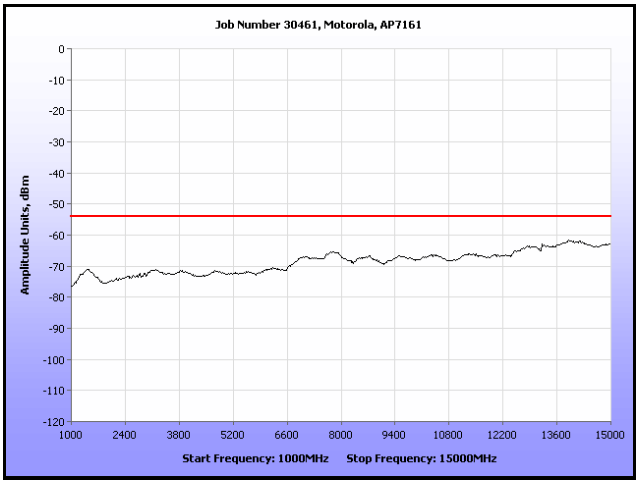
Plot 203. Receiver Spurious Emissions, 4.9 GHz, 30 MHz – 1 GHz, Port B



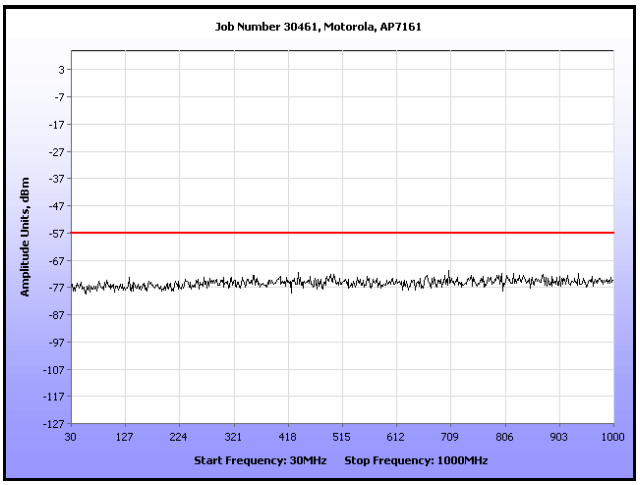
Plot 204. Receiver Spurious Emissions, 4.9 GHz, 1 GHz – 15 GHz, Port B



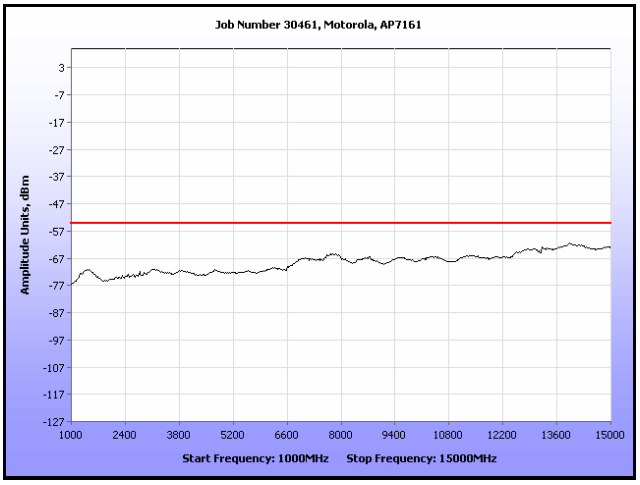
Plot 205. Receiver Spurious Emissions, 4.9 GHz, 30 MHz – 1 GHz, Port C



Plot 206. Receiver Spurious Emissions, 4.9 GHz, 1 GHz – 15 GHz, Port C



Plot 207. Receiver Spurious Emissions, 4.9 GHz, 30 MHz – 1 GHz (1x1)



Plot 208. Receiver Spurious Emissions, 4.9 GHz, 1 GHz – 15 GHz (1x1)

9. Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1T4681	SPECTRUM ANALYZER	AGILENT	4448A	12/3/2010	12/3/2011
1T4442	PRE-AMPLIFIER	MITEQ	AFS42-01001800-30-10P	SEE NOTE	
1T4612	SPECTRUM ANALYZER	AGILENT	4407B	9/27/2010	9/27/2011
1T4744	ANTENNA, HORN	ETS-LINDGREN	3116	5/27/2010	5/27/2011
1T4483	ANTENNA; HORN	ETS-LINDGREN	3117	6/8/2010	6/8/2011
1T4751	ANTENNA - BILOG	SUNOL SCIENCES	JB6	11/19/2010	11/19/2011
1T4505	TEMPERATURE CHAMBER	TEST EQUITY	115	11/29/2010	11/29/2011
1T4752	PRE-AMPLIFIER	MITEQ	JS44-18004000-35-8P	SEE NOTE	

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

Certification & User's Manual Information

10. Certification Label & User's Manual Information

10.1. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

(a) The various types of radio communication transmitting devices described throughout this chapter.

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.

(c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.

(d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

(a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:

(1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or

(2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.

(d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

(i) Compliance testing;

(ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or

(v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a provision that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart Y — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

(a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.[1] *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer*, be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.

(b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant, whichever is applicable.

§ 2.902 Certification.

(a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.

(b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

[1] In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.

§ 2.948 Description of measurement facilities.

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

10.2. Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

(a) In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

§ 15.21 Information to user.

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

§ 15.105 Information to the user.

(a) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

– Reorient or relocate the receiving antenna.
– Increase the separation between the equipment and receiver.
– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
– Consult the dealer or an experienced radio/TV technician for help.

End of Report

