



MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*

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August 8, 2011

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

Dear Bob Greenway,

Enclosed is the EMC Wireless test report for compliance testing of the Motorola Solutions, Inc., AP-7161 as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 15, Subpart B, ICES-003, Issue 4 February 2004 for a Class B Digital Device and FCC Part 15 Subpart C, RSS-210, Issue 8, Dec. 2010 for Intentional Radiators.

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-FCC247 Rev. 4)

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Electromagnetic Compatibility Criteria Test Report

for the

**Motorola Solutions, Inc.
AP-7161**

Tested under
the FCC Certification Rules
contained in
Title 47 of the CFR, Parts 15 Subpart B & ICES-003
for Class B Digital Devices
&
15.247 Subpart C & RSS-210, Issue 8, Dec. 2010
for Intentional Radiators

MET Report: EMC30461-FCC247 Rev. 4

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

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15.247 Subpart C & RSS-210, Issue 8, Dec. 2010
for Intentional Radiators



Shawn McMillen, Project Engineer
Electromagnetic Compatibility Lab



Jennifer Warnell
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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 capable of operation in accordance with the requirements of the FCC Rules Parts 15B, 15.247 and Industry Canada standards ICES-003, Issue 4 February 2004, RSS-210, Issue 8, Dec. 2010 under normal use and maintenance.



Shawn McMillen,
Wireless Manager, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	April 27, 2011	Initial Issue.
1	April 28, 2011	Revised to correct data in Table 12.
2	May 5, 2011	Revised to reflect corrected company name.
3	August 1, 2011	Revised to updated references.
4	August 8, 2011	Revised to reflect editorial corrections.

Table of Contents

I.	Executive Summary	1
	A. Purpose of Test	2
	B. Executive Summary	2
II.	Equipment Configuration	3
	A. Overview.....	4
	B. References.....	5
	C. Test Site	5
	D. Description of Test Sample.....	6
	E. Equipment Configuration.....	7
	F. Support Equipment	7
	G. Ports and Cabling Information.....	7
	H. Mode of Operation.....	8
	I. Method of Monitoring EUT Operation	8
	J. Modifications	8
	a) Modifications to EUT.....	8
	b) Modifications to Test Standard.....	8
	K. Disposition of EUT.....	8
III.	Electromagnetic Compatibility Criteria for Unintentional Radiators	9
	§ 15.107(a) Conducted Emissions Limits.....	10
	§ 15.109(a) Radiated Emissions Limits.....	13
IV.	Electromagnetic Compatibility Criteria for Intentional Radiators.....	16
	§ 15.203 Antenna Requirement	17
	§ 15.207(a) Conducted Emissions Limits.....	18
	§ 15.247(a)(a) 6 dB and 99% Bandwidth	22
	§ 15.247(b) Peak Power Output	67
	§ 15.247(d) Radiated Spurious Emissions Requirements and Band Edge	69
	§ 15.247(d) RF Conducted Spurious Emissions Requirements and Band Edge.....	91
	§ 15.247(e) Peak Power Spectral Density	127
	RSS-GEN Receiver Spurious Emissions.....	130
V.	Test Equipment	135
VI.	Certification & User's Manual Information.....	137
	A. Certification Information	138
	B. Label and User's Manual Information	142
VII.	ICES-003 Procedural & Labeling Requirements.....	144

List of Tables

Table 1. Executive Summary of EMC Part 15.247 Compliance Testing	2
Table 2. EUT Summary Table.....	4
Table 3. References	5
Table 4. Equipment Configuration	7
Table 5. Support Equipment.....	7
Table 6. Ports and Cabling Information	7
Table 7. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Subsections 15.107(a) (b) and 15.207(a)	10
Table 8. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz).....	11
Table 9. Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz).....	12
Table 10. Radiated Emissions Limits calculated from FCC Part 15, §15.109 (a) (b)	13
Table 11. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, FCC Limits	14
Table 12. Radiated Emissions Limits, Test Results, ICES-003 Limits	15
Table 13. Antenna List	17
Table 14. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)	18
Table 15. Conducted Emissions, 15.207, Test Results, Phase Line, 2.4 GHz.....	19
Table 16. Conducted Emissions, 15.207, Test Results, Neutral Line, 2.4 GHz	19
Table 17. Conducted Emissions, 15.207, Test Results, Phase Line, 5.8 GHz.....	19
Table 18. Conducted Emissions, 15.207, Test Results, Neutral Line, 5.8 GHz	19
Table 19. 6 dB Occupied Bandwidth, Test Results, 2.4 GHz.....	23
Table 20. 6 dB Occupied Bandwidth, Test Results, 5.8 GHz.....	23
Table 21. 99% Occupied Bandwidth, Test Results, 2.4 GHz.....	24
Table 22. 99% Occupied Bandwidth, Test Results, 5.8 GHz.....	24
Table 23. Output Power Requirements from §15.247(b)	67
Table 24. Peak Power Output, Test Results, 2.4 GHz.....	68
Table 25. Peak Power Output, Test Results, 5.8 GHz.....	68
Table 26. Restricted Bands of Operation.....	69
Table 27. Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a)	70
Table 28. Peak Power Spectral Density, Test Results, 2.4 GHz.....	128
Table 29. Peak Power Spectral Density, Test Results, 5.8 GHz.....	128
Table 30. Spurious Emission Limits for Receivers	130
Table 31. Test Equipment List	136

List of Plots

Plot 1. Conducted Emission, Phase Line Plot	11
Plot 2. Conducted Emission, Neutral Line Plot.....	12
Plot 3. Radiated Emissions, 30 MHz - 1 GHz, FCC Limits	14
Plot 4. Radiated Emissions, ICES-003 Limits.....	15
Plot 5. Conducted Emissions, 15.207(a), Phase Line, Pre-scan for 2.4 GHz DTS Band	20
Plot 6. Conducted Emissions, 15.207(a), Neutral Line, Pre-scan for 2.4 GHz DTS Band.....	20
Plot 7. Conducted Emissions, 15.207(a), Phase Line, Pre-scan for 5.8 GHz DTS Band	21
Plot 8. Conducted Emissions, 15.207(a), Neutral Line, Pre-scan for 5.8 GHz DTS Band.....	21
Plot 9. 6dB Occupied Bandwidth, Low Channel, 802.11b, 2.4 GHz, R3-A.....	25
Plot 10. 6dB Occupied Bandwidth, Low Channel, 802.11b, 2.4 GHz, R3-B.....	25
Plot 11. 6dB Occupied Bandwidth, Low Channel, 802.11b, 2.4 GHz, R3-C.....	25
Plot 12. 6dB Occupied Bandwidth, Low Channel, 802.11g, 2.4 GHz, R3-A.....	26
Plot 13. 6dB Occupied Bandwidth, Low Channel, 802.11g, 2.4 GHz, R3-B.....	26
Plot 14. 6dB Occupied Bandwidth, Low Channel, 802.11g, 2.4 GHz, R3-C.....	26
Plot 15. 6dB Occupied Bandwidth, Low Channel, 802.11g 20 MHz, 2.4 GHz, R3-A	27

Plot 16. 6dB Occupied Bandwidth, Low Channel, 802.11g 20 MHz, 2.4 GHz, R3-B.....	27
Plot 17. 6dB Occupied Bandwidth, Low Channel, 802.11g 20 MHz, 2.4 GHz, R3-C.....	27
Plot 18. 6dB Occupied Bandwidth, Low Channel, 802.11g 40 MHz, 2.4 GHz, R3-A	28
Plot 19. 6dB Occupied Bandwidth, Low Channel, 802.11g 40 MHz, 2.4 GHz, R3-B.....	28
Plot 20. 6dB Occupied Bandwidth, Low Channel, 802.11g 40 MHz, 2.4 GHz, R3-C.....	28
Plot 21. 6dB Occupied Bandwidth, Mid Channel, 802.11b, 2.4 GHz, R3-A	29
Plot 22. 6dB Occupied Bandwidth, Mid Channel, 802.11b, 2.4 GHz, R3-B	29
Plot 23. 6dB Occupied Bandwidth, Mid Channel, 802.11b, 2.4 GHz, R3-C	29
Plot 24. 6dB Occupied Bandwidth, Mid Channel, 802.11g, 2.4 GHz, R3-A	30
Plot 25. 6dB Occupied Bandwidth, Mid Channel, 802.11g, 2.4 GHz, R3-B	30
Plot 26. 6dB Occupied Bandwidth, Mid Channel, 802.11g, 2.4 GHz, R3-C	30
Plot 27. 6dB Occupied Bandwidth, Mid Channel, 802.11g 20 MHz, 2.4 GHz, R3-A	31
Plot 28. 6dB Occupied Bandwidth, Mid Channel, 802.11g 20 MHz, 2.4 GHz, R3-B	31
Plot 29. 6dB Occupied Bandwidth, Mid Channel, 802.11g 20 MHz, 2.4 GHz, R3-C	31
Plot 30. 6dB Occupied Bandwidth, Mid Channel, 802.11g 40 MHz, 2.4 GHz, R3-A	32
Plot 31. 6dB Occupied Bandwidth, Mid Channel, 802.11g 40 MHz, 2.4 GHz, R3-B	32
Plot 32. 6dB Occupied Bandwidth, Mid Channel, 802.11g 40 MHz, 2.4 GHz, R3-C	32
Plot 33. 6dB Occupied Bandwidth, High Channel, 802.11b, 2.4 GHz, R3-A.....	33
Plot 34. 6dB Occupied Bandwidth, High Channel, 802.11b, 2.4 GHz, R3-B	33
Plot 35. 6dB Occupied Bandwidth, High Channel, 802.11b, 2.4 GHz, R3-C	33
Plot 36. 6dB Occupied Bandwidth, High Channel, 802.11g, 2.4 GHz, R3-A.....	34
Plot 37. 6dB Occupied Bandwidth, High Channel, 802.11g, 2.4 GHz, R3-B	34
Plot 38. 6dB Occupied Bandwidth, High Channel, 802.11g, 2.4 GHz, R3-C	34
Plot 39. 6dB Occupied Bandwidth, High Channel, 802.11g 20 MHz, 2.4 GHz, R3-A.....	35
Plot 40. 6dB Occupied Bandwidth, High Channel, 802.11g 20 MHz, 2.4 GHz, R3-B.....	35
Plot 41. 6dB Occupied Bandwidth, High Channel, 802.11g 20 MHz, 2.4 GHz, R3-C.....	35
Plot 42. 6dB Occupied Bandwidth, High Channel, 802.11g 40 MHz, 2.4 GHz, R3-A.....	36
Plot 43. 6dB Occupied Bandwidth, High Channel, 802.11g 40 MHz, 2.4 GHz, R3-B.....	36
Plot 44. 6dB Occupied Bandwidth, High Channel, 802.11g 40 MHz, 2.4 GHz, R3-C.....	36
Plot 45. 6dB Occupied Bandwidth, Low Channel, 802.11a, 5.8 GHz, R3-A.....	37
Plot 46. 6dB Occupied Bandwidth, Low Channel, 802.11a, 5.8 GHz, R3-B.....	37
Plot 47. 6dB Occupied Bandwidth, Low Channel, 802.11a, 5.8 GHz, R3-C.....	37
Plot 48. 6dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz, 5.8 GHz, R3-A	38
Plot 49. 6dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz, 5.8 GHz, R3-B.....	38
Plot 50. 6dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz, 5.8 GHz, R3-C.....	38
Plot 51. 6dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz, 5.8 GHz, R3-A	39
Plot 52. 6dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz, 5.8 GHz, R3-B.....	39
Plot 53. 6dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz, 5.8 GHz, R3-C.....	39
Plot 54. 6dB Occupied Bandwidth, Mid Channel, 802.11a, 5.8 GHz, R3-A	40
Plot 55. 6dB Occupied Bandwidth, Mid Channel, 802.11a, 5.8 GHz, R3-B.....	40
Plot 56. 6dB Occupied Bandwidth, Mid Channel, 802.11a, 5.8 GHz, R3-C.....	40
Plot 57. 6dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, 5.8 GHz, R3-A	41
Plot 58. 6dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, 5.8 GHz, R3-B	41
Plot 59. 6dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, 5.8 GHz, R3-C	41
Plot 60. 6dB Occupied Bandwidth, Mid Channel, 802.11n 40 MHz, 5.8 GHz, R3-A	42
Plot 61. 6dB Occupied Bandwidth, Mid Channel, 802.11n 40 MHz, 5.8 GHz, R3-B	42
Plot 62. 6dB Occupied Bandwidth, Mid Channel, 802.11n 40 MHz, 5.8 GHz, R3-C	42
Plot 63. 6dB Occupied Bandwidth, High Channel, 802.11a, 5.8 GHz, R3-A	43
Plot 64. 6dB Occupied Bandwidth, High Channel, 802.11a, 5.8 GHz, R3-B	43
Plot 65. 6dB Occupied Bandwidth, High Channel, 802.11a, 5.8 GHz, R3-C	43
Plot 66. 6dB Occupied Bandwidth, High Channel, 802.11n 20 MHz, 5.8 GHz, R3-A.....	44
Plot 67. 6dB Occupied Bandwidth, High Channel, 802.11n 20 MHz, 5.8 GHz, R3-B.....	44
Plot 68. 6dB Occupied Bandwidth, High Channel, 802.11n 20 MHz, 5.8 GHz, R3-C.....	44

Plot 69. 6dB Occupied Bandwidth, High Channel, 802.11n 40 MHz, 5.8 GHz, R3-A.....	45
Plot 70. 6dB Occupied Bandwidth, High Channel, 802.11n 40 MHz, 5.8 GHz, R3-B.....	45
Plot 71. 6dB Occupied Bandwidth, High Channel, 802.11n 40 MHz, 5.8 GHz, R3-C.....	45
Plot 72. 99% Occupied Bandwidth, Low Channel, 802.11b, 2.4 GHz, R3-A.....	46
Plot 73. 99% Occupied Bandwidth, Low Channel, 802.11b, 2.4 GHz, R3-B.....	46
Plot 74. 99% Occupied Bandwidth, Low Channel, 802.11b, 2.4 GHz, R3-C.....	46
Plot 75. 99% Occupied Bandwidth, Low Channel, 802.11g, 2.4 GHz, R3-A.....	47
Plot 76. 99% Occupied Bandwidth, Low Channel, 802.11g, 2.4 GHz, R3-B.....	47
Plot 77. 99% Occupied Bandwidth, Low Channel, 802.11g, 2.4 GHz, R3-C.....	47
Plot 78. 99% Occupied Bandwidth, Low Channel, 802.11g 20 MHz, 2.4 GHz, R3-A.....	48
Plot 79. 99% Occupied Bandwidth, Low Channel, 802.11g 20 MHz, 2.4 GHz, R3-B.....	48
Plot 80. 99% Occupied Bandwidth, Low Channel, 802.11g 20 MHz, 2.4 GHz, R3-C.....	48
Plot 81. 99% Occupied Bandwidth, Low Channel, 802.11g 40 MHz, 2.4 GHz, R3-A.....	49
Plot 82. 99% Occupied Bandwidth, Low Channel, 802.11g 40 MHz, 2.4 GHz, R3-B.....	49
Plot 83. 99% Occupied Bandwidth, Low Channel, 802.11g 40 MHz, 2.4 GHz, R3-C.....	49
Plot 84. 99% Occupied Bandwidth, Mid Channel, 802.11b, 2.4 GHz, R3-A.....	50
Plot 85. 99% Occupied Bandwidth, Mid Channel, 802.11b, 2.4 GHz, R3-B.....	50
Plot 86. 99% Occupied Bandwidth, Mid Channel, 802.11b, 2.4 GHz, R3-C.....	50
Plot 87. 99% Occupied Bandwidth, Mid Channel, 802.11g, 2.4 GHz, R3-A.....	51
Plot 88. 99% Occupied Bandwidth, Mid Channel, 802.11g, 2.4 GHz, R3-B.....	51
Plot 89. 99% Occupied Bandwidth, Mid Channel, 802.11g, 2.4 GHz, R3-C.....	51
Plot 90. 99% Occupied Bandwidth, Mid Channel, 802.11g 20 MHz, 2.4 GHz, R3-A.....	52
Plot 91. 99% Occupied Bandwidth, Mid Channel, 802.11g 20 MHz, 2.4 GHz, R3-B.....	52
Plot 92. 99% Occupied Bandwidth, Mid Channel, 802.11g 20 MHz, 2.4 GHz, R3-C.....	52
Plot 93. 99% Occupied Bandwidth, Mid Channel, 802.11g 40 MHz, 2.4 GHz, R3-A.....	53
Plot 94. 99% Occupied Bandwidth, Mid Channel, 802.11g 40 MHz, 2.4 GHz, R3-B.....	53
Plot 95. 99% Occupied Bandwidth, Mid Channel, 802.11g 40 MHz, 2.4 GHz, R3-C.....	53
Plot 96. 99% Occupied Bandwidth, High Channel, 802.11b, 2.4 GHz, R3-A.....	54
Plot 97. 99% Occupied Bandwidth, High Channel, 802.11b, 2.4 GHz, R3-B.....	54
Plot 98. 99% Occupied Bandwidth, High Channel, 802.11b, 2.4 GHz, R3-C.....	54
Plot 99. 99% Occupied Bandwidth, High Channel, 802.11g, 2.4 GHz, R3-A.....	55
Plot 100. 99% Occupied Bandwidth, High Channel, 802.11g, 2.4 GHz, R3-B.....	55
Plot 101. 99% Occupied Bandwidth, High Channel, 802.11g, 2.4 GHz, R3-C.....	55
Plot 102. 99% Occupied Bandwidth, High Channel, 802.11g 20 MHz, 2.4 GHz, R3-A.....	56
Plot 103. 99% Occupied Bandwidth, High Channel, 802.11g 20 MHz, 2.4 GHz, R3-B.....	56
Plot 104. 99% Occupied Bandwidth, High Channel, 802.11g 20 MHz, 2.4 GHz, R3-C.....	56
Plot 105. 99% Occupied Bandwidth, High Channel, 802.11g 40 MHz, 2.4 GHz, R3-A.....	57
Plot 106. 99% Occupied Bandwidth, High Channel, 802.11g 40 MHz, 2.4 GHz, R3-B.....	57
Plot 107. 99% Occupied Bandwidth, High Channel, 802.11g 40 MHz, 2.4 GHz, R3-C.....	57
Plot 108. 99% Occupied Bandwidth, Low Channel, 802.11a, 5.8 GHz, R3-A.....	58
Plot 109. 99% Occupied Bandwidth, Low Channel, 802.11a, 5.8 GHz, R3-B.....	58
Plot 110. 99% Occupied Bandwidth, Low Channel, 802.11a, 5.8 GHz, R3-C.....	58
Plot 111. 99% Occupied Bandwidth, Low Channel, 802.11n 20 MHz, 5.8 GHz, R3-A.....	59
Plot 112. 99% Occupied Bandwidth, Low Channel, 802.11n 20 MHz, 5.8 GHz, R3-B.....	59
Plot 113. 99% Occupied Bandwidth, Low Channel, 802.11n 20 MHz, 5.8 GHz, R3-C.....	59
Plot 114. 99% Occupied Bandwidth, Low Channel, 802.11n 40 MHz, 5.8 GHz, R3-A.....	60
Plot 115. 99% Occupied Bandwidth, Low Channel, 802.11n 40 MHz, 5.8 GHz, R3-B.....	60
Plot 116. 99% Occupied Bandwidth, Low Channel, 802.11n 40 MHz, 5.8 GHz, R3-C.....	60
Plot 117. 99% Occupied Bandwidth, Mid Channel, 802.11a, 5.8 GHz, R3-A.....	61
Plot 118. 99% Occupied Bandwidth, Mid Channel, 802.11a, 5.8 GHz, R3-B.....	61
Plot 119. 99% Occupied Bandwidth, Mid Channel, 802.11a, 5.8 GHz, R3-C.....	61
Plot 120. 99% Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, 5.8 GHz, R3-A.....	62
Plot 121. 99% Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, 5.8 GHz, R3-B.....	62

Plot 122. 99% Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, 5.8 GHz, R3-C.....	62
Plot 123. 99% Occupied Bandwidth, Mid Channel, 802.11n 40 MHz, 5.8 GHz, R3-A	63
Plot 124. 99% Occupied Bandwidth, Mid Channel, 802.11n 40 MHz, 5.8 GHz, R3-B.....	63
Plot 125. 99% Occupied Bandwidth, Mid Channel, 802.11n 40 MHz, 5.8 GHz, R3-C.....	63
Plot 126. 99% Occupied Bandwidth, High Channel, 802.11a, 5.8 GHz, R3-A	64
Plot 127. 99% Occupied Bandwidth, High Channel, 802.11a, 5.8 GHz, R3-B.....	64
Plot 128. 99% Occupied Bandwidth, High Channel, 802.11a, 5.8 GHz, R3-C.....	64
Plot 129. 99% Occupied Bandwidth, High Channel, 802.11n 20 MHz, 5.8 GHz, R3-A	65
Plot 130. 99% Occupied Bandwidth, High Channel, 802.11n 20 MHz, 5.8 GHz, R3-B	65
Plot 131. 99% Occupied Bandwidth, High Channel, 802.11n 20 MHz, 5.8 GHz, R3-C	65
Plot 132. 99% Occupied Bandwidth, High Channel, 802.11n 40 MHz, 5.8 GHz, R3-A	66
Plot 133. 99% Occupied Bandwidth, High Channel, 802.11n 40 MHz, 5.8 GHz, R3-B	66
Plot 134. 99% Occupied Bandwidth, High Channel, 802.11n 40 MHz, 5.8 GHz, R3-C	66
Plot 135. Radiated Spurious Emissions, 802.11b, Low Channel, 30 MHz – 1 GHz.....	71
Plot 136. Radiated Spurious Emissions, 802.11b, Low Channel, 1 GHz – 18 GHz.....	71
Plot 137. Radiated Spurious Emissions, 802.11b, Mid Channel, 30 MHz – 1 GHz.....	71
Plot 138. Radiated Spurious Emissions, 802.11b, Mid Channel, 1 GHz – 18 GHz	72
Plot 139. Radiated Spurious Emissions, 802.11b, High Channel, 30 MHz – 1 GHz	72
Plot 140. Radiated Spurious Emissions, 802.11b, High Channel, 1 GHz – 18 GHz.....	72
Plot 141. Radiated Spurious Emissions, 802.11g, Low Channel, 30 MHz – 1 GHz.....	73
Plot 142. Radiated Spurious Emissions, 802.11g, Low Channel, 1 GHz – 18 GHz.....	73
Plot 143. Radiated Spurious Emissions, 802.11g, Mid Channel, 30 MHz – 1 GHz.....	73
Plot 144. Radiated Spurious Emissions, 802.11g, Mid Channel, 1 GHz – 18 GHz	74
Plot 145. Radiated Spurious Emissions, 802.11g, High Channel, 30 MHz – 1 GHz	74
Plot 146. Radiated Spurious Emissions, 802.11g, High Channel, 1 GHz – 18 GHz.....	74
Plot 147. Radiated Spurious Emissions, 802.11g 20 MHz, Low Channel, 30 MHz – 1 GHz.....	75
Plot 148. Radiated Spurious Emissions, 802.11g 20 MHz, Low Channel, 1 GHz – 18 GHz	75
Plot 149. Radiated Spurious Emissions, 802.11g 20 MHz, Mid Channel, 30 MHz – 1 GHz	75
Plot 150. Radiated Spurious Emissions, 802.11g 20 MHz, Mid Channel, 1 GHz – 18 GHz	76
Plot 151. Radiated Spurious Emissions, 802.11g 20 MHz, High Channel, 30 MHz – 1 GHz	76
Plot 152. Radiated Spurious Emissions, 802.11g 20 MHz, High Channel, 1 GHz – 18 GHz.....	76
Plot 153. Radiated Spurious Emissions, 802.11g 40 MHz, Low Channel, 30 MHz – 1 GHz.....	77
Plot 154. Radiated Spurious Emissions, 802.11g 40 MHz, Low Channel, 1 GHz – 18 GHz	77
Plot 155. Radiated Spurious Emissions, 802.11g 40 MHz, Mid Channel, 30 MHz – 1 GHz	77
Plot 156. Radiated Spurious Emissions, 802.11g 40 MHz, Mid Channel, 1 GHz – 18 GHz	78
Plot 157. Radiated Spurious Emissions, 802.11g 40 MHz, High Channel, 30 MHz – 1 GHz	78
Plot 158. Radiated Spurious Emissions, 802.11g 40 MHz, High Channel, 1 GHz – 18 GHz.....	78
Plot 159. Radiated Spurious Emissions, 802.11a, Low Channel, 30 MHz – 1 GHz.....	79
Plot 160. Radiated Spurious Emissions, 802.11a, Low Channel, 1 GHz – 18 GHz.....	79
Plot 161. Radiated Spurious Emissions, 802.11a, Mid Channel, 30 MHz – 1 GHz.....	79
Plot 162. Radiated Spurious Emissions, 802.11a, Mid Channel, 1 GHz – 18 GHz	80
Plot 163. Radiated Spurious Emissions, 802.11a, High Channel, 30 MHz – 1 GHz	80
Plot 164. Radiated Spurious Emissions, 802.11a, High Channel, 1 GHz – 18 GHz.....	80
Plot 165. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 30 MHz – 1 GHz.....	81
Plot 166. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 1 GHz – 18 GHz	81
Plot 167. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 30 MHz – 1 GHz	81
Plot 168. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 1 GHz – 18 GHz	82
Plot 169. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 30 MHz – 1 GHz	82
Plot 170. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 1 GHz – 18 GHz.....	82
Plot 171. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 30 MHz – 1 GHz.....	83
Plot 172. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 1 GHz – 18 GHz	83
Plot 173. Radiated Spurious Emissions, 802.11n 40 MHz, Mid Channel, 30 MHz – 1 GHz	83
Plot 174. Radiated Spurious Emissions, 802.11n 40 MHz, Mid Channel, 1 GHz – 18 GHz	84

Plot 175. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 30 MHz – 1 GHz	84
Plot 176. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 1 GHz – 18 GHz	84
Plot 177. Radiated Restricted Band Edge, 802.11b, Low Channel, Average	85
Plot 178. Radiated Restricted Band Edge, 802.11b, Low Channel, Peak	85
Plot 179. Radiated Restricted Band Edge, 802.11b, High Channel, Average	86
Plot 180. Radiated Restricted Band Edge, 802.11b, High Channel, Peak	86
Plot 181. Radiated Restricted Band Edge, 802.11g, Low Channel, Average	86
Plot 182. Radiated Restricted Band Edge, 802.11g, Low Channel, Peak	87
Plot 183. Radiated Restricted Band Edge, 802.11g, High Channel, Average	87
Plot 184. Radiated Restricted Band Edge, 802.11g, High Channel, Peak	87
Plot 185. Radiated Restricted Band Edge, 802.11g (20 MHz), Low Channel, Average	88
Plot 186. Radiated Restricted Band Edge, 802.11g (20 MHz), Low Channel, Peak	88
Plot 187. Radiated Restricted Band Edge, 802.11g (20 MHz), High Channel, Average	88
Plot 188. Radiated Restricted Band Edge, 802.11g (20 MHz), High Channel, Peak	89
Plot 189. Radiated Restricted Band Edge, 802.11g (40 MHz), Low Channel, Average	89
Plot 190. Radiated Restricted Band Edge, 802.11g (40 MHz), Low Channel, Peak	89
Plot 191. Radiated Restricted Band Edge, 802.11g (40 MHz), High Channel, Average	90
Plot 192. Radiated Restricted Band Edge, 802.11g (40 MHz), High Channel, Peak	90
Plot 193. Conducted Spurious Emissions, Low Channel, 802.11b, R3-A	92
Plot 194. Conducted Spurious Emissions, Low Channel, 802.11b, R3-B	92
Plot 195. Conducted Spurious Emissions, Low Channel, 802.11b, R3-C	92
Plot 196. Conducted Spurious Emissions, Low Channel, 802.11g 20 MHz, R3-A	93
Plot 197. Conducted Spurious Emissions, Low Channel, 802.11g 20 MHz, R3-B	93
Plot 198. Conducted Spurious Emissions, Low Channel, 802.11g 20 MHz, R3-C	93
Plot 199. Conducted Spurious Emissions, Low Channel, 802.11g 40 MHz, R3-A	94
Plot 200. Conducted Spurious Emissions, Low Channel, 802.11g 40 MHz, R3-B	94
Plot 201. Conducted Spurious Emissions, Low Channel, 802.11g 40 MHz, R3-C	94
Plot 202. Conducted Spurious Emissions, Low Channel, 802.11g, R3-A	95
Plot 203. Conducted Spurious Emissions, Low Channel, 802.11g, R3-B	95
Plot 204. Conducted Spurious Emissions, Low Channel, 802.11g, R3-C	95
Plot 205. Conducted Spurious Emissions, Mid Channel, 802.11b, R3-A	96
Plot 206. Conducted Spurious Emissions, Mid Channel, 802.11b, R3-B	96
Plot 207. Conducted Spurious Emissions, Mid Channel, 802.11b, R3-C	96
Plot 208. Conducted Spurious Emissions, Mid Channel, 802.11g 20 MHz, R3-A	97
Plot 209. Conducted Spurious Emissions, Mid Channel, 802.11g 20 MHz, R3-B	97
Plot 210. Conducted Spurious Emissions, Mid Channel, 802.11g 20 MHz, R3-C	97
Plot 211. Conducted Spurious Emissions, Mid Channel, 802.11g 40 MHz, R3-A	98
Plot 212. Conducted Spurious Emissions, Mid Channel, 802.11g 40 MHz, R3-B	98
Plot 213. Conducted Spurious Emissions, Mid Channel, 802.11g 40 MHz, R3-C	98
Plot 214. Conducted Spurious Emissions, Mid Channel, 802.11g, R3-A	99
Plot 215. Conducted Spurious Emissions, Mid Channel, 802.11g, R3-B	99
Plot 216. Conducted Spurious Emissions, Mid Channel, 802.11g, R3-C	99
Plot 217. Conducted Spurious Emissions, High Channel, 802.11b, R3-A	100
Plot 218. Conducted Spurious Emissions, High Channel, 802.11b, R3-B	100
Plot 219. Conducted Spurious Emissions, High Channel, 802.11b, R3-C	100
Plot 220. Conducted Spurious Emissions, High Channel, 802.11g 20 MHz, R3-A	101
Plot 221. Conducted Spurious Emissions, High Channel, 802.11g 20 MHz, R3-B	101
Plot 222. Conducted Spurious Emissions, High Channel, 802.11g 20 MHz, R3-C	101
Plot 223. Conducted Spurious Emissions, High Channel, 802.11g 40 MHz, R3-A	102
Plot 224. Conducted Spurious Emissions, High Channel, 802.11g 40 MHz, R3-B	102
Plot 225. Conducted Spurious Emissions, High Channel, 802.11g 40 MHz, R3-C	102
Plot 226. Conducted Spurious Emissions, High Channel, 802.11g, R3-A	103
Plot 227. Conducted Spurious Emissions, High Channel, 802.11g, R3-B	103

Plot 228. Conducted Spurious Emissions, High Channel, 802.11g, R3-C	103
Plot 229. Conducted Spurious Emissions, Low Channel, 802.11a, R3-A	104
Plot 230. Conducted Spurious Emissions, Low Channel, 802.11a, R3-B	104
Plot 231. Conducted Spurious Emissions, Low Channel, 802.11a, R3-C	104
Plot 232. Conducted Spurious Emissions, Low Channel, 802.11n 20 MHz, R3-A	105
Plot 233. Conducted Spurious Emissions, Low Channel, 802.11n 20 MHz, R3-B	105
Plot 234. Conducted Spurious Emissions, Low Channel, 802.11n 20 MHz, R3-C	105
Plot 235. Conducted Spurious Emissions, Low Channel, 802.11n 40 MHz, R3-A	106
Plot 236. Conducted Spurious Emissions, Low Channel, 802.11n 40 MHz, R3-B	106
Plot 237. Conducted Spurious Emissions, Low Channel, 802.11n 40 MHz, R3-C	106
Plot 238. Conducted Spurious Emissions, Mid Channel, 802.11a, R3-A	107
Plot 239. Conducted Spurious Emissions, Mid Channel, 802.11a, R3-B	107
Plot 240. Conducted Spurious Emissions, Mid Channel, 802.11a, R3-C	107
Plot 241. Conducted Spurious Emissions, Mid Channel, 802.11n 20 MHz, R3-A	108
Plot 242. Conducted Spurious Emissions, Mid Channel, 802.11n 20 MHz, R3-B	108
Plot 243. Conducted Spurious Emissions, Mid Channel, 802.11n 20 MHz, R3-C	108
Plot 244. Conducted Spurious Emissions, Mid Channel, 802.11n 40 MHz, R3-A	109
Plot 245. Conducted Spurious Emissions, Mid Channel, 802.11n 40 MHz, R3-B	109
Plot 246. Conducted Spurious Emissions, Mid Channel, 802.11n 40 MHz, R3-C	109
Plot 247. Conducted Spurious Emissions, High Channel, 802.11a, R3-A	110
Plot 248. Conducted Spurious Emissions, High Channel, 802.11a, R3-B	110
Plot 249. Conducted Spurious Emissions, High Channel, 802.11a, R3-C	110
Plot 250. Conducted Spurious Emissions, High Channel, 802.11n 20 MHz, R3-A	111
Plot 251. Conducted Spurious Emissions, High Channel, 802.11n 20 MHz, R3-B	111
Plot 252. Conducted Spurious Emissions, High Channel, 802.11n 20 MHz, R3-C	111
Plot 253. Conducted Spurious Emissions, High Channel, 802.11n 40 MHz, R3-A	112
Plot 254. Conducted Spurious Emissions, High Channel, 802.11n 40 MHz, R3-B	112
Plot 255. Conducted Spurious Emissions, High Channel, 802.11n 40 MHz, R3-C	112
Plot 256. Conducted Band Edge, Low Channel, 802.11b, Port A	113
Plot 257. Conducted Band Edge, Low Channel, 802.11b, Port B	113
Plot 258. Conducted Band Edge, Low Channel, 802.11b, Port C	113
Plot 259. Conducted Band Edge, Low Channel, 802.11g, Port A	114
Plot 260. Conducted Band Edge, Low Channel, 802.11g, Port B	114
Plot 261. Conducted Band Edge, Low Channel, 802.11g, Port C	114
Plot 262. Conducted Band Edge, Low Channel, 802.11g 20 MHz, Port A	115
Plot 263. Conducted Band Edge, Low Channel, 802.11g 20 MHz, Port B	115
Plot 264. Conducted Band Edge, Low Channel, 802.11g 20 MHz, Port C	115
Plot 265. Conducted Band Edge, Low Channel, 802.11g 40 MHz, Port A	116
Plot 266. Conducted Band Edge, Low Channel, 802.11g 40 MHz, Port B	116
Plot 267. Conducted Band Edge, Low Channel, 802.11g 40 MHz, Port C	116
Plot 268. Conducted Band Edge, High Channel, 802.11b, Port A	117
Plot 269. Conducted Band Edge, High Channel, 802.11g, Port B	117
Plot 270. Conducted Band Edge, High Channel, 802.11b, Port C	117
Plot 271. Conducted Band Edge, High Channel, 802.11g, Port A	118
Plot 272. Conducted Band Edge, High Channel, 802.11g, Port B	118
Plot 273. Conducted Band Edge, High Channel, 802.11g, Port C	118
Plot 274. Conducted Band Edge, High Channel, 802.11g 20 MHz, Port A	119
Plot 275. Conducted Band Edge, High Channel, 802.11g 20 MHz, Port B	119
Plot 276. Conducted Band Edge, High Channel, 802.11g 20 MHz, Port C	119
Plot 277. Conducted Band Edge, High Channel, 802.11g 40 MHz, Port A	120
Plot 278. Conducted Band Edge, High Channel, 802.11g 40 MHz, Port B	120
Plot 279. Conducted Band Edge, High Channel, 802.11g 40 MHz, Port C	120
Plot 280. Conducted Band Edge, Low Channel, 802.11a, Port A	121

Plot 281. Conducted Band Edge, Low Channel, 802.11a, Port B	121
Plot 282. Conducted Band Edge, Low Channel, 802.11a, Port C	121
Plot 283. Conducted Band Edge, Low Channel, 802.11g 20 MHZ, Port A	122
Plot 284. Conducted Band Edge, Low Channel, 802.11g 20 MHZ, Port B	122
Plot 285. Conducted Band Edge, Low Channel, 802.11g 20 MHZ, Port C	122
Plot 286. Conducted Band Edge, Low Channel, 802.11g 40 MHZ, Port A	123
Plot 287. Conducted Band Edge, Low Channel, 802.11g 40 MHZ, Port B	123
Plot 288. Conducted Band Edge, Low Channel, 802.11g 40 MHZ, Port C	123
Plot 289. Conducted Band Edge, High Channel, 802.11a, Port A	124
Plot 290. Conducted Band Edge, High Channel, 802.11a, Port B.....	124
Plot 291. Conducted Band Edge, High Channel, 802.11a, Port C.....	124
Plot 292. Conducted Band Edge, High Channel, 802.11g 20 MHZ, Port A	125
Plot 293. Conducted Band Edge, High Channel, 802.11g 20 MHZ, Port B.....	125
Plot 294. Conducted Band Edge, High Channel, 802.11g 20 MHZ, Port C.....	125
Plot 295. Conducted Band Edge, High Channel, 802.11g 40 MHZ, Port A	126
Plot 296. Conducted Band Edge, High Channel, 802.11g 40 MHZ, Port B.....	126
Plot 297. Conducted Band Edge, High Channel, 802.11g 40 MHZ, Port C.....	126
Plot 298. Receiver Spurious Emission, Port A, 30 MHz – 1 GHz	131
Plot 299. Receiver Spurious Emission, Port A, 1 GHz - 7.5 GHz.....	131
Plot 300. Receiver Spurious Emission, Port B, 30 MHz – 1 GHz.....	131
Plot 301. Receiver Spurious Emission, Port B, 1 GHz - 7.5 GHz.....	132
Plot 302. Receiver Spurious Emission, Port C, 30 MHz – 1 GHz.....	132
Plot 303. Receiver Spurious Emission, Port C, 1 - 7.5 GHz	132
Plot 304. Receiver Spurious Emission, Port A, 30 MHz – 1 GHz	133
Plot 305. Receiver Spurious Emission, Port A, 1 GHz - 17.4 GHz.....	133
Plot 306. Receiver Spurious Emission, Port B, 30 MHz – 1 GHz.....	133
Plot 307. Receiver Spurious Emission, Port B, 1 GHz - 17.4 GHz.....	134
Plot 308. Receiver Spurious Emission, Port C, 30 MHz – 1 GHz.....	134
Plot 309. Receiver Spurious Emission, Port C, 1 GHz - 17.4 GHz.....	134

List of Figures

Figure 1. Block Diagram of Test Configuration.....	6
Figure 2. Block Diagram, Occupied Bandwidth Test Setup.....	22
Figure 3. Peak Power Output Test Setup.....	67
Figure 4. Block Diagram, Conducted Spurious Emissions Test Setup.....	91
Figure 5. Block Diagram, Peak Power Spectral Density Test Setup	127
Figure 6. Block Diagram, Conducted Receiver Spurious Emissions Test Setup	130

List of Terms and Abbreviations

AC	Alternating Current
ACF	Antenna Correction Factor
Cal	Calibration
<i>d</i>	Measurement Distance
dB	Decibels
dB μ A	Decibels above one microamp
dB μ V	Decibels above one microvolt
dB μ A/m	Decibels above one microamp per meter
dB μ V/m	Decibels above one microvolt per meter
DC	Direct Current
E	Electric Field
DSL	Digital Subscriber Line
ESD	Electrostatic Discharge
EUT	Equipment Under Test
<i>f</i>	Frequency
FCC	Federal Communications Commission
GRP	Ground Reference Plane
H	Magnetic Field
HCP	Horizontal Coupling Plane
Hz	Hertz
IEC	International Electrotechnical Commission
kHz	kilohertz
kPa	kilopascal
kV	kilovolt
LISN	Line Impedance Stabilization Network
MHz	Megahertz
μ H	microhenry
μ	microfarad
μ s	microseconds
NEBS	Network Equipment-Building System
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
TWT	Traveling Wave Tube
V/m	Volts per meter
VCP	Vertical Coupling Plane

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Motorola Solutions, Inc. AP-7161, with the requirements of Part 15, §15.247. 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 AP-7161. Motorola Solutions, Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the AP-7161, has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, §15.247, in accordance with Motorola Solutions, Inc., purchase order number NP5280921. All tests were conducted using measurement procedure ANSI C63.4-2003.

FCC Reference 47 CFR Part 15.247:2005	IC Reference RSS-210 Issue 8: 2010	Description	Compliance
47 CFR Part 15.107 (a)	ICES-003 Issue 4 February 2004	Conducted Emission Limits for a Class B Digital Device	Compliant
47 CFR Part 15.109 (a)	ICES-003 Issue 4 February 2004	Radiated Emission Limits for a Class B Digital Device	Compliant
Title 47 of the CFR, Part 15 §15.203	N/A	Antenna Requirement	Compliant
Title 47 of the CFR, Part 15 §15.207(a)	RSS-210(7.2.2)	Conducted Emission Limits	Compliant
Title 47 of the CFR, Part 15 §15.247(a)(2)	RSS-Gen(4.6)	6dB Occupied Bandwidth	Compliant
		99% Occupied Bandwidth	Compliant
Title 47 of the CFR, Part 15 §15.247(b)	RSS-210(A8.4)	Peak Power Output	Compliant
Title 47 of the CFR, Part 15 §15.247(d); §15.209; §15.205	RSS-210(A8.5)	Radiated Spurious Emissions Requirements	Compliant
Title 47 of the CFR, Part 15 §15.247(d)	RSS-210(A8.5)	RF Conducted Spurious Emissions Requirements	Compliant
Title 47 of the CFR, Part 15 §15.247(d)	RSS-210(A8.5)	RF Conducted Band Edge	Compliant
Title 47 of the CFR, Part 15; §15.247(e)	RSS-210(A8.3)	Peak Power Spectral Density	Compliant
Title 47 of the CFR, Part 15 §15.247(i)	RSS-Gen(5.5)	Maximum Permissible Exposure (MPE)	Compliant
N/A	RSS-Gen(4.8)	Receiver Spurious Emissions	Compliant

Table 1. Executive Summary of EMC Part 15.247 Compliance Testing

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Motorola Solutions, Inc. to perform testing on the AP-7161, under Motorola Solutions, Inc.'s 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.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	AP-7161	
Model(s) Covered:	AP-7161	
EUT Specifications:	Primary Power: 120 VAC, 60 Hz	
	FCC ID: QJEAP716101 IC: 4602A-AP716101	
	Equipment Code:	DTS
	Peak RF Output Power:	2.4 GHz – 22.5 dBm 5.8 GHz – 20.9 dBm
	EUT Frequency Ranges:	2412 – 2462 MHz 2422 – 2452 MHz (HT40) 5745 – 5825 MHz 5755 – 5815 MHz (HT40)
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Shawn McMillen	
Report Date(s):	August 8, 2011	

Table 2. EUT Summary Table

B. References

CFR 47, Part 15, Subpart C	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
RSS-210, Issue 8, Dec. 2010	Low-power Licence-exempt Radiocommunications Devices (All Frequency Bands): Category I Equipment
CFR 47, Part 15, Subpart B	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
ICES-003, Issue 4 February 2004	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
ANSI C63.4:2003	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI/NCSL Z540-1-1994	Calibration Laboratories and Measuring and Test Equipment - General Requirements
ANSI/ISO/IEC 17025:2000	General Requirements for the Competence of Testing and Calibration Laboratories
ANSI C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices
EN 55022: 2006/A1:2007 CISPR 22: 2005/A1:2005	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement CISPR 22:2005 (Modified)

Table 3. References

C. 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 3 meter 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.

D. Description of Test Sample

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

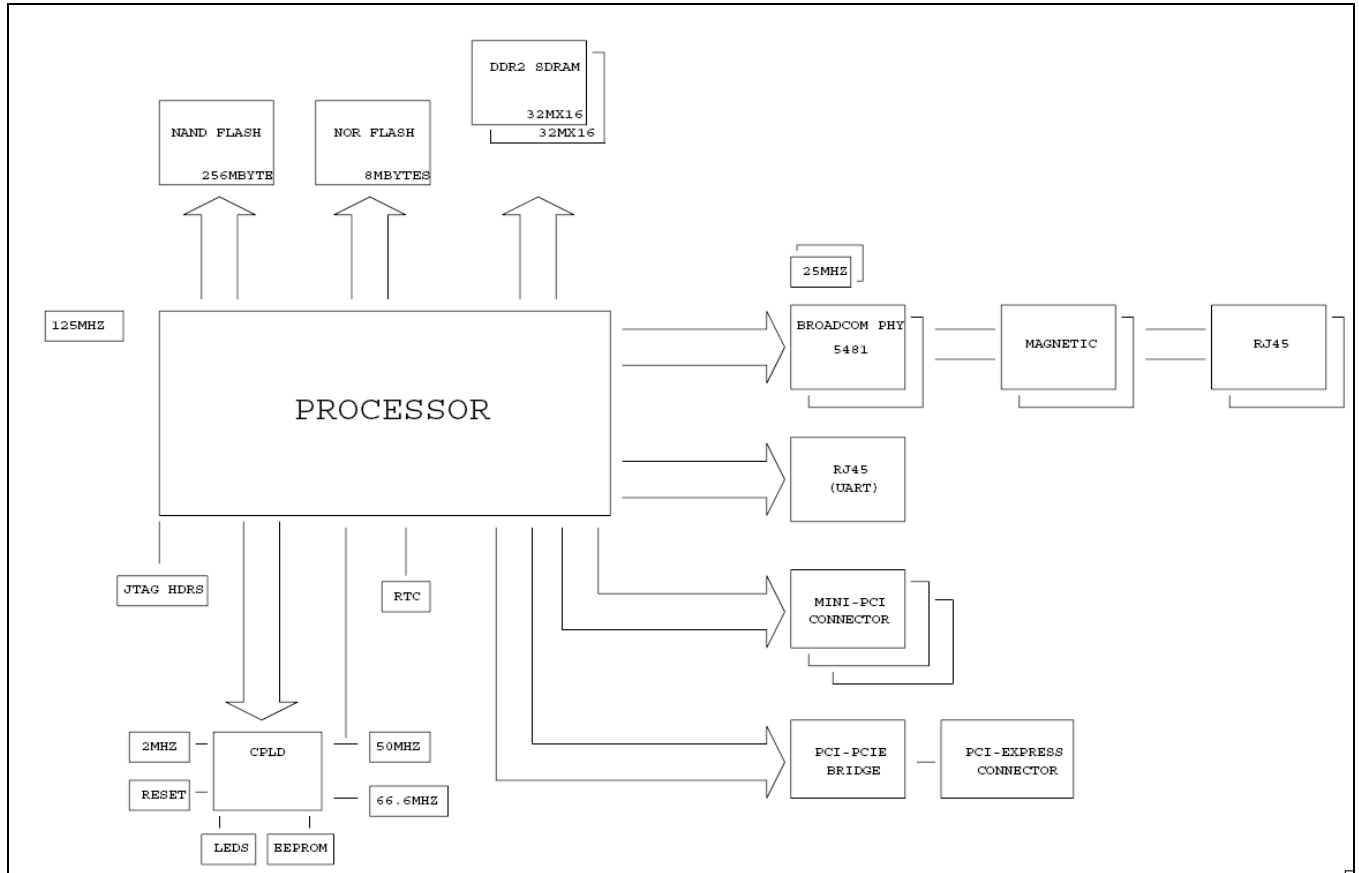


Figure 1. Block Diagram of Test Configuration

E. 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 4. Equipment Configuration

F. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

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

Table 5. Support Equipment

G. 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 6. Ports and Cabling Information

H. Mode of Operation

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

I. Method of Monitoring EUT Operation

Wireless radios are monitored in the intended frequency bands.

J. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

K. 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 Unintentional Radiators

Electromagnetic Compatibility Criteria

§ 15.107 Conducted Emissions Limits

Test Requirement(s): **15.107 (a)** Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 7. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

15.107 (b) For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 7. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges.

15.207(a), Except as shown in paragraphs (b) and (c) of this section*, charging, AC adapters or battery eliminators the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the Table 7, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency range (MHz)	Class A Conducted Limits (dB μ V)		*Class B Conducted Limits (dB μ V)	
	Quasi-Peak	Average	Quasi-Peak	Average
* 0.15- 0.45	79	66	66 - 56	56 - 46
0.45 - 0.5	79	66	56	46
0.5 - 30	73	60	60	50

Note 1 — The lower limit shall apply at the transition frequencies.
 Note 2 — The limit decreases linearly with the logarithm if the frequency in the range 0.15 MHz to 0.5 MHz.
 * -- Limits per Subsection 15.207(a).

Table 7. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Subsections 15.107(a) (b) and 15.207(a)

Test Results: The EUT was compliant with the Class B requirement(s) of this section. Measured emissions were below applicable limits.

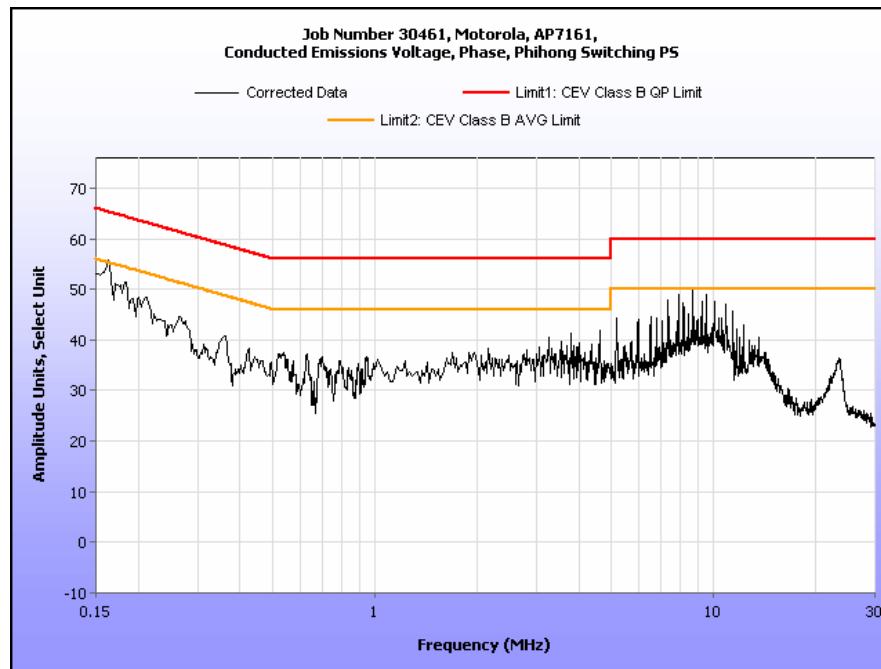
Test Engineer(s): Darrell Robinson

Test Date(s): 04/14/11

Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.1602	46.73	0	46.73	65.45	-18.72	41.37	0	41.37	55.45	-14.08
0.1804	31.78	0	31.78	64.47	-32.69	27.13	0	27.13	54.47	-27.34
8.7012	45.5	0.36	45.86	60	-14.14	44.61	0.36	44.97	50	-5.03
9.244	45.62	0.37	45.99	60	-14.01	41.85	0.37	42.22	50	-7.78
5.165	40.9	0.31	41.21	60	-18.79	37.57	0.31	37.88	50	-12.12
4.622	40.16	0.26	40.42	56	-15.58	36.65	0.26	36.91	46	-9.09

Table 8. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)

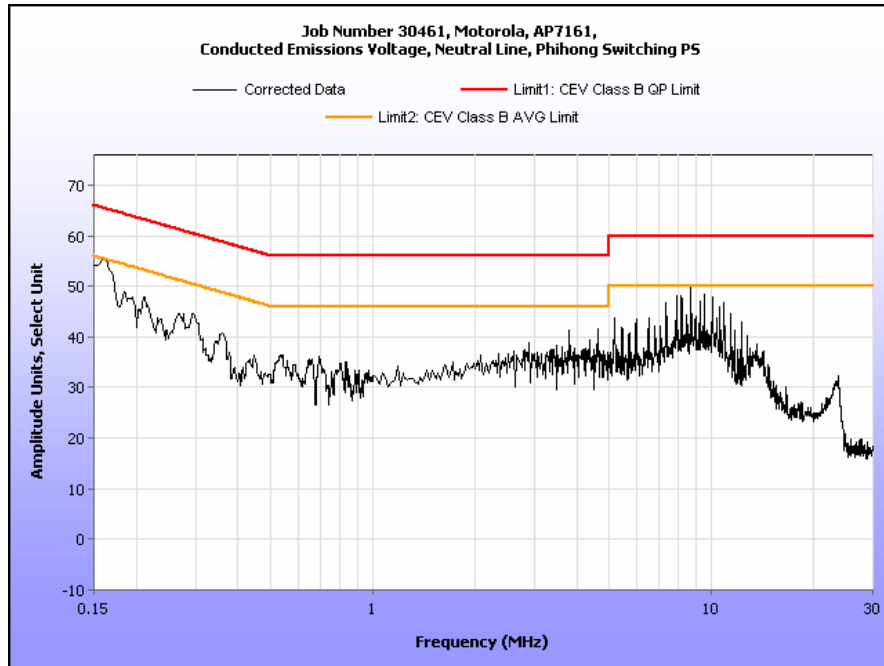


Plot 1. Conducted Emission, Phase Line Plot

Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.1599	52.83	0	52.83	65.47	-12.64	42.07	0	42.07	55.47	-13.4
8.699	47.85	0.36	48.21	60	-11.79	44.98	0.36	45.34	50	-4.66
9.517	45.68	0.38	46.06	60	-13.94	42.67	0.38	43.05	50	-6.95
8.158	45.29	0.35	45.64	60	-14.36	42.65	0.35	43	50	-7
4.621	39.32	0.26	39.58	56	-16.42	36.33	0.26	36.59	46	-9.41
0.2142	37.89	0.02	37.91	63.04	-25.13	33.38	0.02	33.4	53.04	-19.64

Table 9. Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)



Plot 2. Conducted Emission, Neutral Line Plot

Radiated Emission Limits

§ 15.109 Radiated Emissions Limits

Test Requirement(s): **15.109 (a)** Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the Class B limits expressed in Table 10.

15.109 (b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the Class A limits expressed in Table 10.

Frequency (MHz)	Field Strength (dB μ V/m)	
	§15.109 (b), Class A Limit (dB μ V) @ 10m	§15.109 (a), Class B Limit (dB μ V) @ 3m
30 - 88	39.00	40.00
88 - 216	43.50	43.50
216 - 960	46.40	46.00
Above 960	49.50	54.00

Table 10. Radiated Emissions Limits calculated from FCC Part 15, §15.109 (a) (b)

Test Procedures: The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.4 were used. An antenna was located 3 m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

Test Results: The EUT was compliant with the Class B requirement(s) of this section. Measured emissions were below applicable limits.

Test Engineer(s): Jeff Pratt

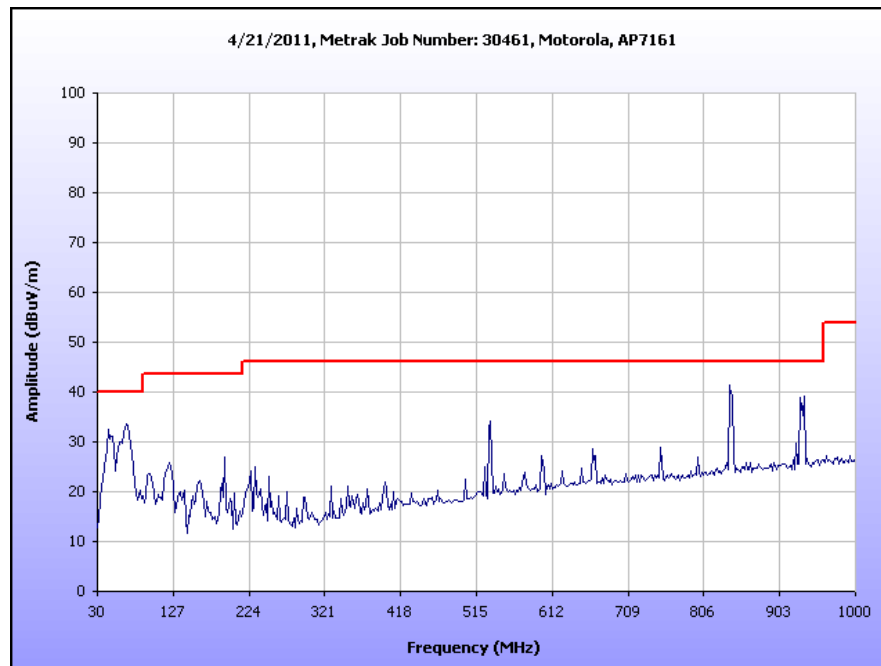
Test Date(s): 04/21/11

Radiated Emissions Limits Test Results, Class B

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
66.943587	135	H	1.05	-0.50	7.90	0.23	0.00	7.63	40.00	-32.37
66.943587	127	V	0.99	11.06	7.90	0.23	0.00	19.19	40.00	-20.81
44.775182	321	H	2.00	-0.81	10.93	0.23	0.00	10.35	40.00	-29.65
44.775182	73	V	1.40	11.51	10.93	0.23	0.00	22.67	40.00	-17.33
121.11951	325	H	2.28	3.41	13.80	0.23	0.00	17.44	43.50	-26.06
121.11951	36	V	1.01	10.22	13.80	0.23	0.00	24.25	43.50	-19.25
95.657688	329	H	1.56	6.02	9.00	0.23	0.00	15.25	43.50	-28.25
95.657688	28	V	1.11	12.93	9.00	0.23	0.00	22.16	43.50	-21.34
192.89923	293	H	1.59	12.93	11.79	0.23	0.00	24.95	43.50	-18.55
192.89923	331	V	1.01	17.44	11.79	0.23	0.00	29.46	43.50	-14.04
530.79409	289	H	1.00	9.82	18.50	1.00	0.00	29.32	46.00	-16.68
530.79409	236	V	1.01	14.03	18.50	1.00	0.00	33.53	46.00	-12.47

Table 11. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, FCC Limits

Note: The EUT was tested at 3 m.



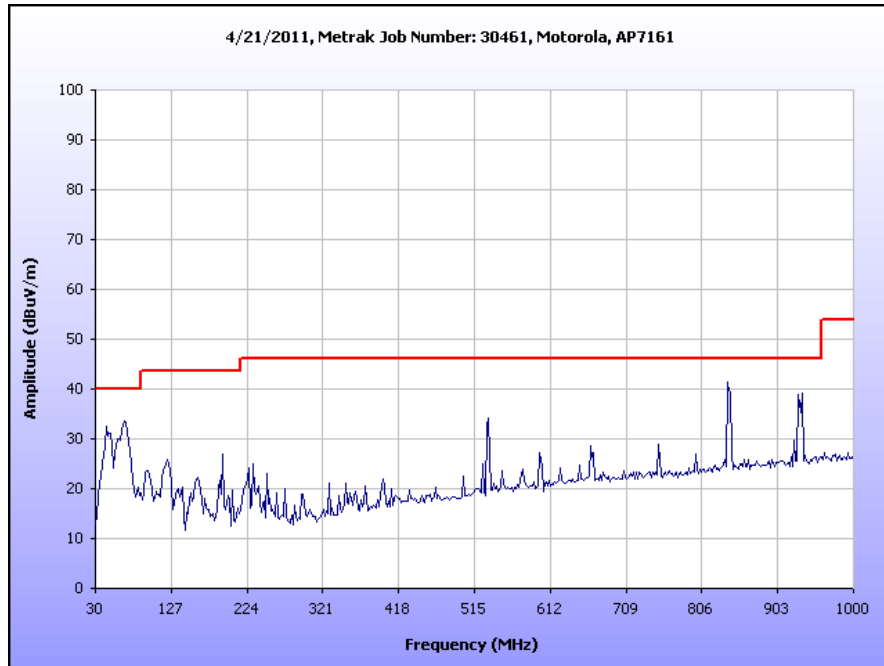
Plot 3. Radiated Emissions, 30 MHz - 1 GHz, FCC Limits

Radiated Emissions Limits Test Results, Class B

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
66.943587	135	H	1.05	-0.50	7.90	0.23	10.46	-2.83	30.00	-32.83
66.943587	127	V	0.99	11.06	7.90	0.23	10.46	8.73	30.00	-21.27
44.775182	321	H	2.00	-0.81	10.93	0.23	10.46	-0.11	30.00	-30.11
44.775182	73	V	1.40	11.51	10.93	0.23	10.46	12.21	30.00	-17.79
121.11951	325	H	2.28	3.41	13.80	0.23	10.46	6.98	30.00	-23.02
121.11951	36	V	1.01	10.22	13.80	0.23	10.46	13.79	30.00	-16.21
95.657688	329	H	1.56	6.02	9.00	0.23	10.46	4.79	30.00	-25.21
95.657688	28	V	1.11	12.93	9.00	0.23	10.46	11.70	30.00	-18.30
192.89923	293	H	1.59	12.93	11.79	0.23	10.46	14.49	30.00	-15.51
192.89923	331	V	1.01	17.44	11.79	0.23	10.46	19.00	30.00	-11.00
530.79409	289	H	1.00	9.82	18.50	1.00	10.46	18.86	37.00	-18.14
530.79409	236	V	1.01	14.03	18.50	1.00	10.46	23.07	37.00	-13.93

Table 12. Radiated Emissions Limits, Test Results, ICES-003 Limits

Note: The EUT was tested at 3 m.



Plot 4. Radiated Emissions, ICES-003 Limits

IV. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

Test Requirement: § 15.203: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The structure and application of the EUT were analyzed to determine compliance with Section 15.203 of the Rules. Section 15.203 states that the subject device must meet at least one of the following criteria:

- a.) Antenna must be permanently attached to the unit.
- b.) Antenna must use a unique type of connector to attach to the EUT.
- c.) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

Results: The EUT as tested is compliant the criteria of §15.203.

Test Engineer(s): Jeff Pratt

Test Date(s): 03/31/11

Gain	Type	Model	Manufacturer
8	Omni	S2406BFNM	Cushcraft
10	Omni	S4908WBF	Laird

Table 13. Antenna List

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207(a) Conducted Emissions Limits

Test Requirement(s): § 15.207 (a): For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency range (MHz)	§ 15.207(a), Conducted Limit (dB μ V)	
	Quasi-Peak	Average
* 0.15- 0.45	66 - 56	56 - 46
0.45 - 0.5	56	46
0.5 - 30	60	50

Table 14. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)

Test Procedure: The EUT was placed on a 0.8 m-high wooden table inside a screen room. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50 Ω /50 μ H Line Impedance Stabilization Network (LISN). The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. Conducted Emissions measurements were made in accordance with *ANSI C63.4-2003 "Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"*. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω /50 μ H LISN as the input transducer to an EMC/field intensity meter. For the purpose of this testing, the transmitter was turned on. Scans were performed with the transmitter on.

Test Results: The EUT was compliant with this requirement. Measured emissions were below applicable limits.

Test Engineer(s): Jeff Pratt

Test Date(s): 03/31/11

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
14.12	47.8	0.45	48.25	73	-24.75	41.74	0.45	42.19	60	-17.81
13.43	48.4	0.44	48.84	73	-24.16	43.71	0.44	44.15	60	-15.85
12.76	49.06	0.44	49.5	73	-23.5	42.95	0.44	43.39	60	-16.61
3.81	42.15	0.23	42.38	73	-30.62	35.97	0.23	36.2	60	-23.8
10.08	48.95	0.41	49.36	73	-23.64	42.04	0.41	42.45	60	-17.55
7.91	44.96	0.35	45.31	73	-27.69	39.16	0.35	39.51	60	-20.49

Table 15. Conducted Emissions, 15.207, Test Results, Phase Line, 2.4 GHz

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
10.08	48.94	0.41	49.35	73	-23.65	42.12	0.41	42.53	60	-17.47
13.36	48.56	0.44	49	73	-24	43.13	0.44	43.57	60	-16.43
14.18	47.63	0.45	48.08	73	-24.92	41.72	0.45	42.17	60	-17.83
8.73	46.89	0.36	47.25	73	-25.75	40.34	0.36	40.7	60	-19.3
16.19	44.51	0.48	44.99	73	-28.01	38.96	0.48	39.44	60	-20.56
11.94	47.62	0.43	48.05	73	-24.95	41.03	0.43	41.46	60	-18.54

Table 16. Conducted Emissions, 15.207, Test Results, Neutral Line, 2.4 GHz

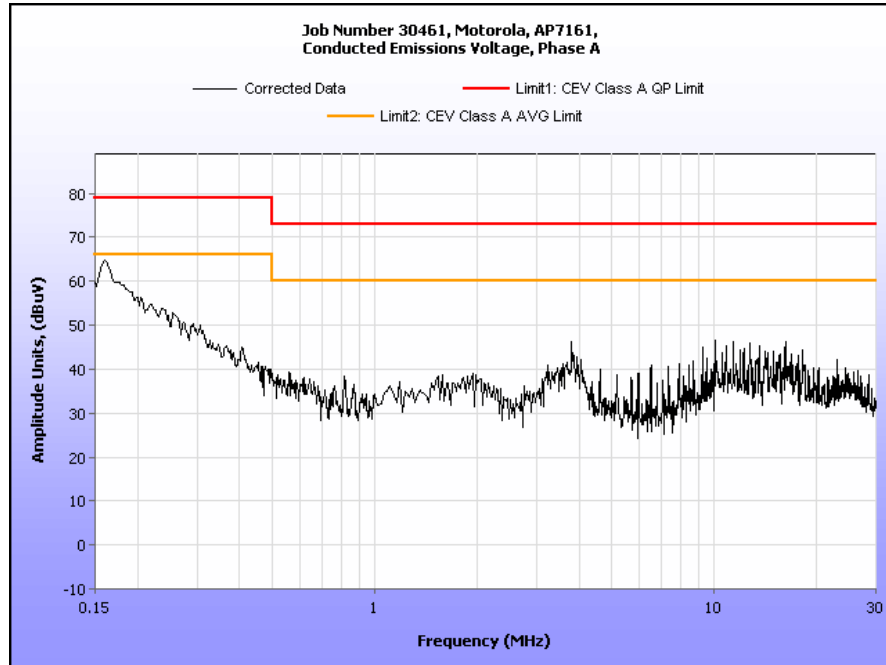
Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
10.08	49.82	0.41	50.23	73	-22.77	42.85	0.41	43.26	60	-16.74
12.76	50.31	0.44	50.75	73	-22.25	43.77	0.44	44.21	60	-15.79
14.18	48.62	0.45	49.07	73	-23.93	42.72	0.45	43.17	60	-16.83
3.81	41.22	0.23	41.45	73	-31.55	35.23	0.23	35.46	60	-24.54
11.94	49.05	0.43	49.48	73	-23.52	42.57	0.43	43	60	-17
9.33	44.81	0.38	45.19	73	-27.81	38.8	0.38	39.18	60	-20.82

Table 17. Conducted Emissions, 15.207, Test Results, Phase Line, 5.8 GHz

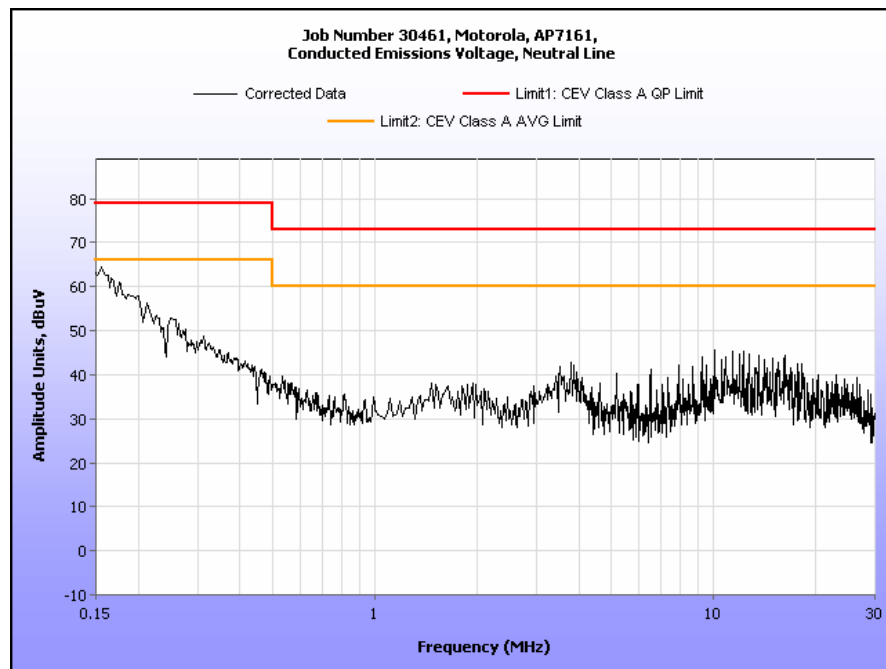
Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
13.43	48.93	0.44	49.37	73	-23.63	44.02	0.44	44.46	60	-15.54
12.76	49.89	0.44	50.33	73	-22.67	43.51	0.44	43.95	60	-16.05
10.08	49.51	0.41	49.92	73	-23.08	42.66	0.41	43.07	60	-16.93
14.18	48.23	0.45	48.68	73	-24.32	42.41	0.45	42.86	60	-17.14
16.19	44.95	0.48	45.43	73	-27.57	39.33	0.48	39.81	60	-20.19
11.94	48.88	0.43	49.31	73	-23.69	42.4	0.43	42.83	60	-17.17

Table 18. Conducted Emissions, 15.207, Test Results, Neutral Line, 5.8 GHz

15.207(a) Conducted Emissions Test Results

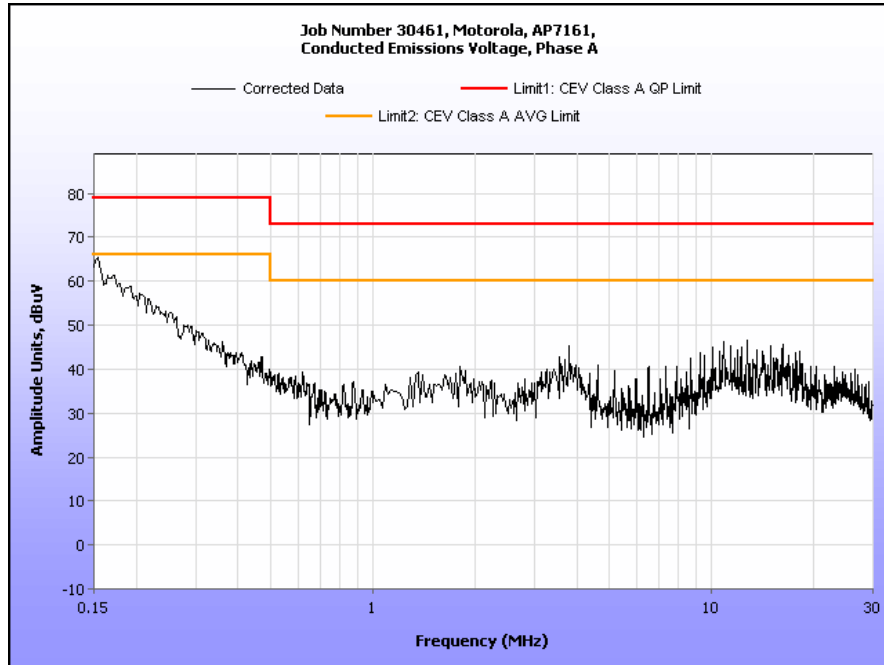


Plot 5. Conducted Emissions, 15.207(a), Phase Line, Pre-scan for 2.4 GHz DTS Band

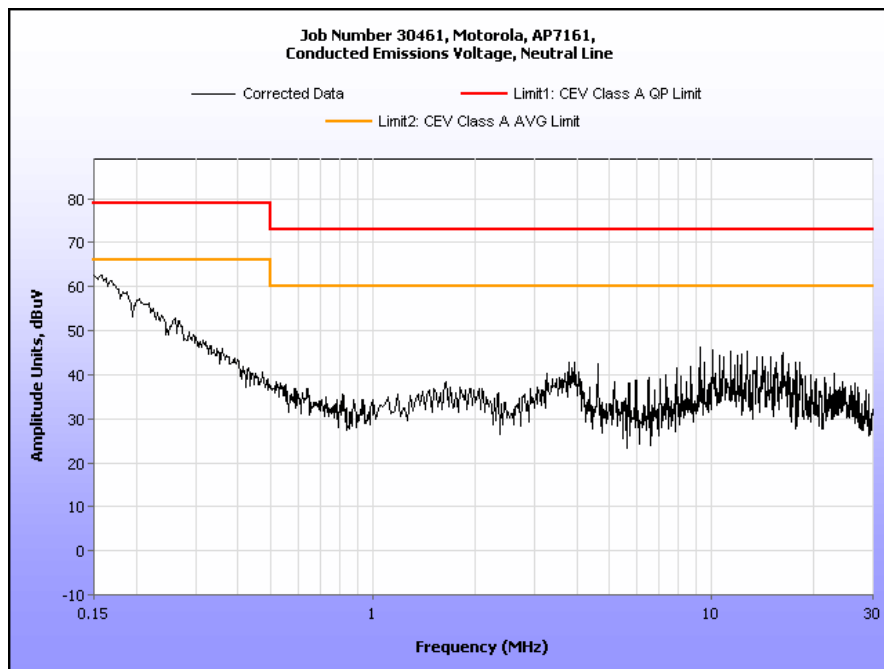


Plot 6. Conducted Emissions, 15.207(a), Neutral Line, Pre-scan for 2.4 GHz DTS Band

15.207(a) Conducted Emissions Test Results



Plot 7. Conducted Emissions, 15.207(a), Phase Line, Pre-scan for 5.8 GHz DTS Band



Plot 8. Conducted Emissions, 15.207(a), Neutral Line, Pre-scan for 5.8 GHz DTS Band

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(a)(2) 6 dB and 99% Bandwidth

Test Requirements: § 15.247(a)(2): Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

For systems using digital modulation techniques, the EUT may operate in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

Test Procedure: The transmitter was on and transmitting at the highest output power. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately 1% of the total emission bandwidth, VBW > RBW. The 6 dB Bandwidth was measured and recorded. The measurements were performed on the low, mid and high channels.

Test Results The EUT was compliant with § 15.247 (a)(2).

The 6 dB and 99% Bandwidth was determined from the plots on the following pages.

Test Engineer(s): Jeff Pratt

Test Date(s): 03/07/11

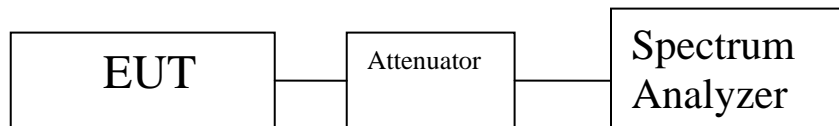


Figure 2. Block Diagram, Occupied Bandwidth Test Setup

Occupied Bandwidth Test Results

Occupied Bandwidth					
Carrier Channel	Frequency (MHz)	Mode	Measured 6 dB Bandwidth (MHz)		
			R3-A	R3-B	R3-C
Low	2412	802.11b	10.313	9.968	10.037
Low	2412	802.11g	15.353	15.868	16.417
Low	2412	802.11g 20 MHz	17.667	13.320	17.528
Low	2422	802.11g 40 MHz	36.136	36.252	36.504
Mid	2437	802.11b	9.574	11.144	9.860
Mid	2437	802.11g	16.281	16.088	16.209
Mid	2437	802.11g 20 MHz	17.563	17.628	17.509
Mid	2437	802.11g 40 MHz	36.354	36.447	36.534
High	2462	802.11b	10.302	10.257	10.898
High	2462	802.11g	16.462	17.728	16.061
High	2462	802.11n 20 MHz	17.721	17.707	17.619
High	2452	802.11n 40 MHz	36.161	36.456	36.130

Table 19. 6 dB Occupied Bandwidth, Test Results, 2.4 GHz

Occupied Bandwidth					
Carrier Channel	Frequency (MHz)	Mode	Measured 6 dB Bandwidth (MHz)		
			R3-A	R3-B	R3-C
Low	5745	802.11a	16.177	16.419	16.532
Low	5745	802.11n 20 MHz	17.461	17.694	16.983
Low	5755	802.11n 40 MHz	36.504	36.314	36.227
Mid	5785	802.11a	16.452	16.357	16.029
Mid	5785	802.11n 20 MHz	16.966	17.607	17.704
Mid	5785	802.11n 40 MHz	36.039	36.471	36.422
High	5825	802.11a	16.449	16.211	16.432
High	5825	802.11n 20 MHz	17.525	17.525	17.351
High	5815	802.11n 40 MHz	36.440	36.200	36.218

Table 20. 6 dB Occupied Bandwidth, Test Results, 5.8 GHz

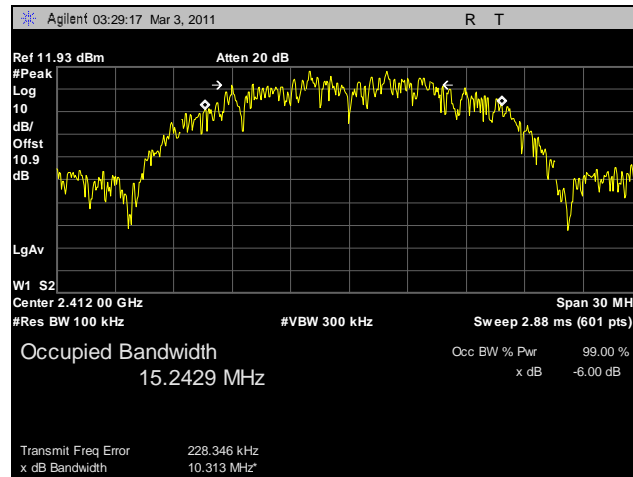
Occupied Bandwidth					
Carrier Channel	Frequency (MHz)	Mode	Measured 99% Bandwidth (MHz)		
			R3-A	R3-B	R3-C
Low	2412	802.11b	15.4710	15.2058	15.1189
Low	2412	802.11g	16.5396	16.3744	16.4058
Low	2412	802.11g 20 MHz	17.6698	17.7558	17.6596
Low	2422	802.11g 40 MHz	36.2915	36.1751	36.2757
Mid	2437	802.11b	15.3713	15.3519	15.1369
Mid	2437	802.11g	16.5249	16.4279	16.4661
Mid	2437	802.11g 20 MHz	17.5187	17.6597	17.6090
Mid	2437	802.11g 40 MHz	36.2355	36.2067	36.3387
High	2462	802.11b	15.4775	15.0114	15.2966
High	2462	802.11g	16.3804	16.4491	16.5060
High	2462	802.11g 20 MHz	17.5750	17.6184	17.6504
High	2452	802.11g 40 MHz	36.2588	36.4039	35.9949

Table 21. 99% Occupied Bandwidth, Test Results, 2.4 GHz

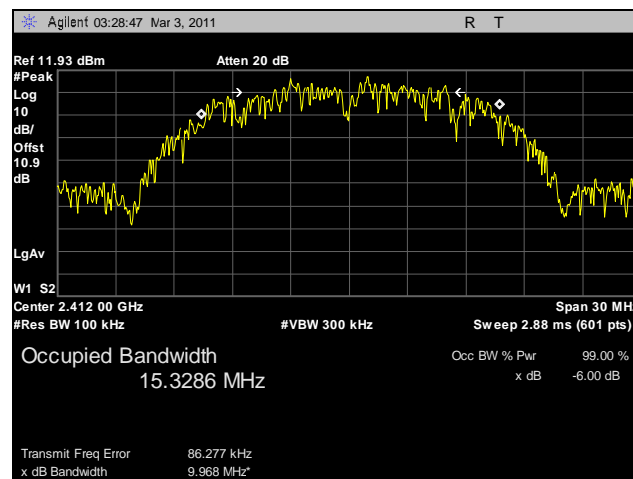
Occupied Bandwidth					
Carrier Channel	Frequency (MHz)	Mode	Measured 99% Bandwidth (MHz)		
			R3-A	R3-B	R3-C
Low	5745	802.11a	16.4877	16.4656	16.5717
Low	5745	802.11n 20 MHz	17.6661	17.5847	17.7479
Low	5755	802.11n 40 MHz	36.2385	36.2898	36.2931
Mid	5785	802.11a	16.4517	16.4316	16.5043
Mid	5785	802.11n 20 MHz	17.7007	17.6184	17.6288
Mid	5785	802.11n 40 MHz	36.2431	36.1860	36.1892
High	5825	802.11a	16.4233	16.3744	16.4229
High	5825	802.11n 20 MHz	17.6650	17.7196	17.6977
High	5815	802.11n 40 MHz	36.3933	36.2438	36.2710

Table 22. 99% Occupied Bandwidth, Test Results, 5.8 GHz

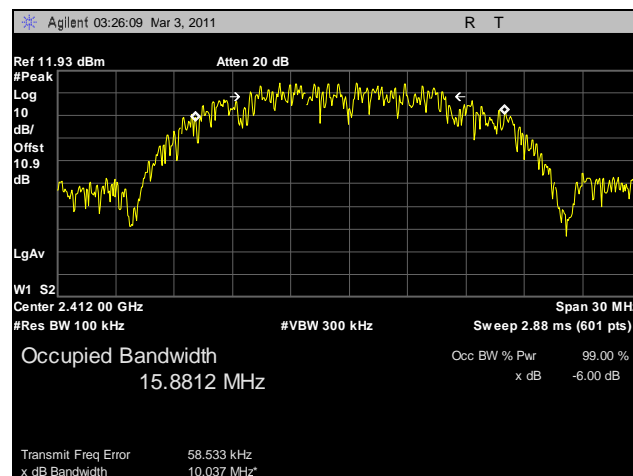
6 dB Occupied Bandwidth Test Results, 2.4 GHz



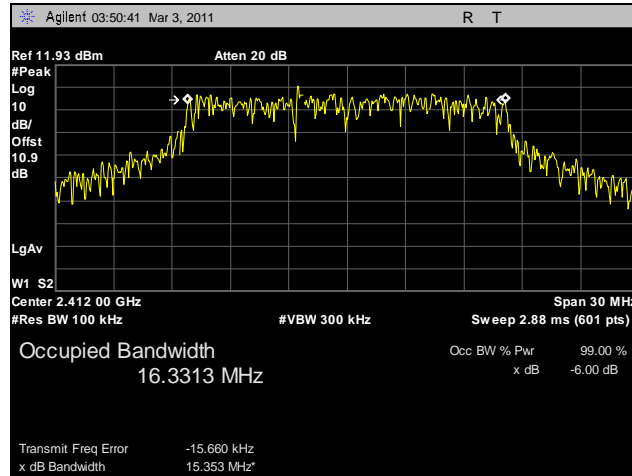
Plot 9. 6dB Occupied Bandwidth, Low Channel, 802.11b, 2.4 GHz, R3-A



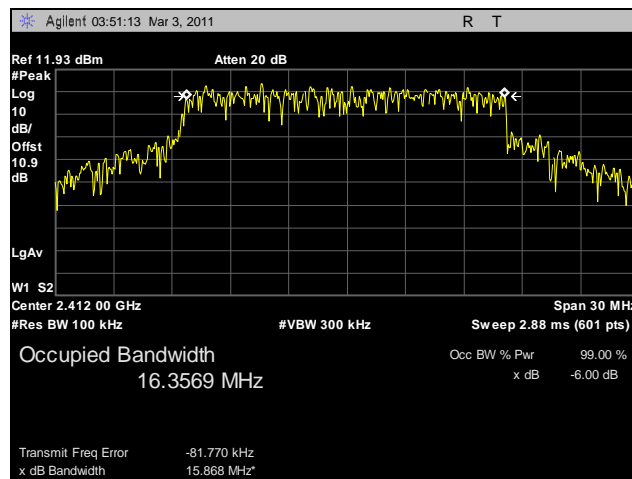
Plot 10. 6dB Occupied Bandwidth, Low Channel, 802.11b, 2.4 GHz, R3-B



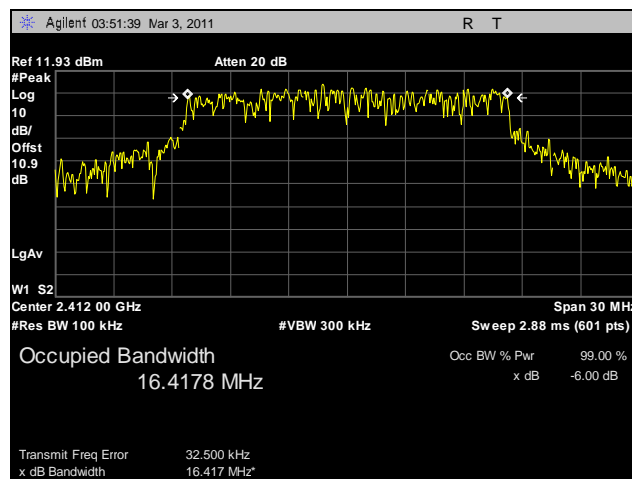
Plot 11. 6dB Occupied Bandwidth, Low Channel, 802.11b, 2.4 GHz, R3-C



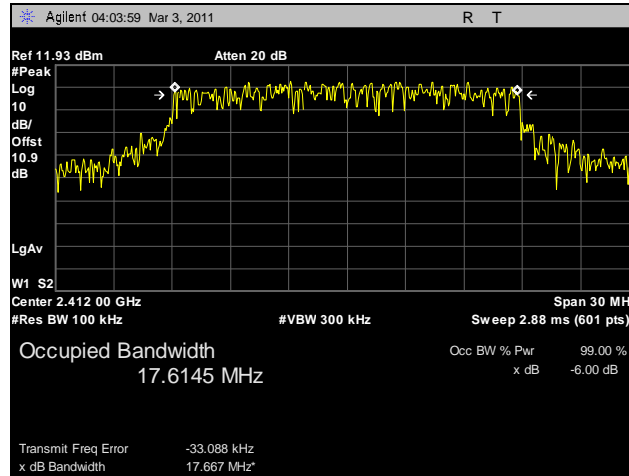
Plot 12. 6dB Occupied Bandwidth, Low Channel, 802.11g, 2.4 GHz, R3-A



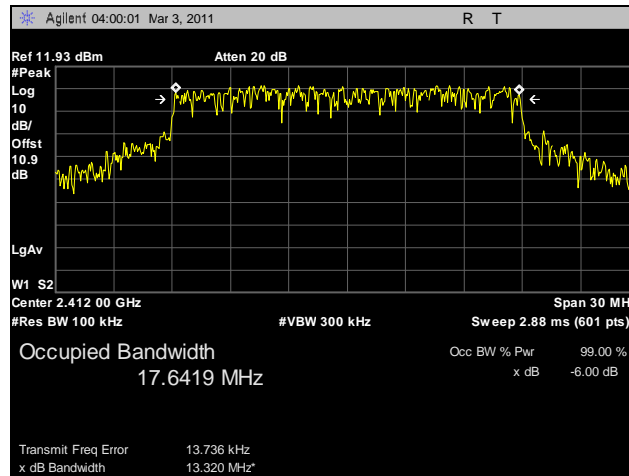
Plot 13. 6dB Occupied Bandwidth, Low Channel, 802.11g, 2.4 GHz, R3-B



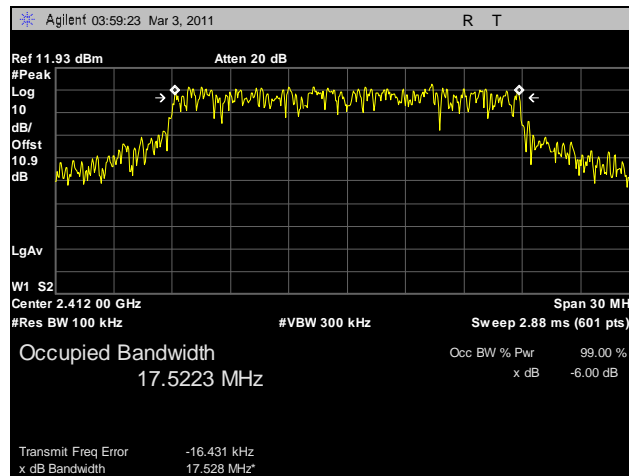
Plot 14. 6dB Occupied Bandwidth, Low Channel, 802.11g, 2.4 GHz, R3-C



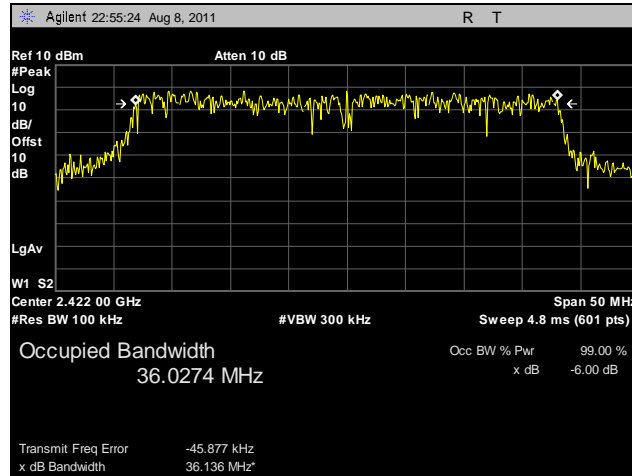
Plot 15. 6dB Occupied Bandwidth, Low Channel, 802.11g 20 MHz, 2.4 GHz, R3-A



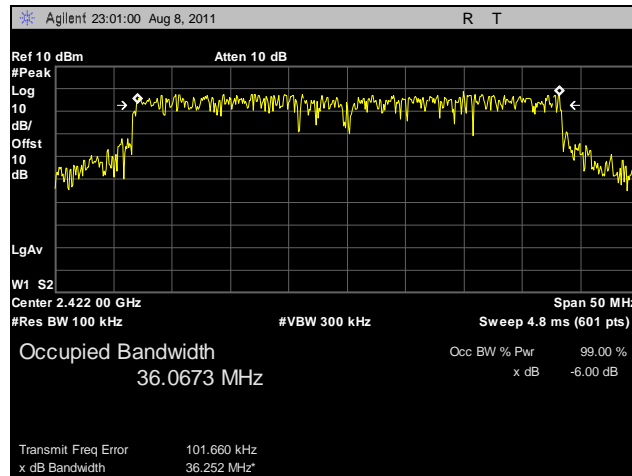
Plot 16. 6dB Occupied Bandwidth, Low Channel, 802.11g 20 MHz, 2.4 GHz, R3-B



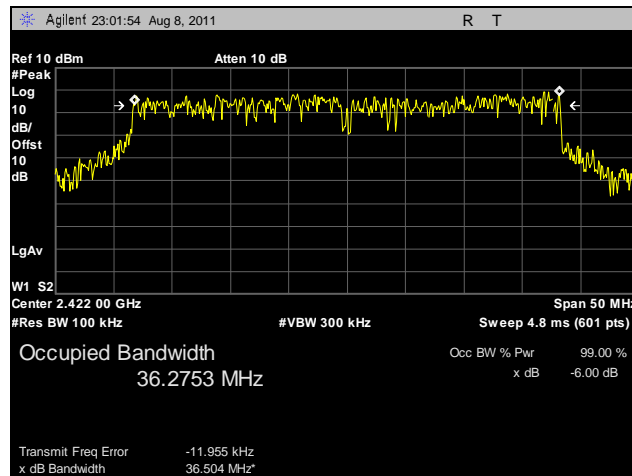
Plot 17. 6dB Occupied Bandwidth, Low Channel, 802.11g 20 MHz, 2.4 GHz, R3-C



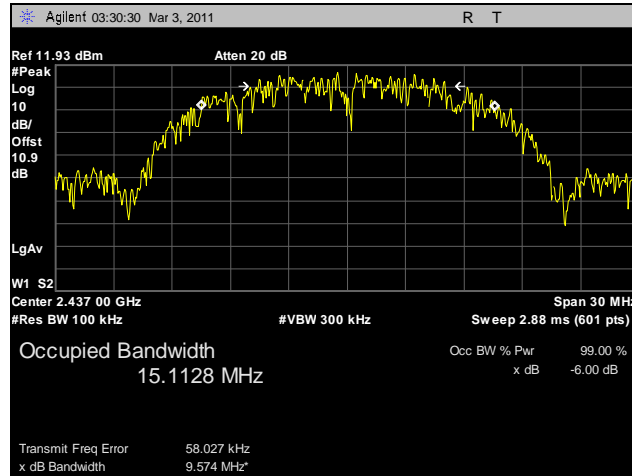
Plot 18. 6dB Occupied Bandwidth, Low Channel, 802.11g 40 MHz, 2.4 GHz, R3-A



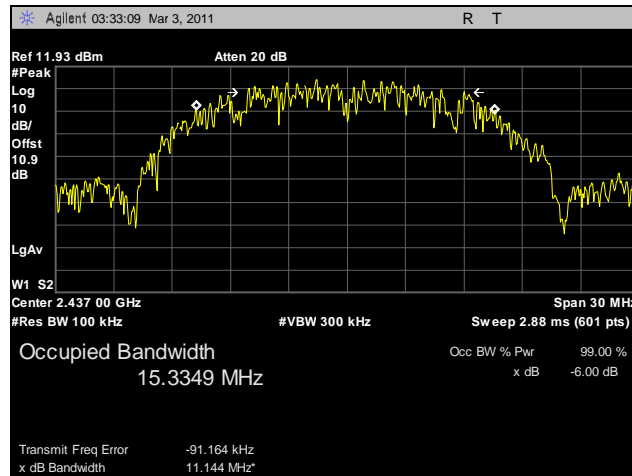
Plot 19. 6dB Occupied Bandwidth, Low Channel, 802.11g 40 MHz, 2.4 GHz, R3-B



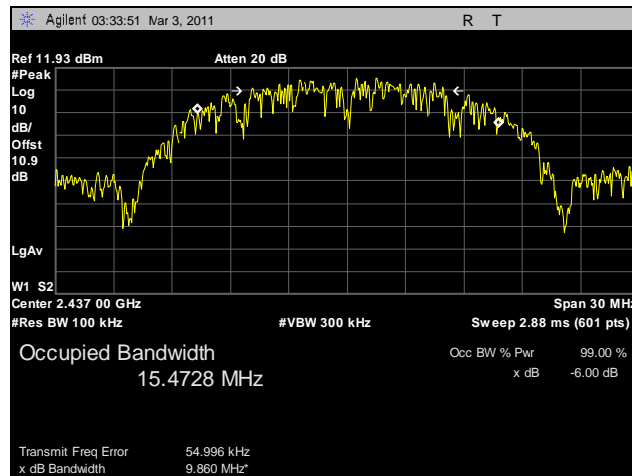
Plot 20. 6dB Occupied Bandwidth, Low Channel, 802.11g 40 MHz, 2.4 GHz, R3-C



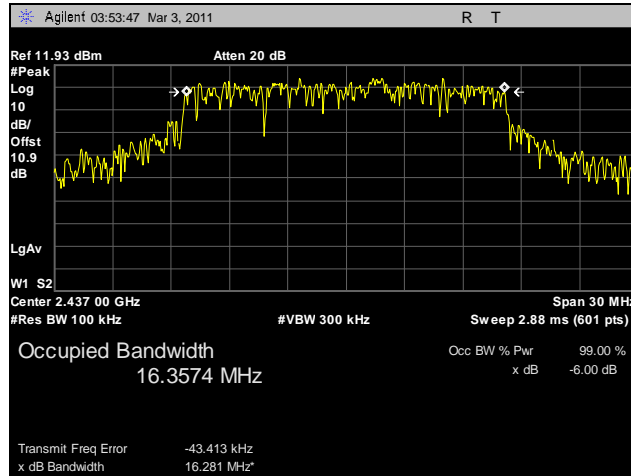
Plot 21. 6dB Occupied Bandwidth, Mid Channel, 802.11b, 2.4 GHz, R3-A



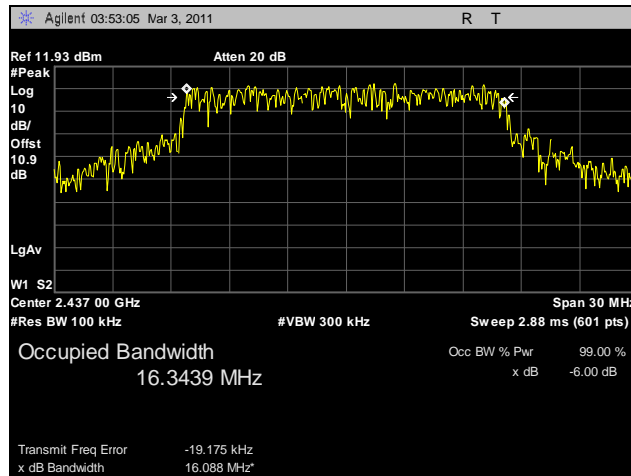
Plot 22. 6dB Occupied Bandwidth, Mid Channel, 802.11b, 2.4 GHz, R3-B



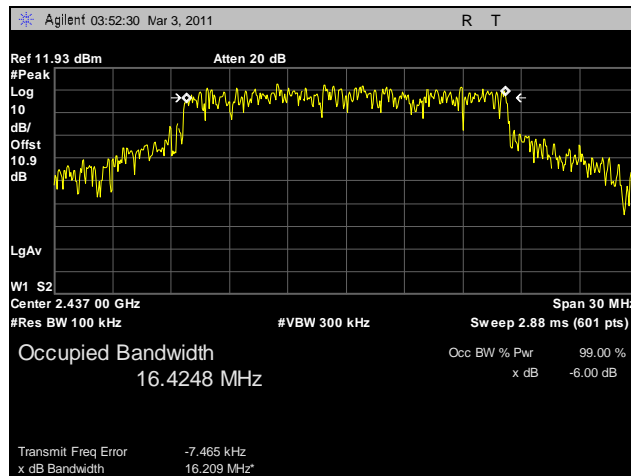
Plot 23. 6dB Occupied Bandwidth, Mid Channel, 802.11b, 2.4 GHz, R3-C



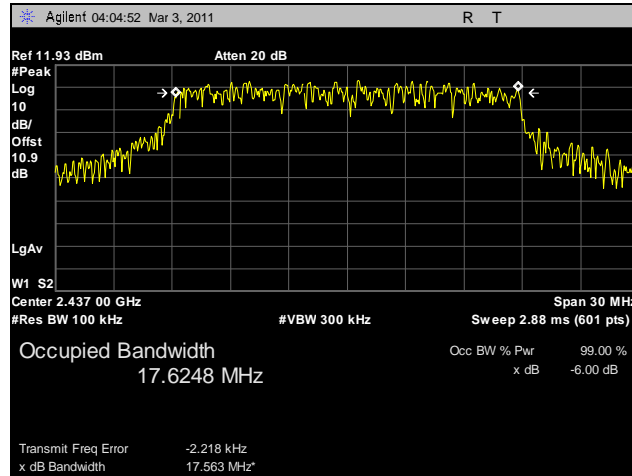
Plot 24. 6dB Occupied Bandwidth, Mid Channel, 802.11g, 2.4 GHz, R3-A



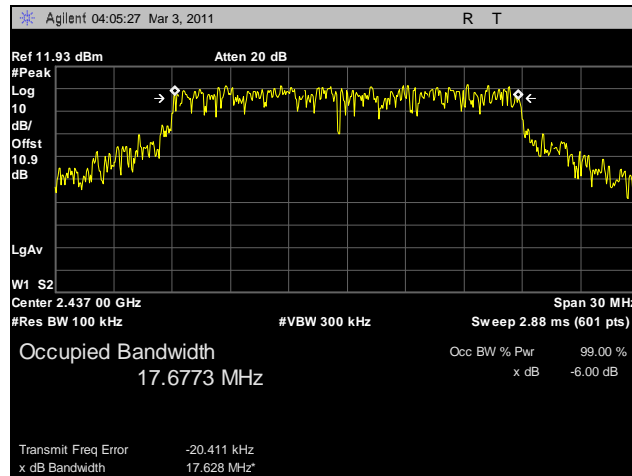
Plot 25. 6dB Occupied Bandwidth, Mid Channel, 802.11g, 2.4 GHz, R3-B



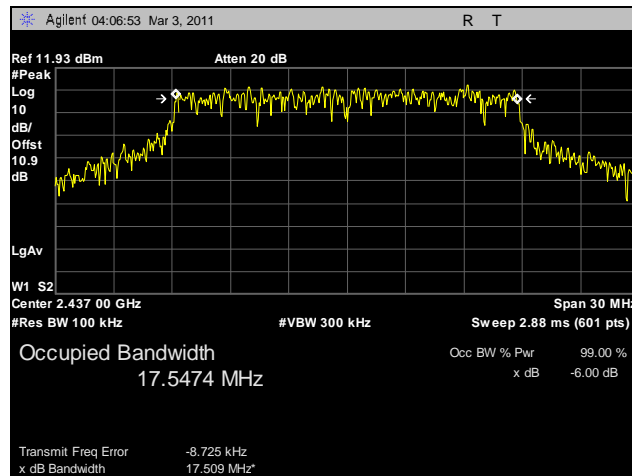
Plot 26. 6dB Occupied Bandwidth, Mid Channel, 802.11g, 2.4 GHz, R3-C



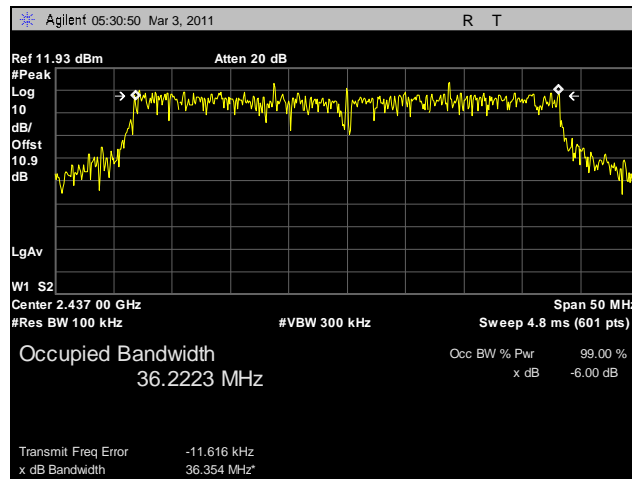
Plot 27. 6dB Occupied Bandwidth, Mid Channel, 802.11g 20 MHz, 2.4 GHz, R3-A



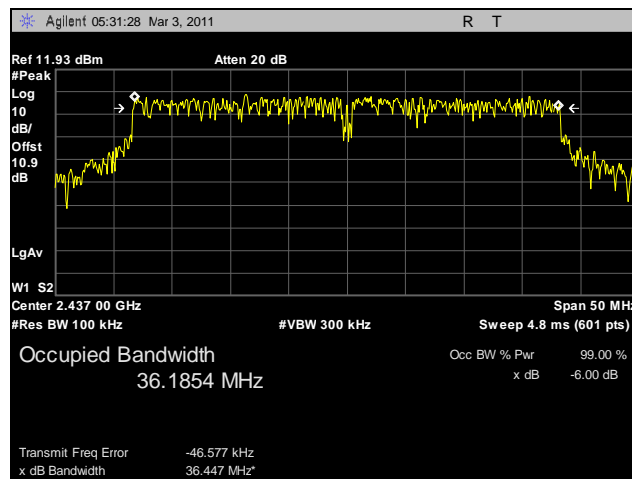
Plot 28. 6dB Occupied Bandwidth, Mid Channel, 802.11g 20 MHz, 2.4 GHz, R3-B



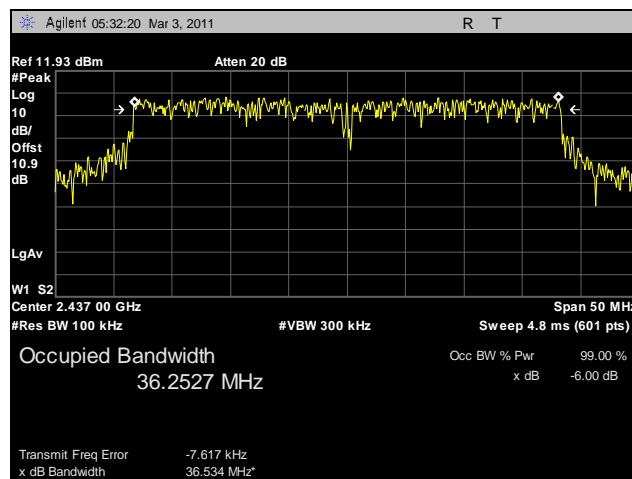
Plot 29. 6dB Occupied Bandwidth, Mid Channel, 802.11g 20 MHz, 2.4 GHz, R3-C



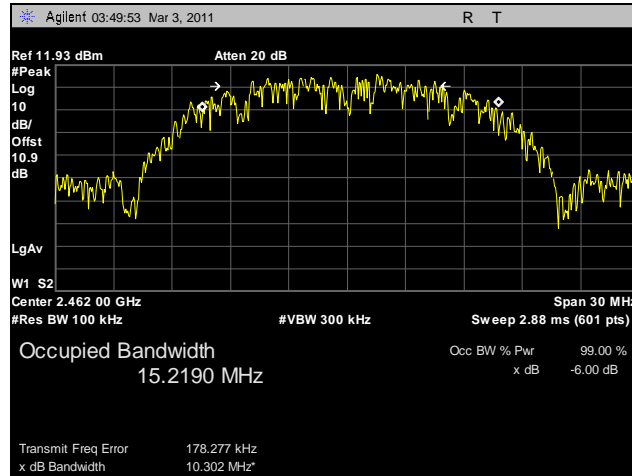
Plot 30. 6dB Occupied Bandwidth, Mid Channel, 802.11g 40 MHz, 2.4 GHz, R3-A



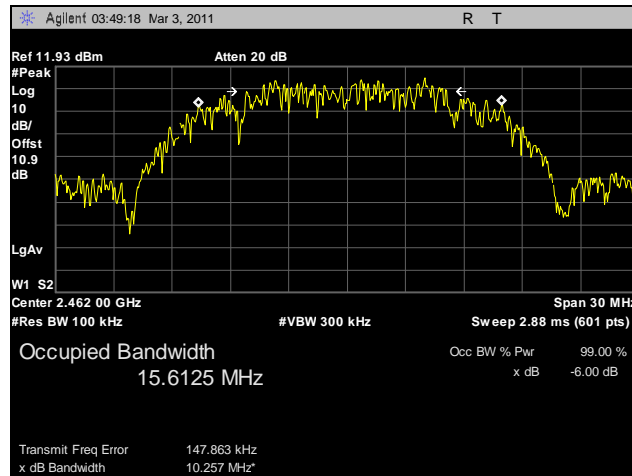
Plot 31. 6dB Occupied Bandwidth, Mid Channel, 802.11g 40 MHz, 2.4 GHz, R3-B



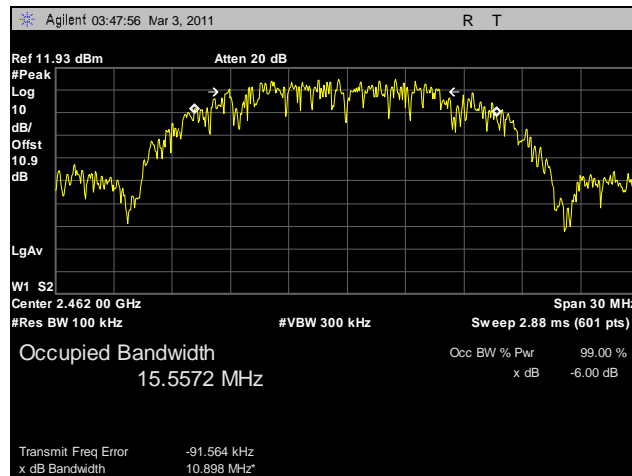
Plot 32. 6dB Occupied Bandwidth, Mid Channel, 802.11g 40 MHz, 2.4 GHz, R3-C



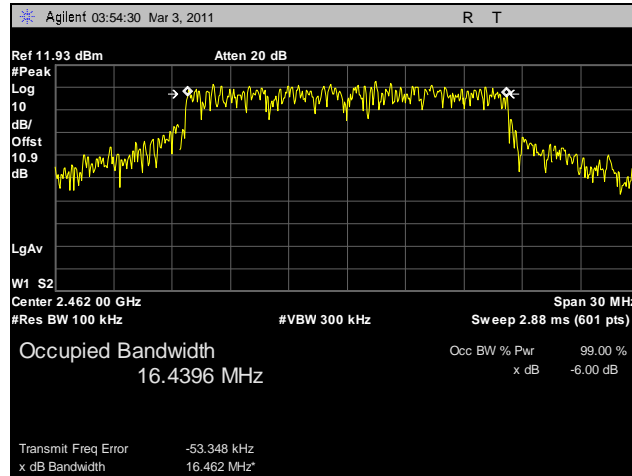
Plot 33. 6dB Occupied Bandwidth, High Channel, 802.11b, 2.4 GHz, R3-A



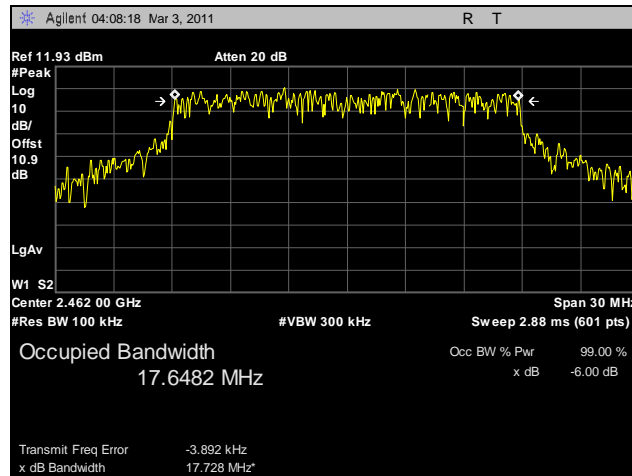
Plot 34. 6dB Occupied Bandwidth, High Channel, 802.11b, 2.4 GHz, R3-B



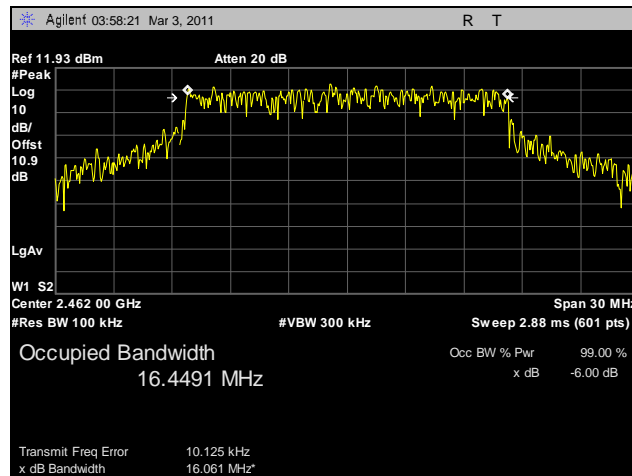
Plot 35. 6dB Occupied Bandwidth, High Channel, 802.11b, 2.4 GHz, R3-C



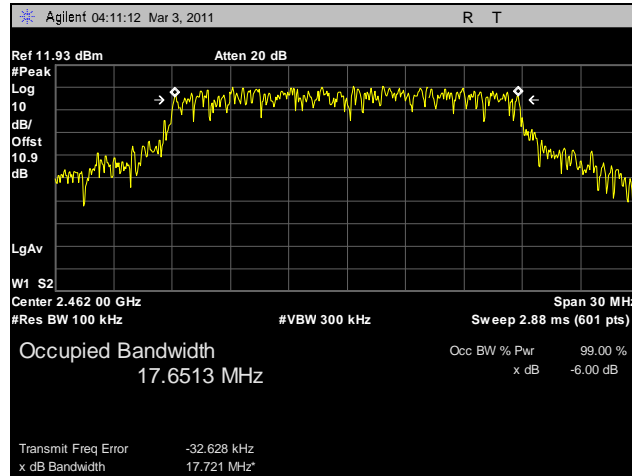
Plot 36. 6dB Occupied Bandwidth, High Channel, 802.11g, 2.4 GHz, R3-A



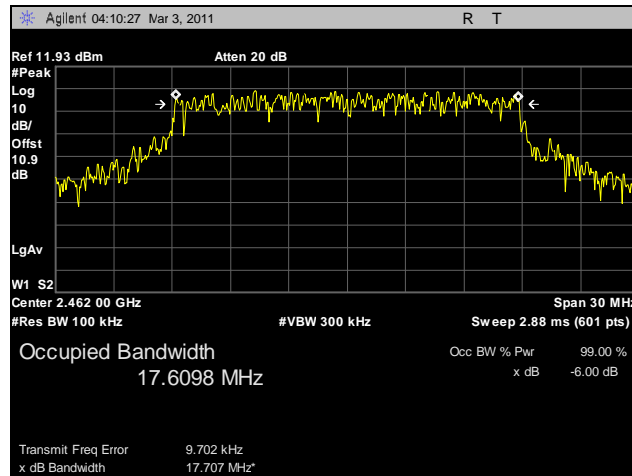
Plot 37. 6dB Occupied Bandwidth, High Channel, 802.11g, 2.4 GHz, R3-B



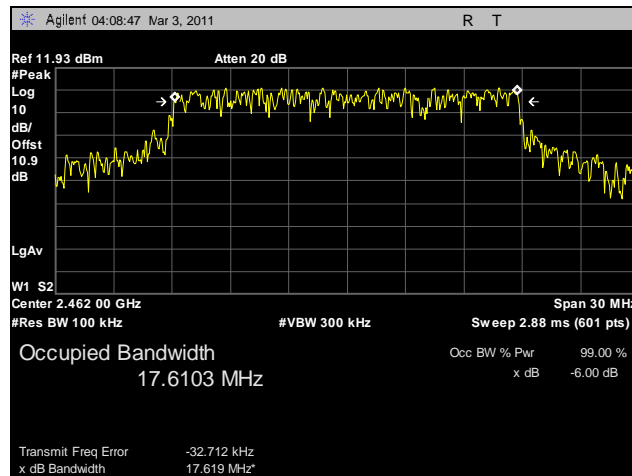
Plot 38. 6dB Occupied Bandwidth, High Channel, 802.11g, 2.4 GHz, R3-C



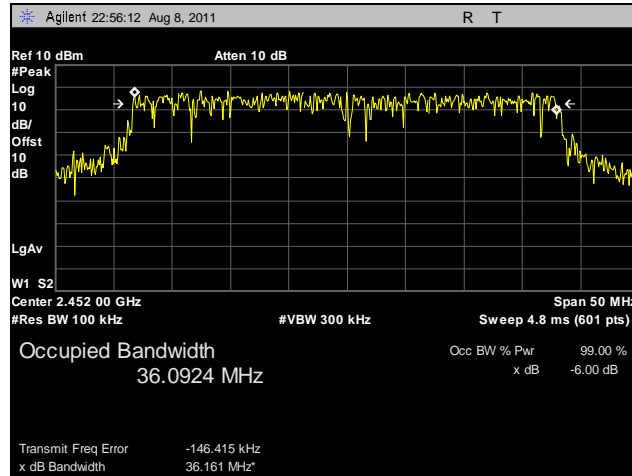
Plot 39. 6dB Occupied Bandwidth, High Channel, 802.11g 20 MHz, 2.4 GHz, R3-A



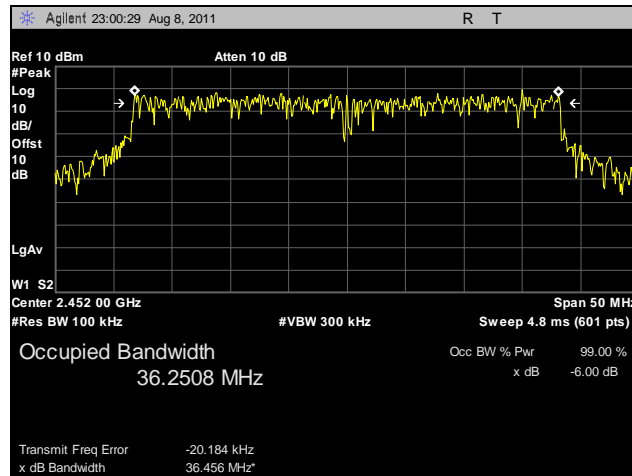
Plot 40. 6dB Occupied Bandwidth, High Channel, 802.11g 20 MHz, 2.4 GHz, R3-B



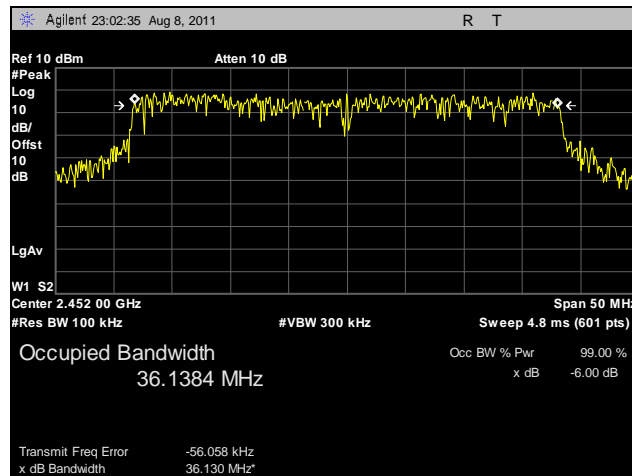
Plot 41. 6dB Occupied Bandwidth, High Channel, 802.11g 20 MHz, 2.4 GHz, R3-C



Plot 42. 6dB Occupied Bandwidth, High Channel, 802.11g 40 MHz, 2.4 GHz, R3-A

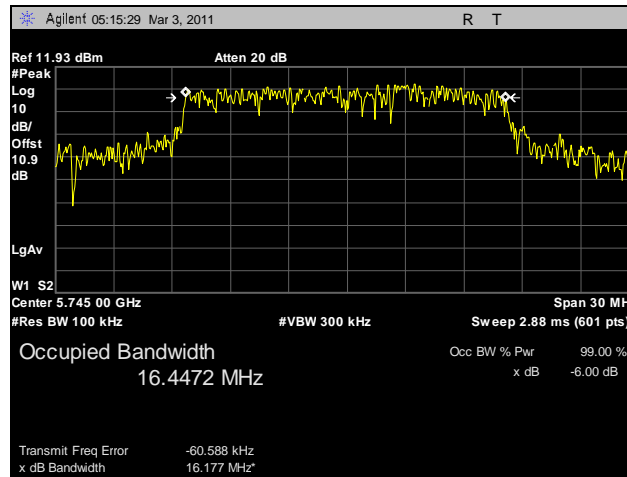


Plot 43. 6dB Occupied Bandwidth, High Channel, 802.11g 40 MHz, 2.4 GHz, R3-B

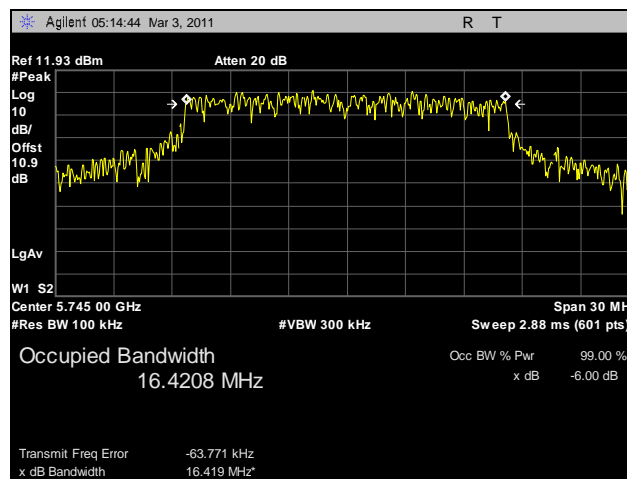


Plot 44. 6dB Occupied Bandwidth, High Channel, 802.11g 40 MHz, 2.4 GHz, R3-C

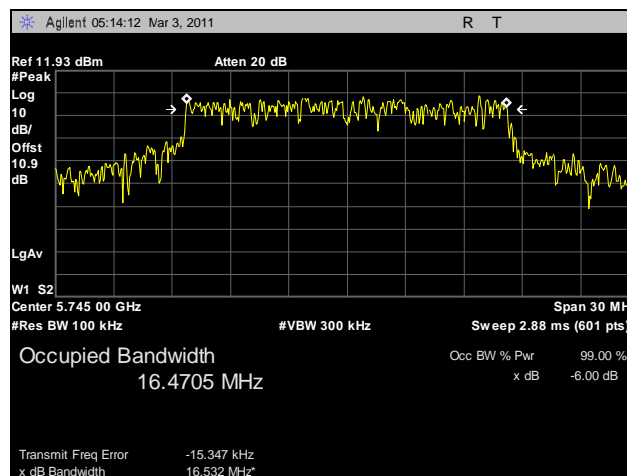
6 dB Occupied Bandwidth Test Results, 5.8 GHz



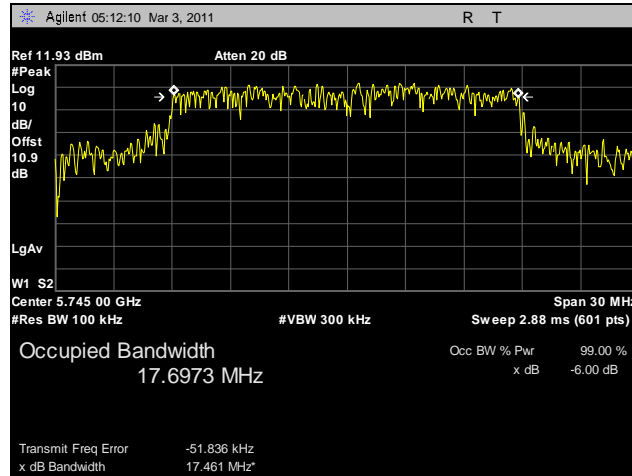
Plot 45. 6dB Occupied Bandwidth, Low Channel, 802.11a, 5.8 GHz, R3-A



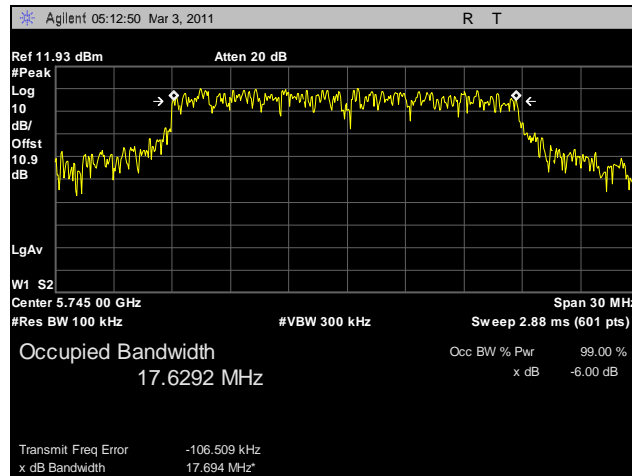
Plot 46. 6dB Occupied Bandwidth, Low Channel, 802.11a, 5.8 GHz, R3-B



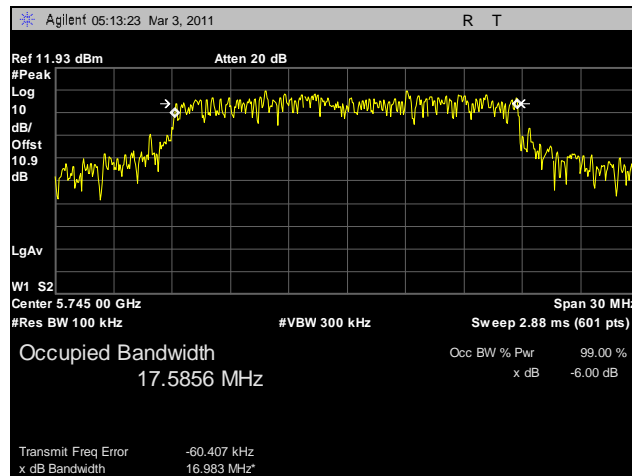
Plot 47. 6dB Occupied Bandwidth, Low Channel, 802.11a, 5.8 GHz, R3-C



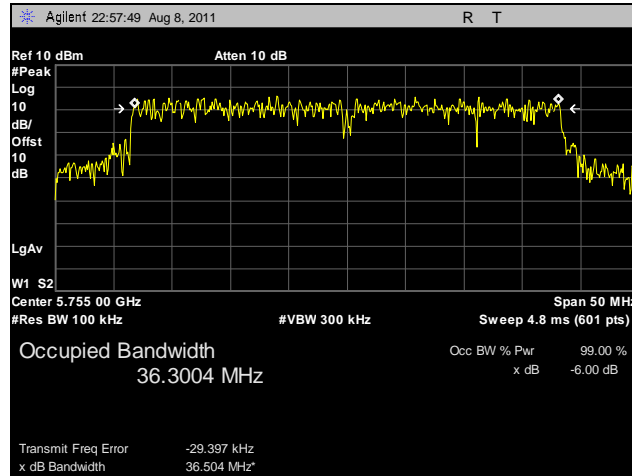
Plot 48. 6dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz, 5.8 GHz, R3-A



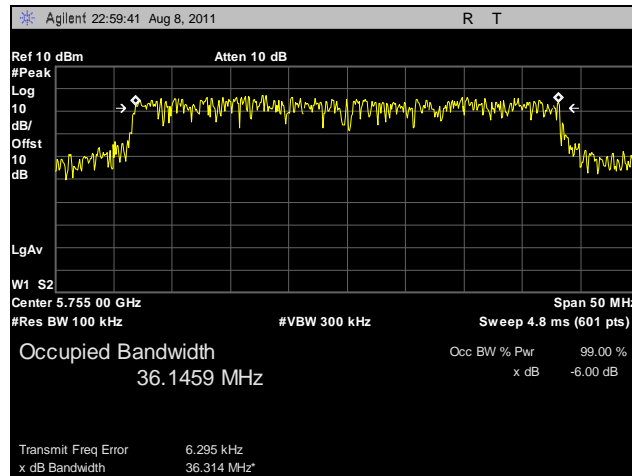
Plot 49. 6dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz, 5.8 GHz, R3-B



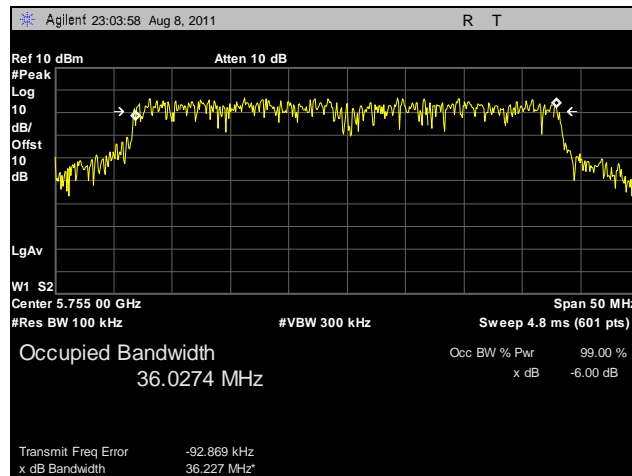
Plot 50. 6dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz, 5.8 GHz, R3-C



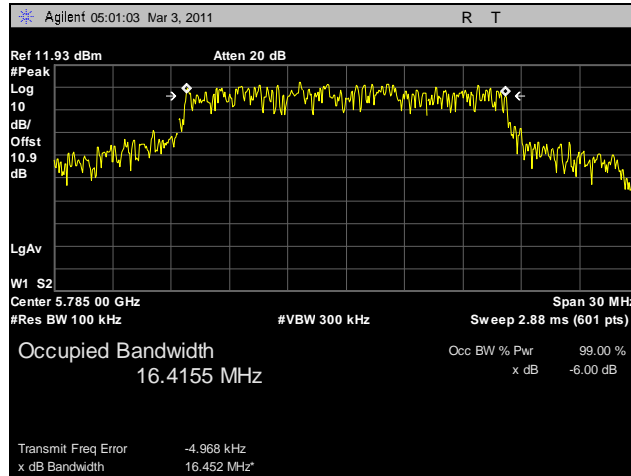
Plot 51. 6dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz, 5.8 GHz, R3-A



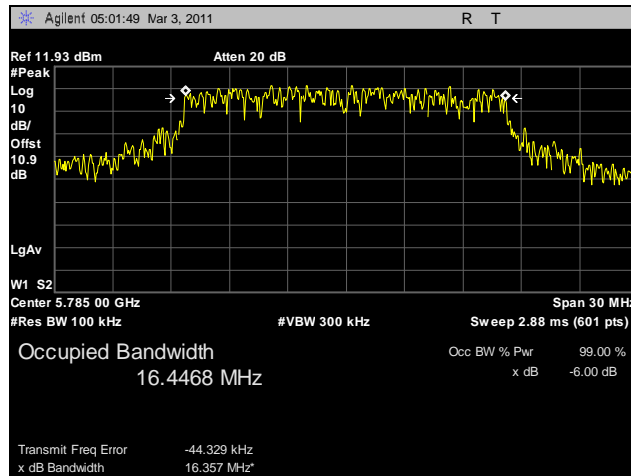
Plot 52. 6dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz, 5.8 GHz, R3-B



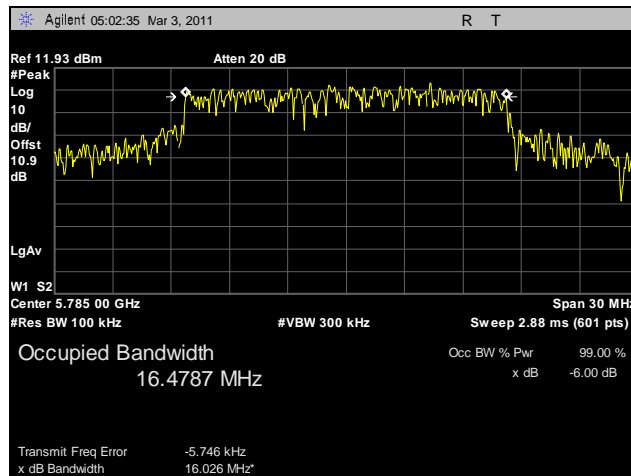
Plot 53. 6dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz, 5.8 GHz, R3-C



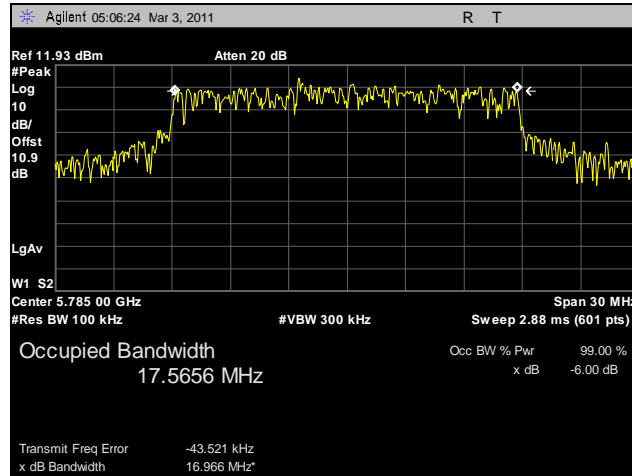
Plot 54. 6dB Occupied Bandwidth, Mid Channel, 802.11a, 5.8 GHz, R3-A



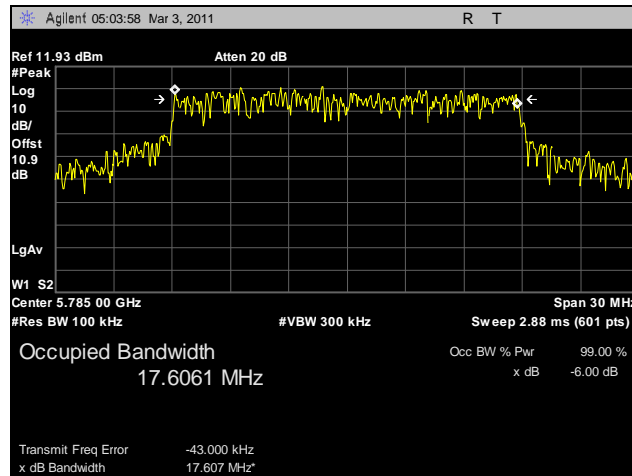
Plot 55. 6dB Occupied Bandwidth, Mid Channel, 802.11a, 5.8 GHz, R3-B



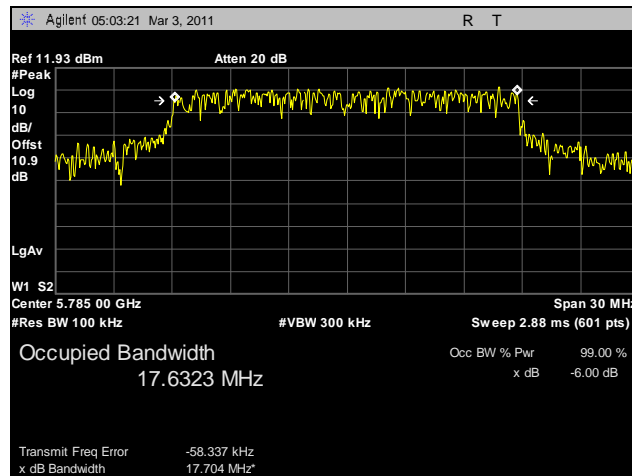
Plot 56. 6dB Occupied Bandwidth, Mid Channel, 802.11a, 5.8 GHz, R3-C



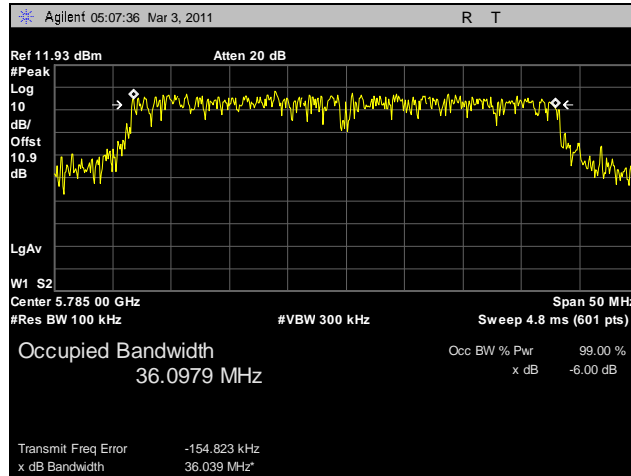
Plot 57. 6dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, 5.8 GHz, R3-A



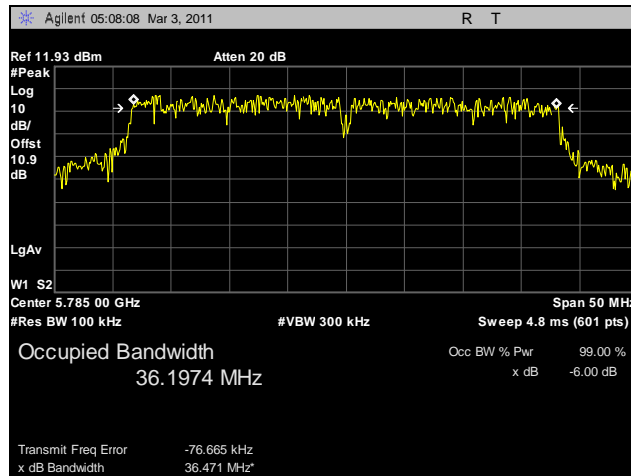
Plot 58. 6dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, 5.8 GHz, R3-B



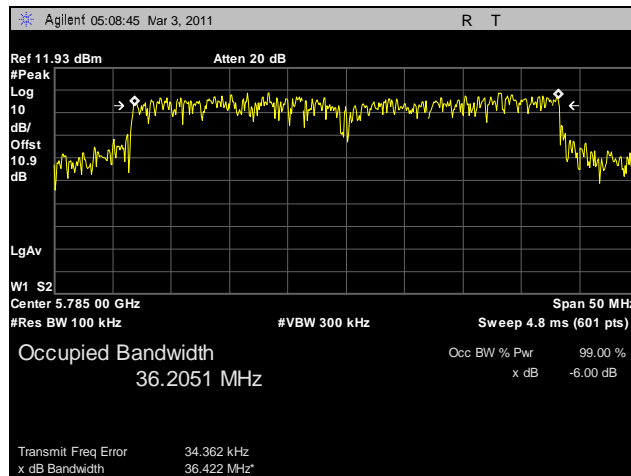
Plot 59. 6dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, 5.8 GHz, R3-C



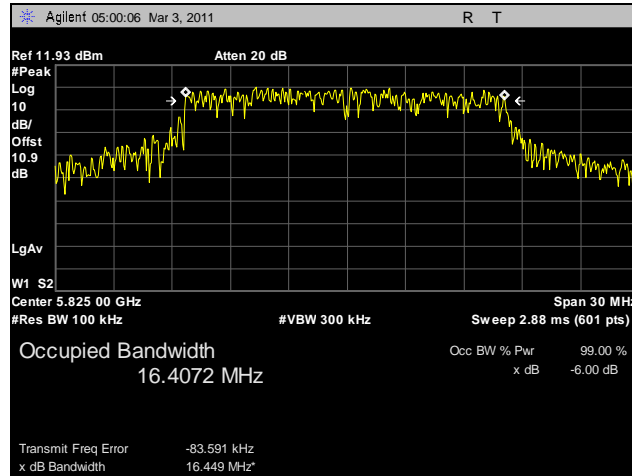
Plot 60. 6dB Occupied Bandwidth, Mid Channel, 802.11n 40 MHz, 5.8 GHz, R3-A



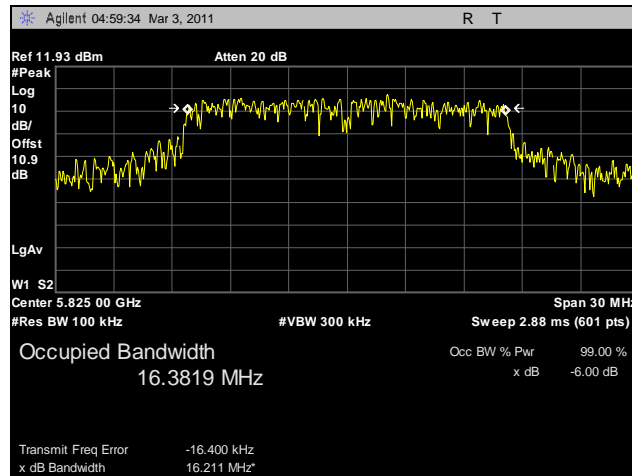
Plot 61. 6dB Occupied Bandwidth, Mid Channel, 802.11n 40 MHz, 5.8 GHz, R3-B



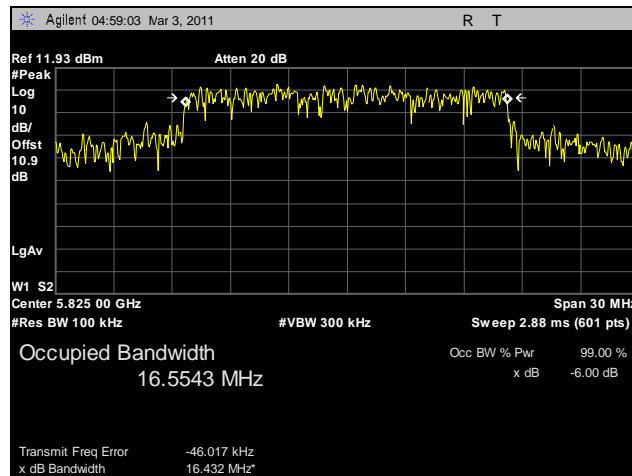
Plot 62. 6dB Occupied Bandwidth, Mid Channel, 802.11n 40 MHz, 5.8 GHz, R3-C



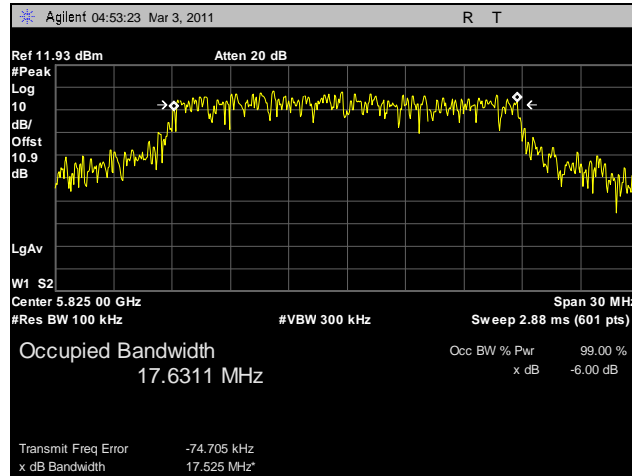
Plot 63. 6dB Occupied Bandwidth, High Channel, 802.11a, 5.8 GHz, R3-A



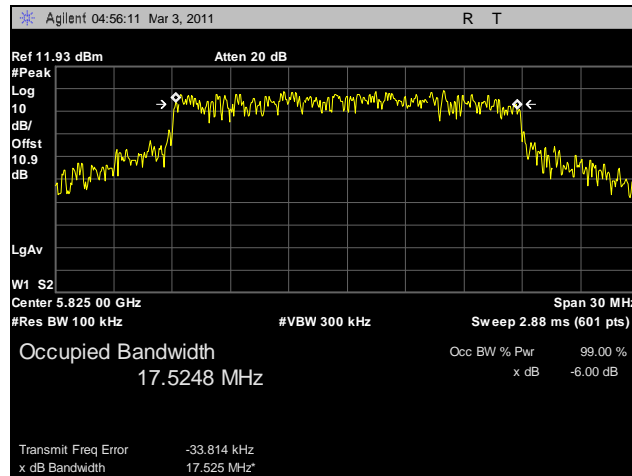
Plot 64. 6dB Occupied Bandwidth, High Channel, 802.11a, 5.8 GHz, R3-B



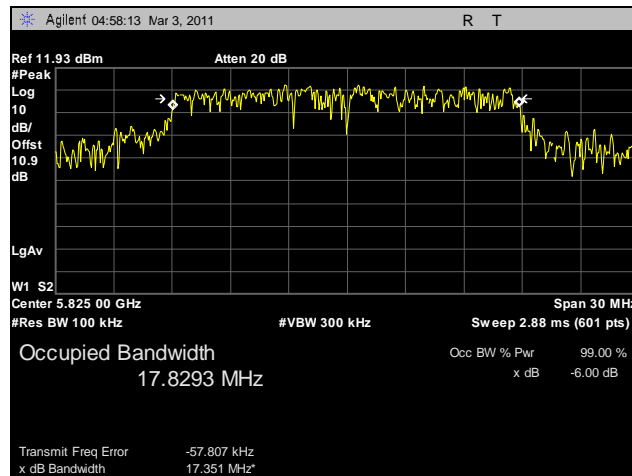
Plot 65. 6dB Occupied Bandwidth, High Channel, 802.11a, 5.8 GHz, R3-C



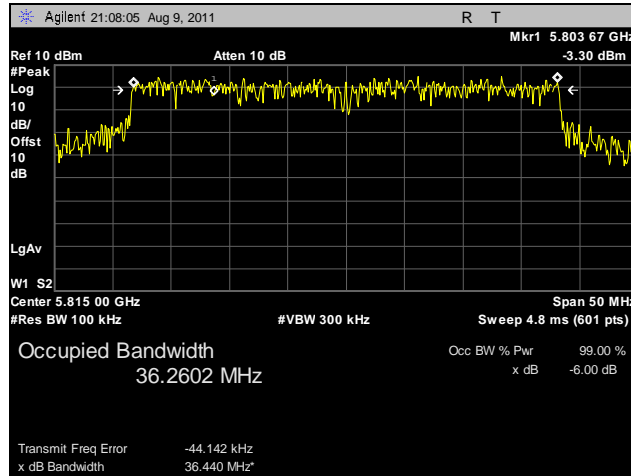
Plot 66. 6dB Occupied Bandwidth, High Channel, 802.11n 20 MHz, 5.8 GHz, R3-A



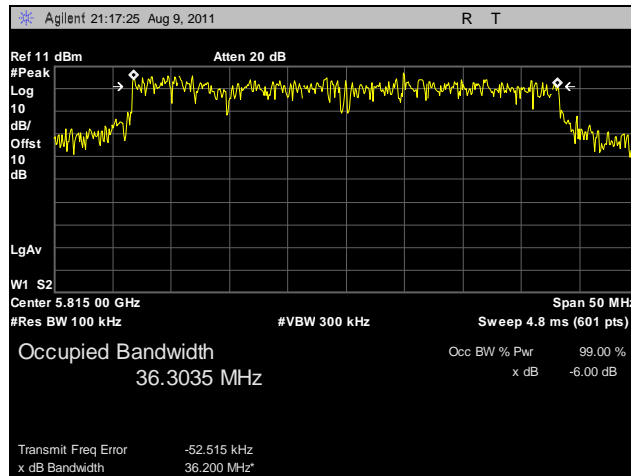
Plot 67. 6dB Occupied Bandwidth, High Channel, 802.11n 20 MHz, 5.8 GHz, R3-B



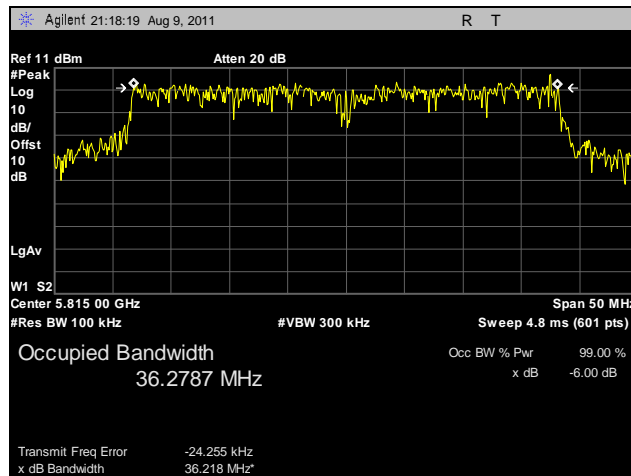
Plot 68. 6dB Occupied Bandwidth, High Channel, 802.11n 20 MHz, 5.8 GHz, R3-C



Plot 69. 6dB Occupied Bandwidth, High Channel, 802.11n 40 MHz, 5.8 GHz, R3-A

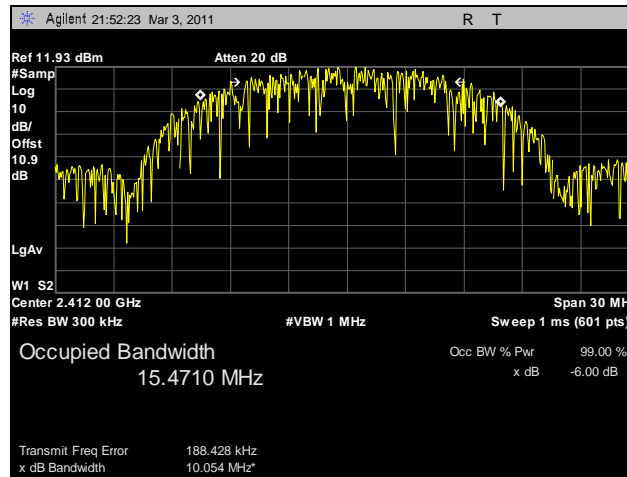


Plot 70. 6dB Occupied Bandwidth, High Channel, 802.11n 40 MHz, 5.8 GHz, R3-B

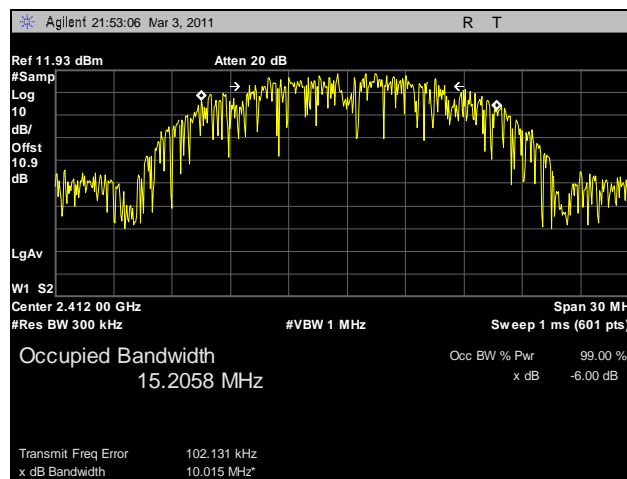


Plot 71. 6dB Occupied Bandwidth, High Channel, 802.11n 40 MHz, 5.8 GHz, R3-C

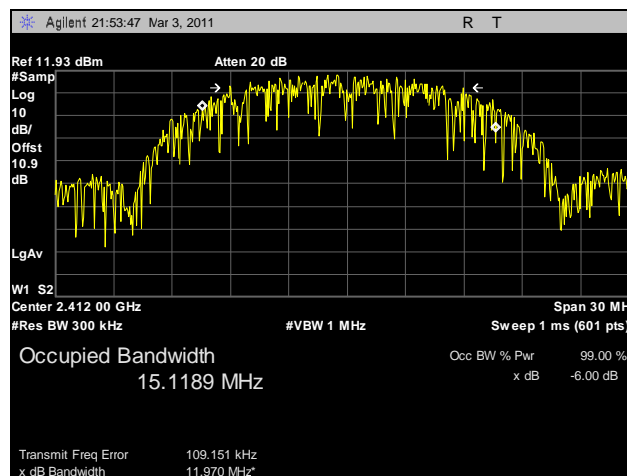
99% Occupied Bandwidth Test Results, 2.4 GHz



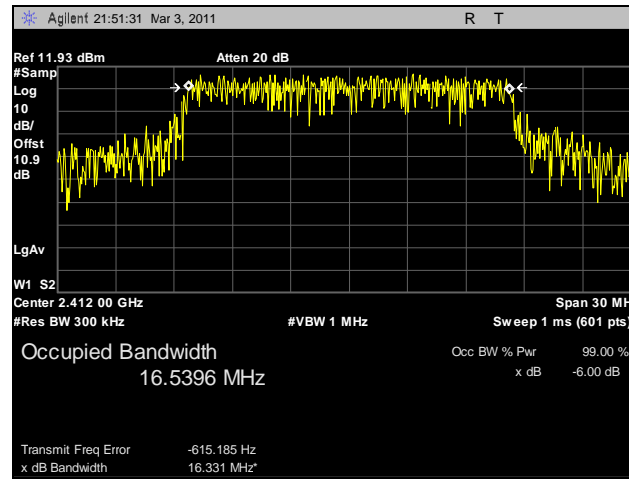
Plot 72. 99% Occupied Bandwidth, Low Channel, 802.11b, 2.4 GHz, R3-A



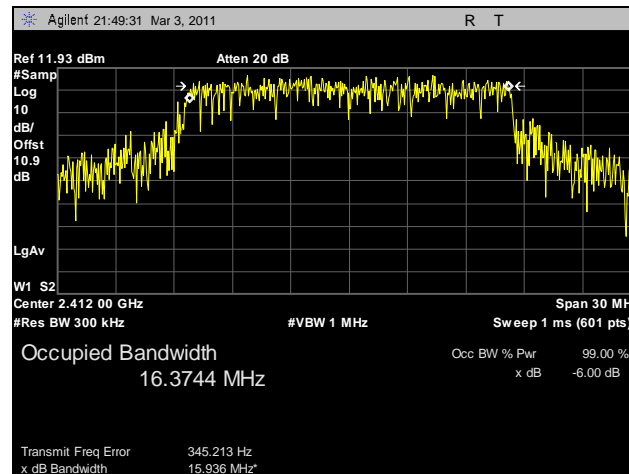
Plot 73. 99% Occupied Bandwidth, Low Channel, 802.11b, 2.4 GHz, R3-B



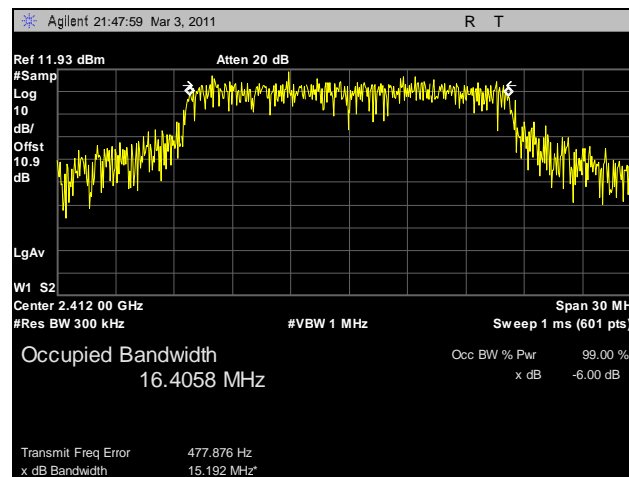
Plot 74. 99% Occupied Bandwidth, Low Channel, 802.11b, 2.4 GHz, R3-C



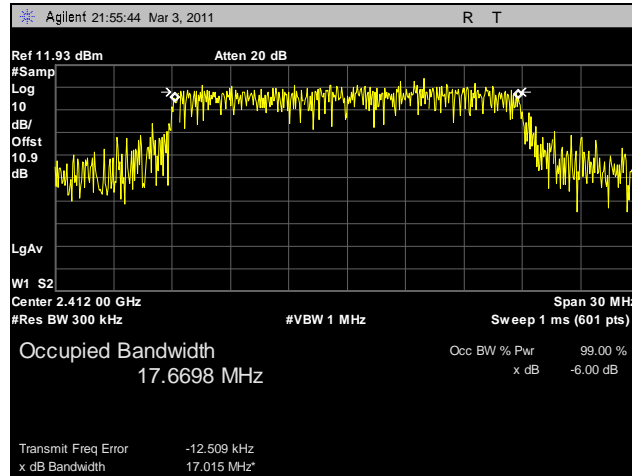
Plot 75. 99% Occupied Bandwidth, Low Channel, 802.11g, 2.4 GHz, R3-A



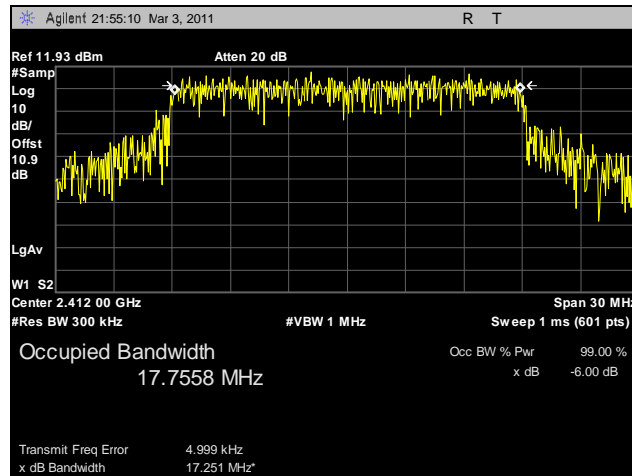
Plot 76. 99% Occupied Bandwidth, Low Channel, 802.11g, 2.4 GHz, R3-B



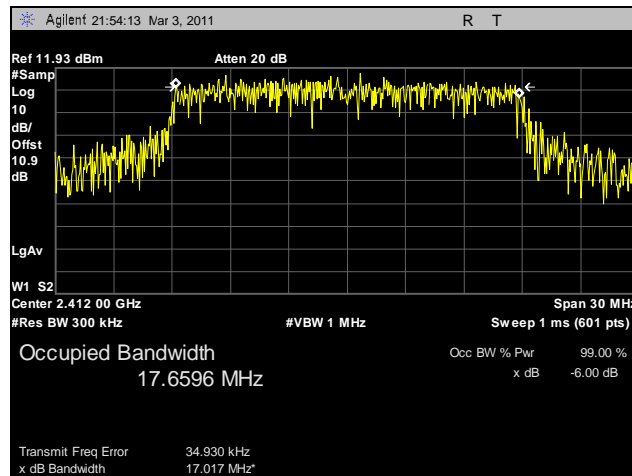
Plot 77. 99% Occupied Bandwidth, Low Channel, 802.11g, 2.4 GHz, R3-C



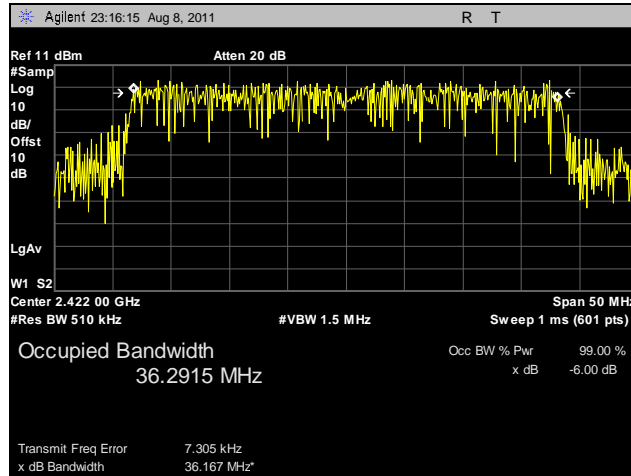
Plot 78. 99% Occupied Bandwidth, Low Channel, 802.11g 20 MHz, 2.4 GHz, R3-A



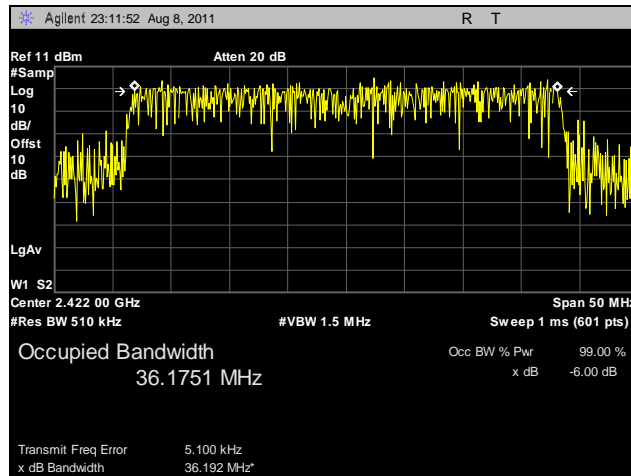
Plot 79. 99% Occupied Bandwidth, Low Channel, 802.11g 20 MHz, 2.4 GHz, R3-B



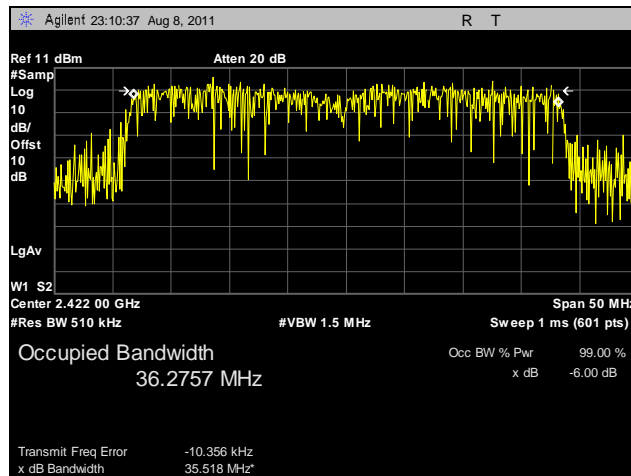
Plot 80. 99% Occupied Bandwidth, Low Channel, 802.11g 20 MHz, 2.4 GHz, R3-C



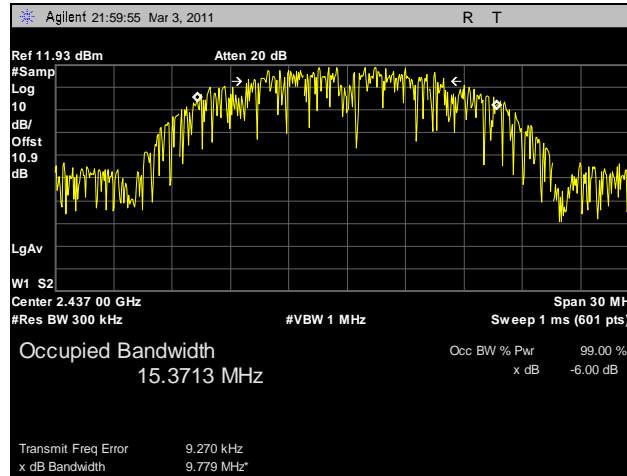
Plot 81. 99% Occupied Bandwidth, Low Channel, 802.11g 40 MHz, 2.4 GHz, R3-A



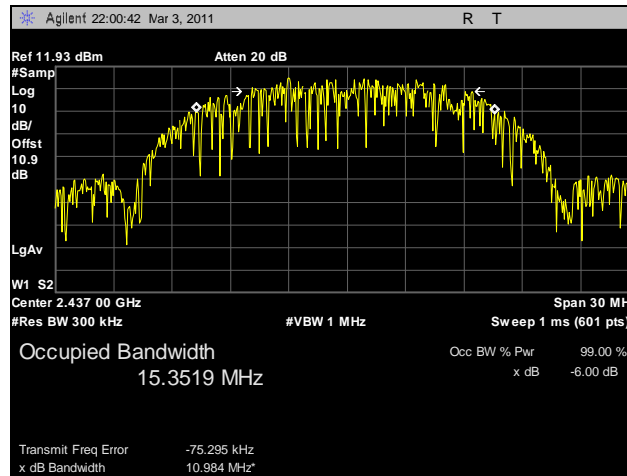
Plot 82. 99% Occupied Bandwidth, Low Channel, 802.11g 40 MHz, 2.4 GHz, R3-B



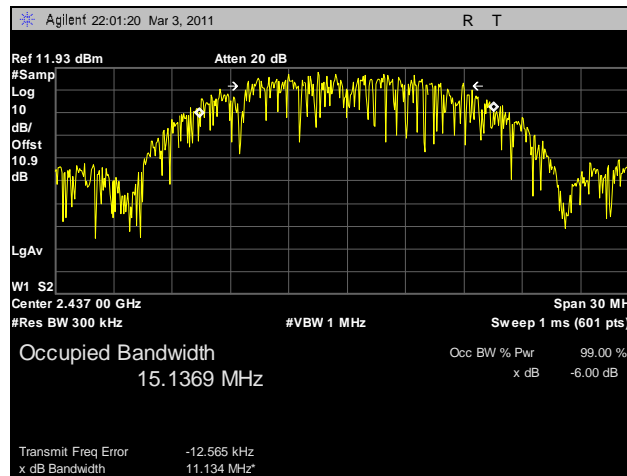
Plot 83. 99% Occupied Bandwidth, Low Channel, 802.11g 40 MHz, 2.4 GHz, R3-C



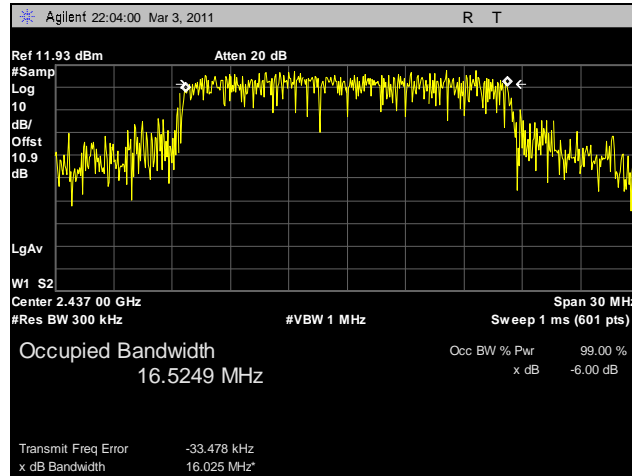
Plot 84. 99% Occupied Bandwidth, Mid Channel, 802.11b, 2.4 GHz, R3-A



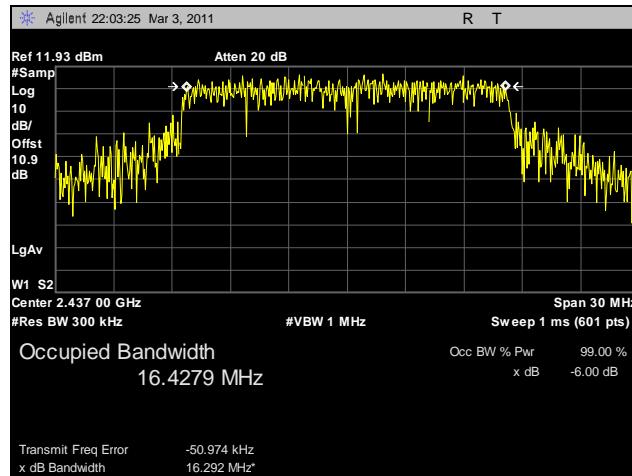
Plot 85. 99% Occupied Bandwidth, Mid Channel, 802.11b, 2.4 GHz, R3-B



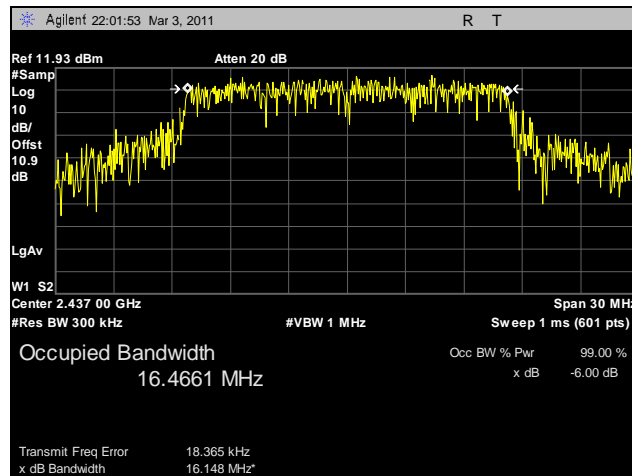
Plot 86. 99% Occupied Bandwidth, Mid Channel, 802.11b, 2.4 GHz, R3-C



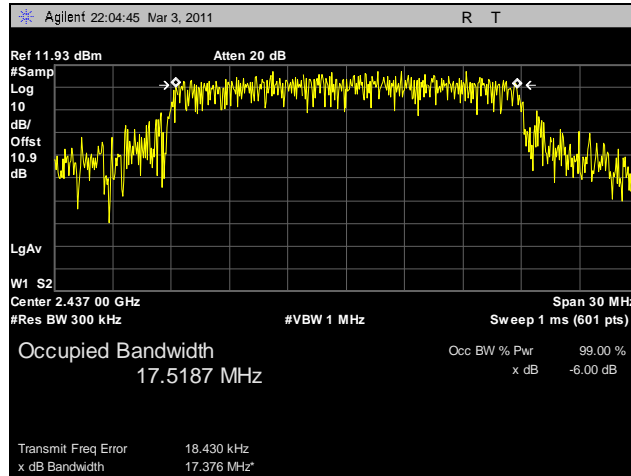
Plot 87. 99% Occupied Bandwidth, Mid Channel, 802.11g, 2.4 GHz, R3-A



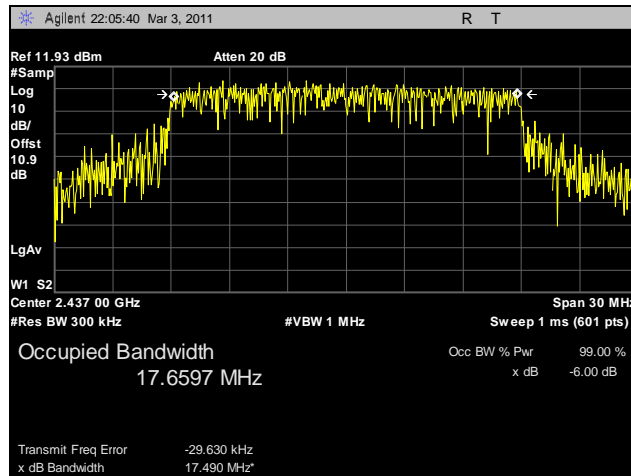
Plot 88. 99% Occupied Bandwidth, Mid Channel, 802.11g, 2.4 GHz, R3-B



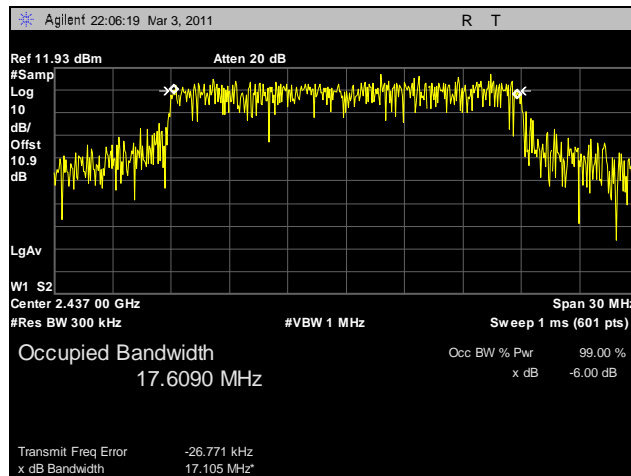
Plot 89. 99% Occupied Bandwidth, Mid Channel, 802.11g, 2.4 GHz, R3-C



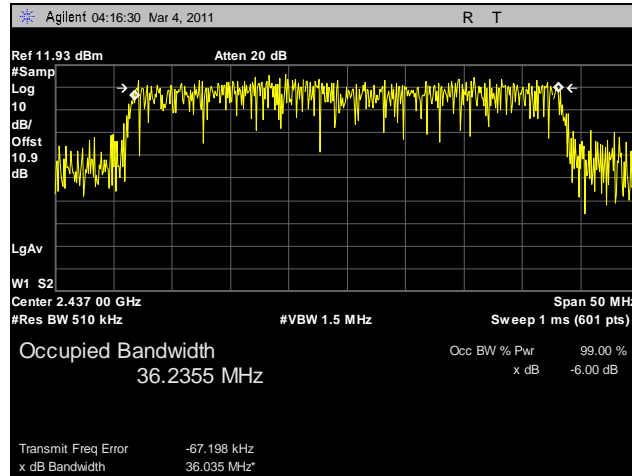
Plot 90. 99% Occupied Bandwidth, Mid Channel, 802.11g 20 MHz, 2.4 GHz, R3-A



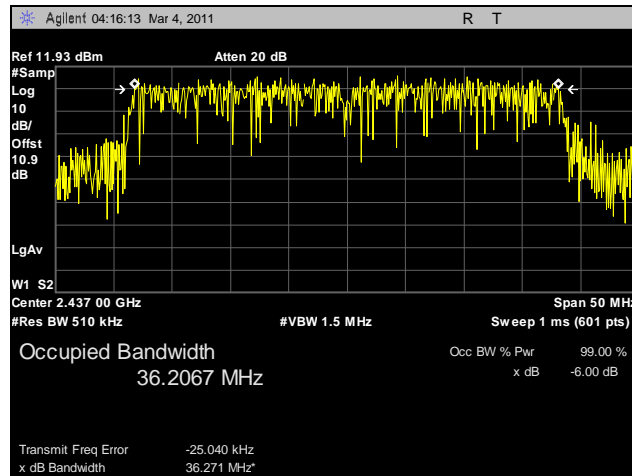
Plot 91. 99% Occupied Bandwidth, Mid Channel, 802.11g 20 MHz, 2.4 GHz, R3-B



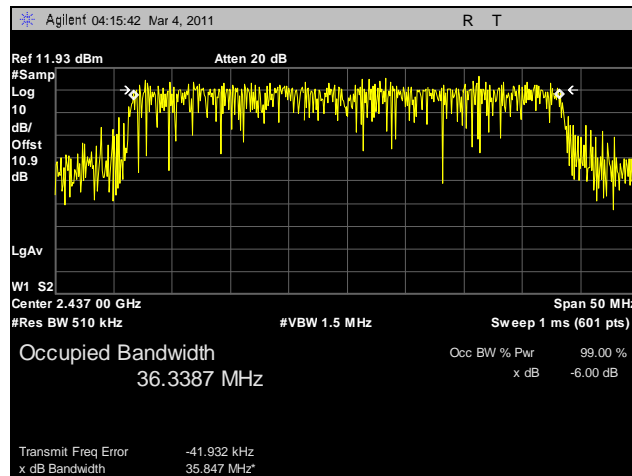
Plot 92. 99% Occupied Bandwidth, Mid Channel, 802.11g 20 MHz, 2.4 GHz, R3-C



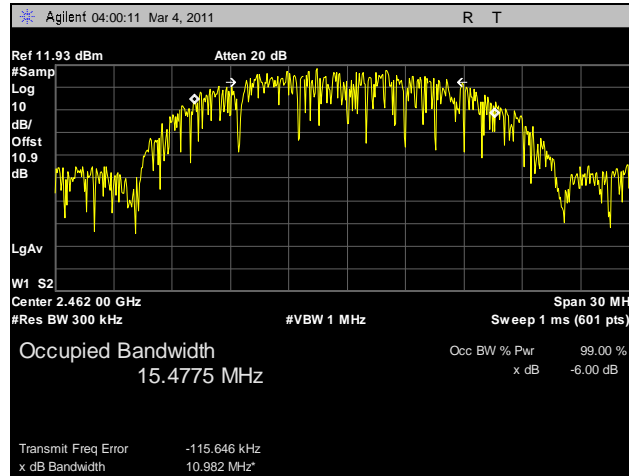
Plot 93. 99% Occupied Bandwidth, Mid Channel, 802.11g 40 MHz, 2.4 GHz, R3-A



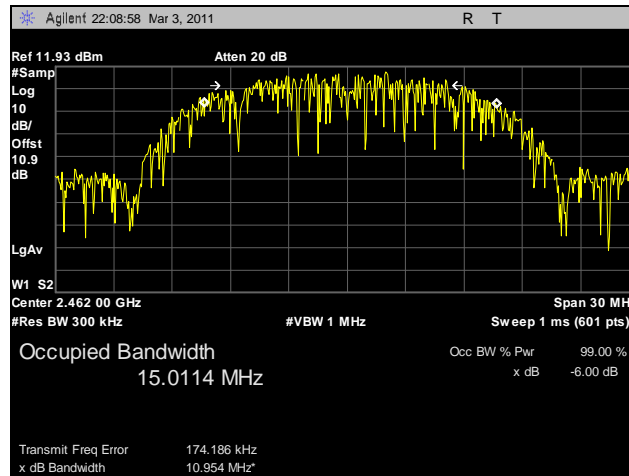
Plot 94. 99% Occupied Bandwidth, Mid Channel, 802.11g 40 MHz, 2.4 GHz, R3-B



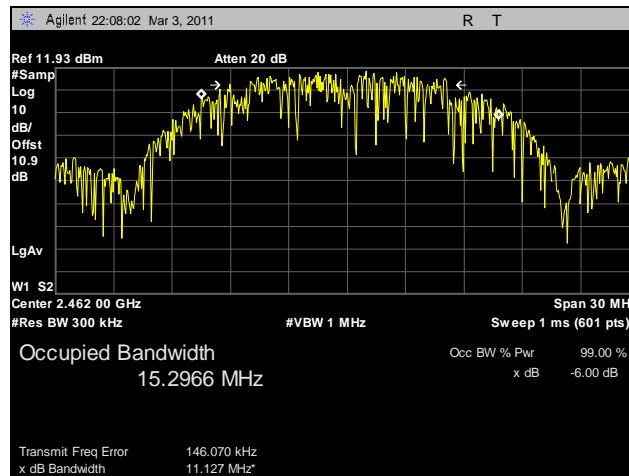
Plot 95. 99% Occupied Bandwidth, Mid Channel, 802.11g 40 MHz, 2.4 GHz, R3-C



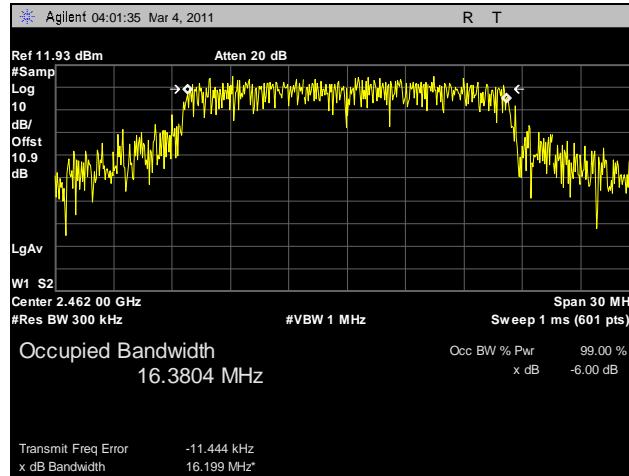
Plot 96. 99% Occupied Bandwidth, High Channel, 802.11b, 2.4 GHz, R3-A



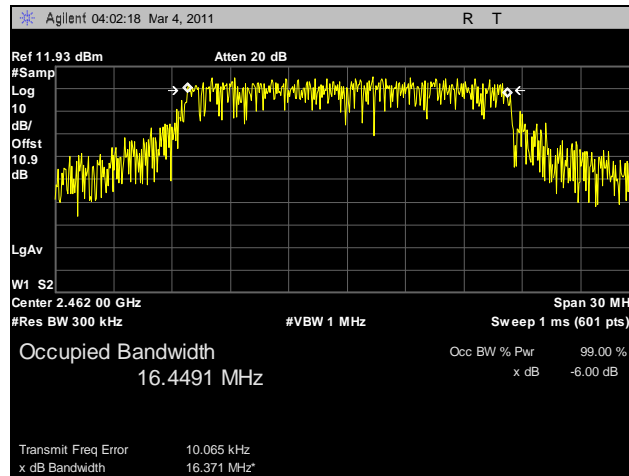
Plot 97. 99% Occupied Bandwidth, High Channel, 802.11b, 2.4 GHz, R3-B



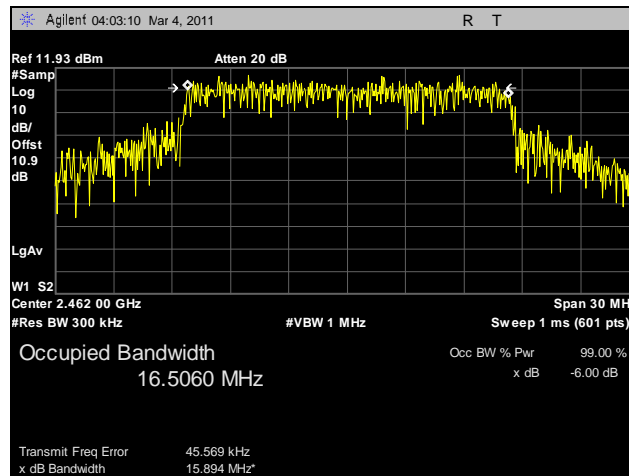
Plot 98. 99% Occupied Bandwidth, High Channel, 802.11b, 2.4 GHz, R3-C



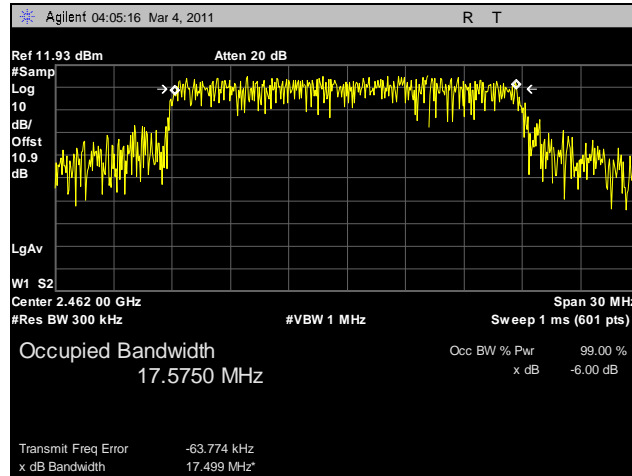
Plot 99. 99% Occupied Bandwidth, High Channel, 802.11g, 2.4 GHz, R3-A



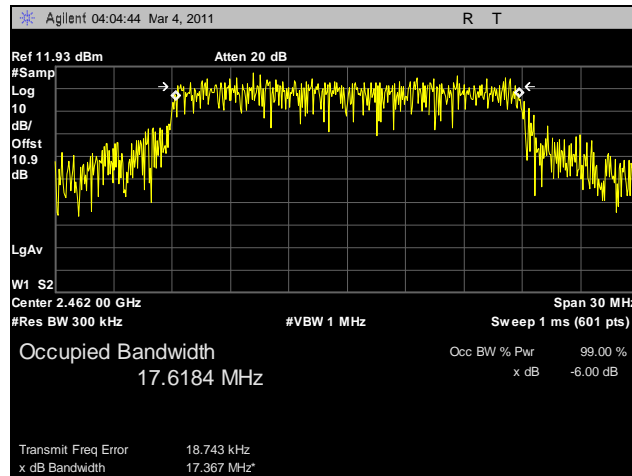
Plot 100. 99% Occupied Bandwidth, High Channel, 802.11g, 2.4 GHz, R3-B



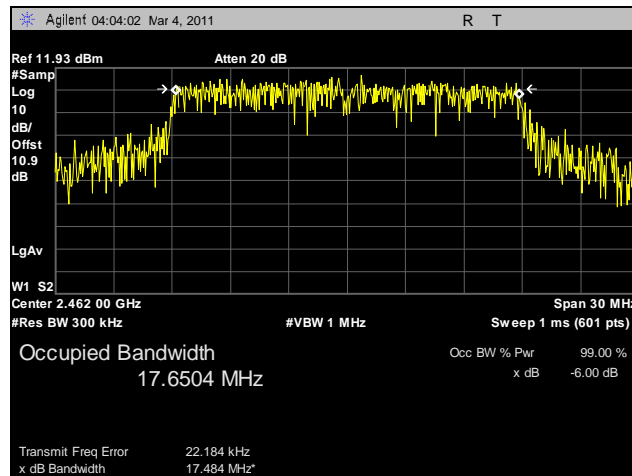
Plot 101. 99% Occupied Bandwidth, High Channel, 802.11g, 2.4 GHz, R3-C



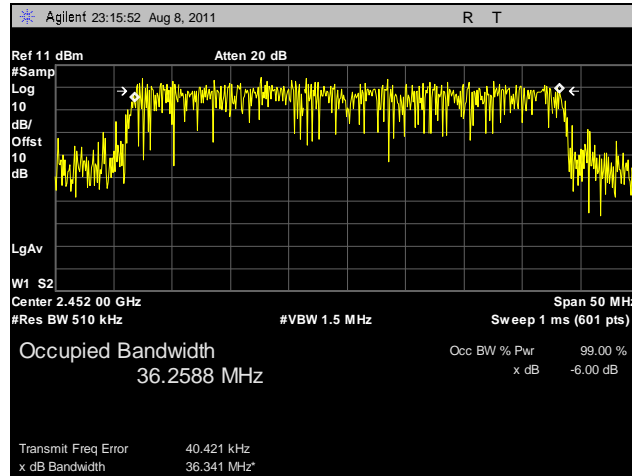
Plot 102. 99% Occupied Bandwidth, High Channel, 802.11g 20 MHz, 2.4 GHz, R3-A



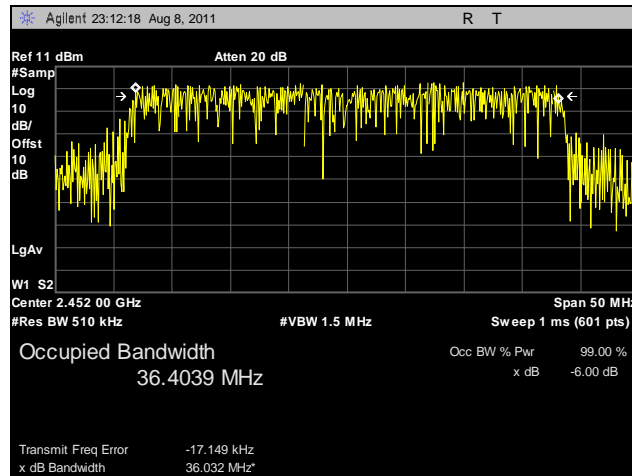
Plot 103. 99% Occupied Bandwidth, High Channel, 802.11g 20 MHz, 2.4 GHz, R3-B



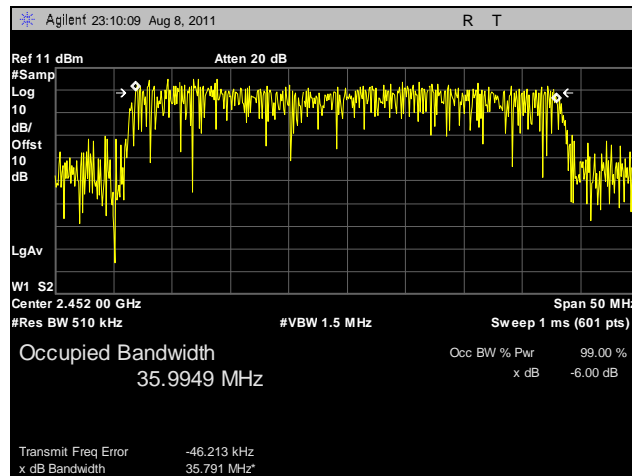
Plot 104. 99% Occupied Bandwidth, High Channel, 802.11g 20 MHz, 2.4 GHz, R3-C



Plot 105. 99% Occupied Bandwidth, High Channel, 802.11g 40 MHz, 2.4 GHz, R3-A

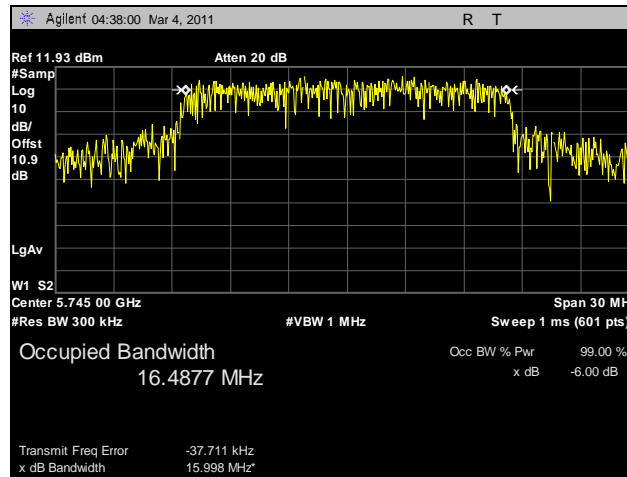


Plot 106. 99% Occupied Bandwidth, High Channel, 802.11g 40 MHz, 2.4 GHz, R3-B

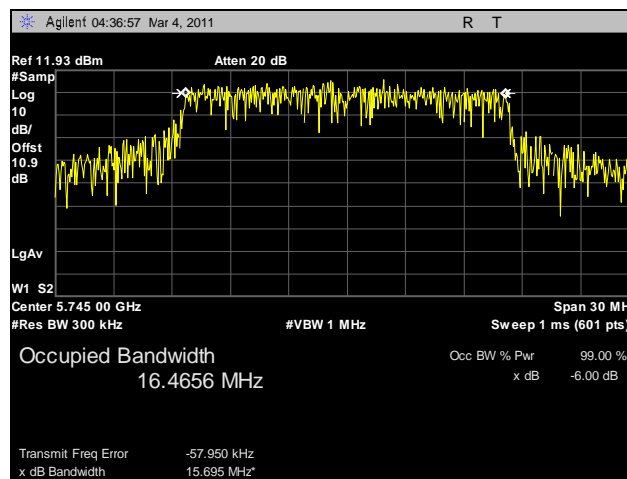


Plot 107. 99% Occupied Bandwidth, High Channel, 802.11g 40 MHz, 2.4 GHz, R3-C

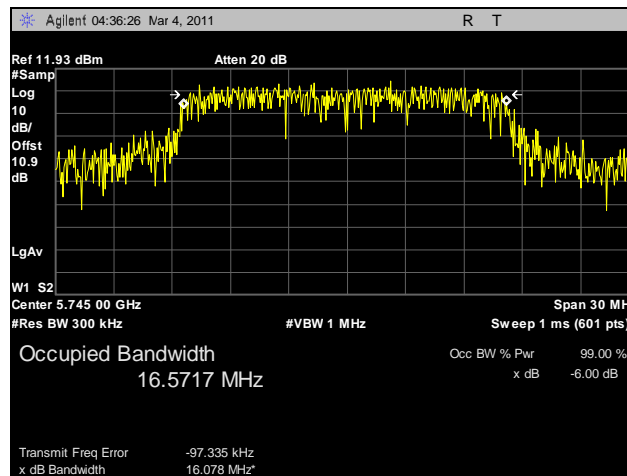
99% Occupied Bandwidth Test Results, 5.8 GHz



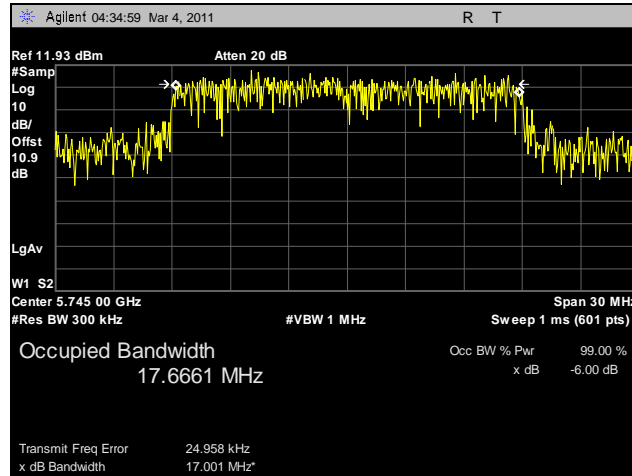
Plot 108. 99% Occupied Bandwidth, Low Channel, 802.11a, 5.8 GHz, R3-A



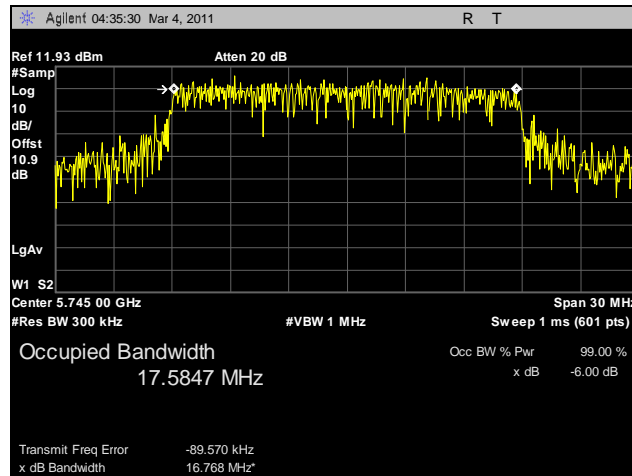
Plot 109. 99% Occupied Bandwidth, Low Channel, 802.11a, 5.8 GHz, R3-B



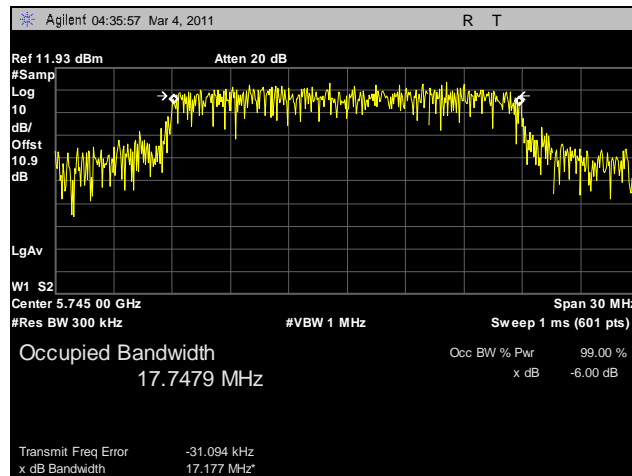
Plot 110. 99% Occupied Bandwidth, Low Channel, 802.11a, 5.8 GHz, R3-C



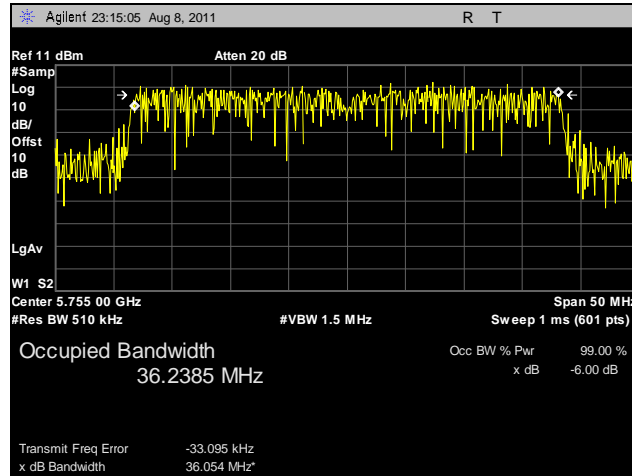
Plot 111. 99% Occupied Bandwidth, Low Channel, 802.11n 20 MHz, 5.8 GHz, R3-A



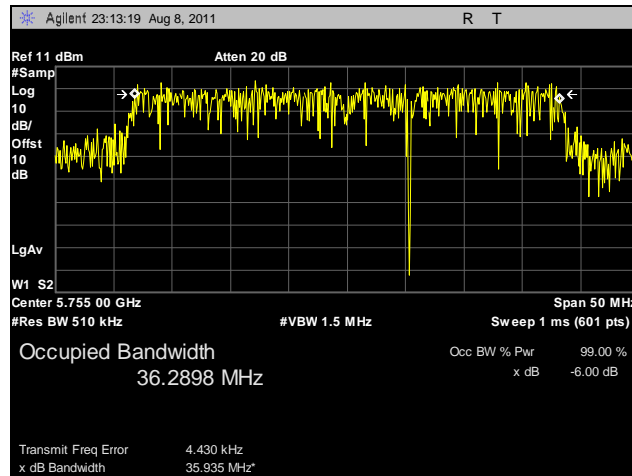
Plot 112. 99% Occupied Bandwidth, Low Channel, 802.11n 20 MHz, 5.8 GHz, R3-B



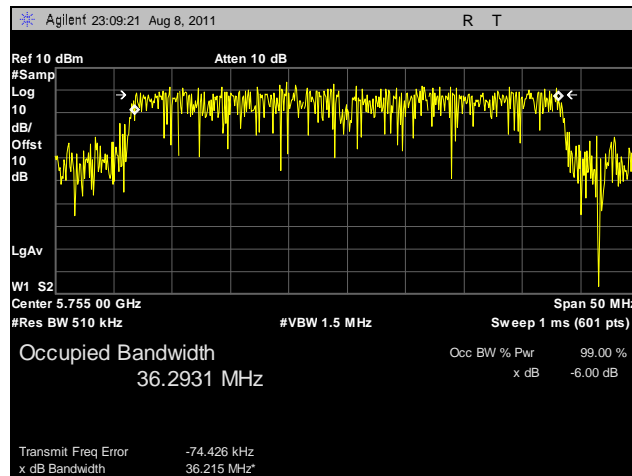
Plot 113. 99% Occupied Bandwidth, Low Channel, 802.11n 20 MHz, 5.8 GHz, R3-C



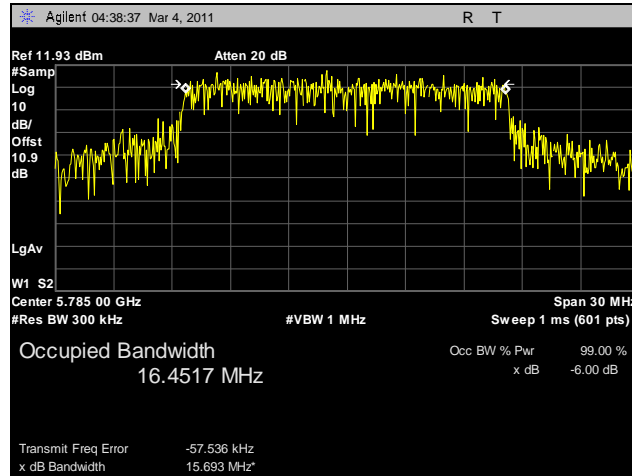
Plot 114. 99% Occupied Bandwidth, Low Channel, 802.11n 40 MHz, 5.8 GHz, R3-A



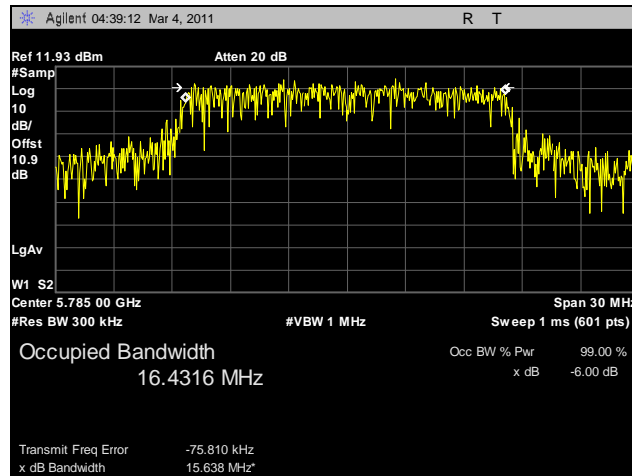
Plot 115. 99% Occupied Bandwidth, Low Channel, 802.11n 40 MHz, 5.8 GHz, R3-B



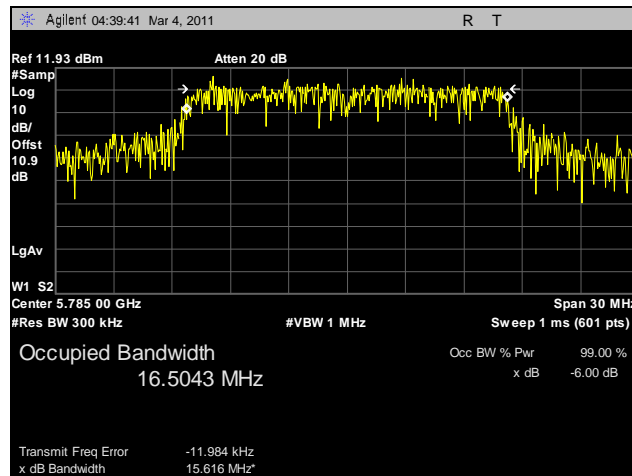
Plot 116. 99% Occupied Bandwidth, Low Channel, 802.11n 40 MHz, 5.8 GHz, R3-C



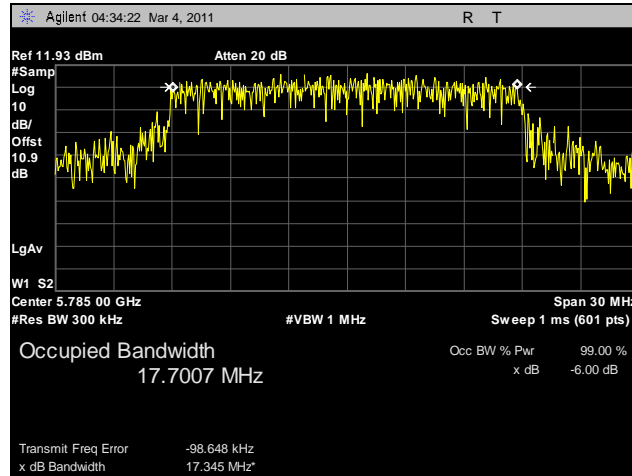
Plot 117. 99% Occupied Bandwidth, Mid Channel, 802.11a, 5.8 GHz, R3-A



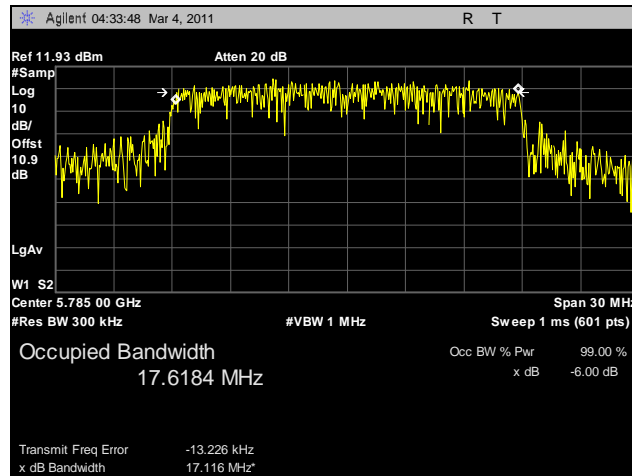
Plot 118. 99% Occupied Bandwidth, Mid Channel, 802.11a, 5.8 GHz, R3-B



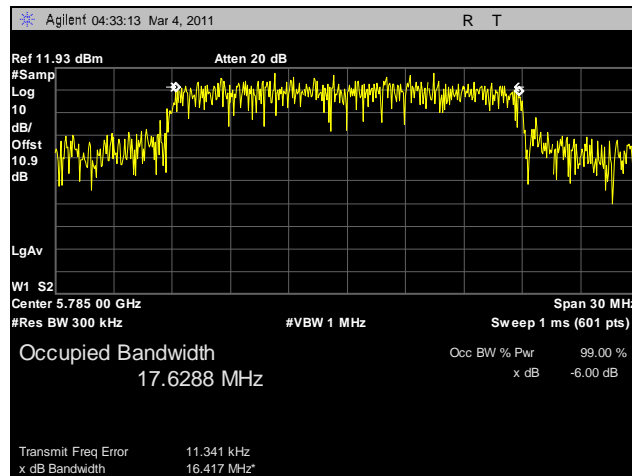
Plot 119. 99% Occupied Bandwidth, Mid Channel, 802.11a, 5.8 GHz, R3-C



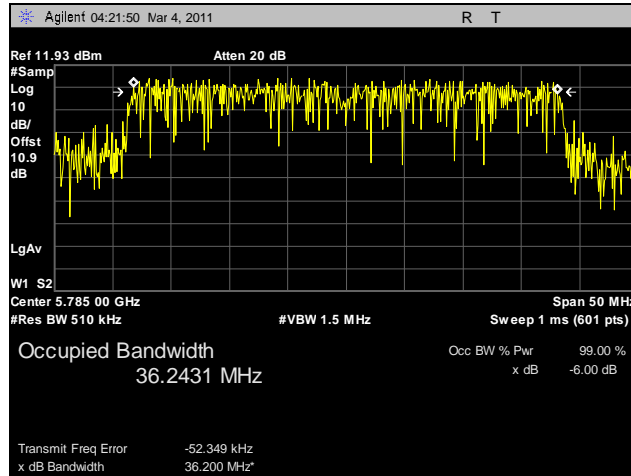
Plot 120. 99% Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, 5.8 GHz, R3-A



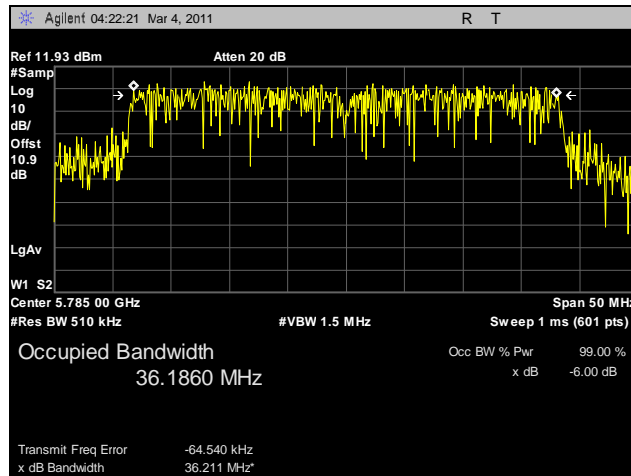
Plot 121. 99% Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, 5.8 GHz, R3-B



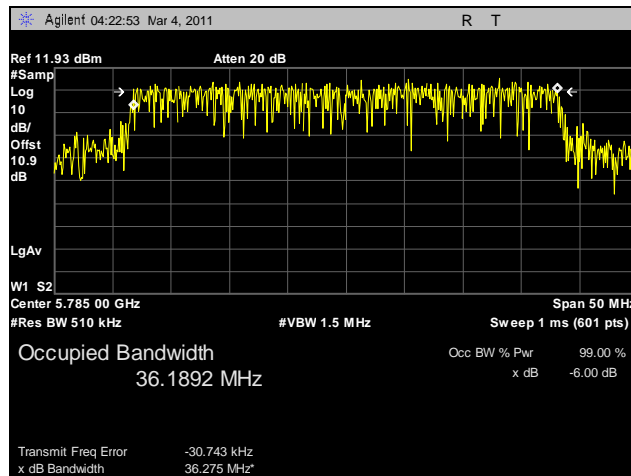
Plot 122. 99% Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, 5.8 GHz, R3-C



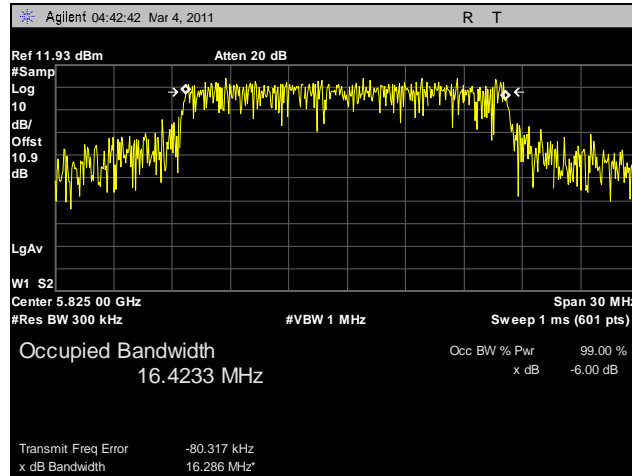
Plot 123. 99% Occupied Bandwidth, Mid Channel, 802.11n 40 MHz, 5.8 GHz, R3-A



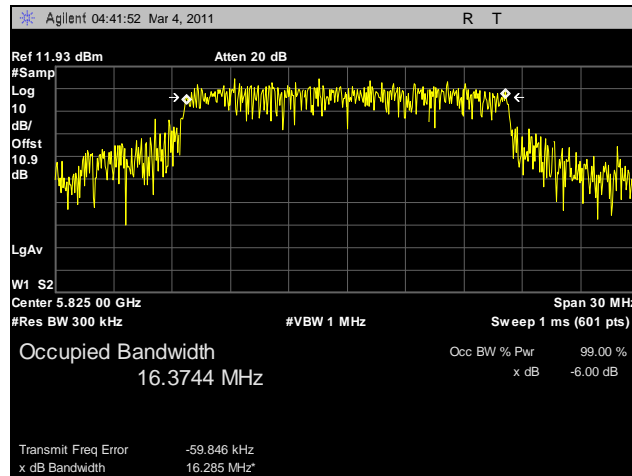
Plot 124. 99% Occupied Bandwidth, Mid Channel, 802.11n 40 MHz, 5.8 GHz, R3-B



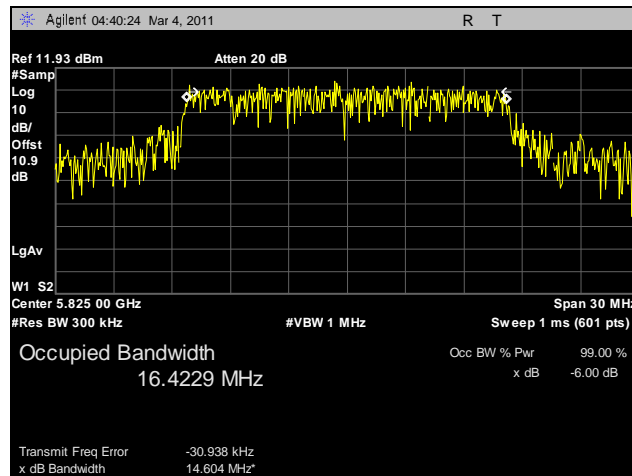
Plot 125. 99% Occupied Bandwidth, Mid Channel, 802.11n 40 MHz, 5.8 GHz, R3-C



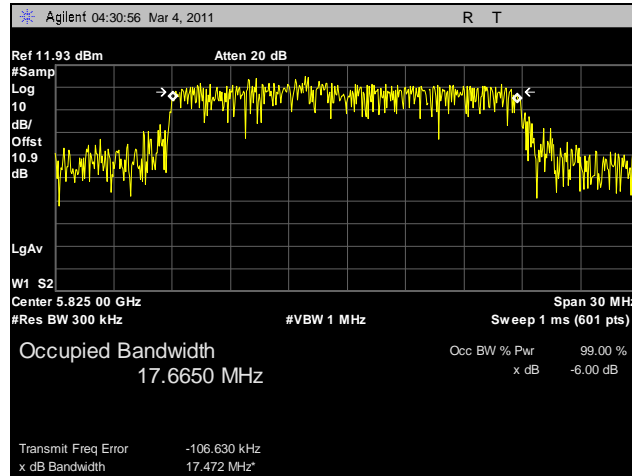
Plot 126. 99% Occupied Bandwidth, High Channel, 802.11a, 5.8 GHz, R3-A



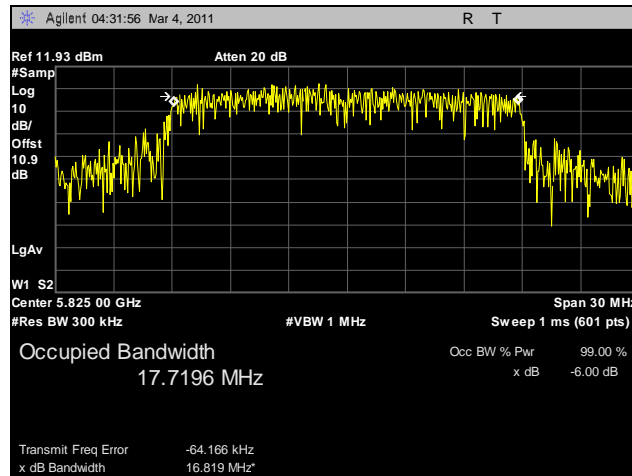
Plot 127. 99% Occupied Bandwidth, High Channel, 802.11a, 5.8 GHz, R3-B



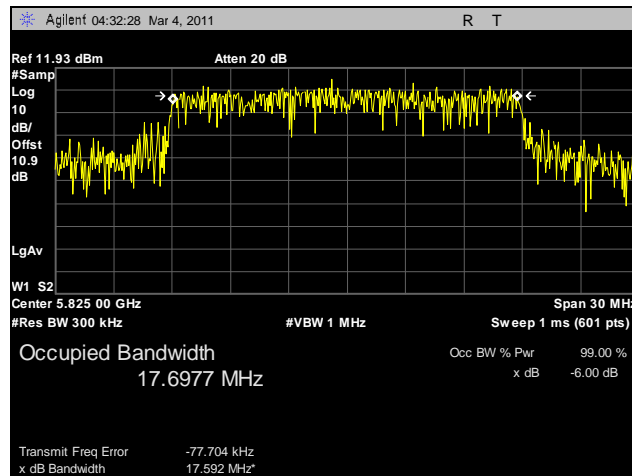
Plot 128. 99% Occupied Bandwidth, High Channel, 802.11a, 5.8 GHz, R3-C



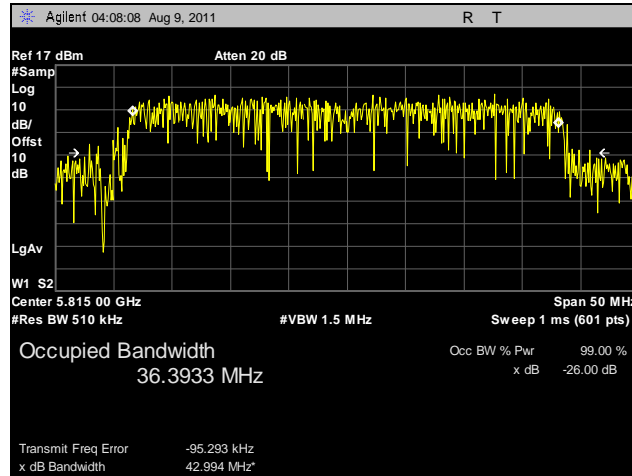
Plot 129. 99% Occupied Bandwidth, High Channel, 802.11n 20 MHz, 5.8 GHz, R3-A



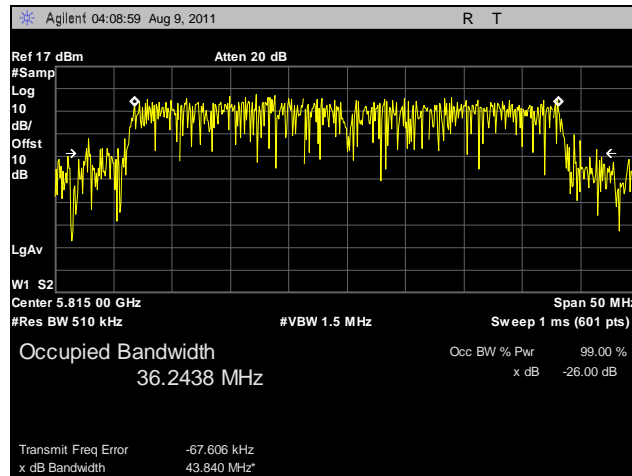
Plot 130. 99% Occupied Bandwidth, High Channel, 802.11n 20 MHz, 5.8 GHz, R3-B



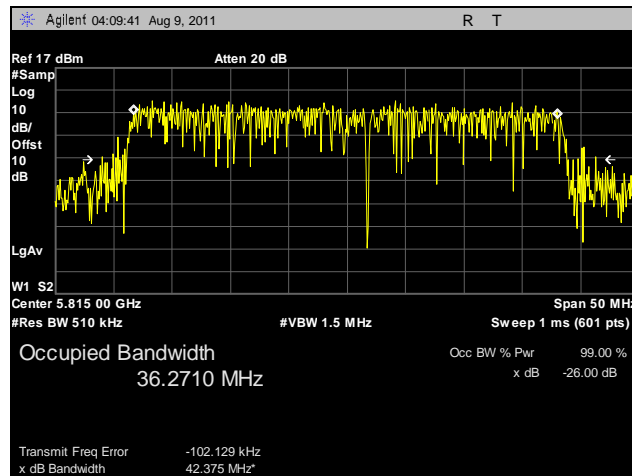
Plot 131. 99% Occupied Bandwidth, High Channel, 802.11n 20 MHz, 5.8 GHz, R3-C



Plot 132. 99% Occupied Bandwidth, High Channel, 802.11n 40 MHz, 5.8 GHz, R3-A



Plot 133. 99% Occupied Bandwidth, High Channel, 802.11n 40 MHz, 5.8 GHz, R3-B



Plot 134. 99% Occupied Bandwidth, High Channel, 802.11n 40 MHz, 5.8 GHz, R3-C

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(b) Peak Power Output

Test Requirements: §15.247(b): The maximum peak output power of the intentional radiator shall not exceed the following:

Digital Transmission Systems (MHz)	Output Limit (Watts)
902-928	1.000
2400-2483.5	1.000
5725- 5850	1.000

Table 23. Output Power Requirements from §15.247(b)

§15.247(c): if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in the Table 23, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400 – 2483.5 MHz band and using a point to point application may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Fixed, point-to-point operation excludes the use of point-to-multipoint systems, Omni-directional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

Test Procedure: The transmitter was connected to a calibrated spectrum analyzer. The EUT was measured at the low, mid and high channels of each band at the maximum power level.

Test Results: The EUT was compliant with the Peak Power Output limits of §15.247(b).

Test Engineer(s): Dan Youngcourt and Jeff Pratt

Test Date(s): 03/31/11

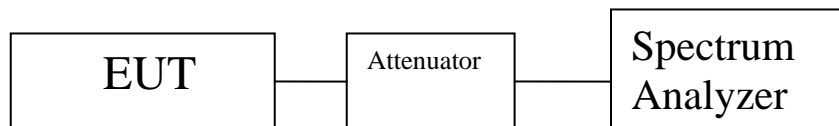


Figure 3. Peak Power Output Test Setup

Peak Power Output Test Results

Frequency (MHz)	Mode / Modulation Type	Port A Conducted Power (dBm)	Port B Conducted Power (dBm)	Port C Conducted Power (dBm)	Summed Conducted Power (mW)	Summed Conducted Power (dBm)	Port A (mW)	Port B (mW)	Port C (mW)
2412	802.11b	13.78	17.92	18.4	155.005317	21.903466	23.87811283	61.94410751	69.18309709
2437	802.11b	15.08	18.78	18.42	177.222342	22.4851847	32.21068791	75.50922277	69.50243176
2462	802.11b	14.01	16.21	17.76	126.663335	21.0265092	25.17676928	41.78303666	59.70352866
2412	802.11g	9.85	15.76	16.29	89.89073	19.5371491	9.66050879	37.6703799	42.55984131
2437	802.11g	16.63	16.09	16.14	127.784962	21.0647975	46.02565736	40.64433292	41.11497211
2462	802.11g	17.17	17.07	17.47	158.899578	22.0112274	52.11947111	50.93308711	55.84701947
2412	802.11g HT20	12.62	15.61	16.29	97.2323471	19.8781077	18.28100216	36.39150361	42.55984131
2437	802.11g HT20	15.7	14.58	15.02	97.6300694	19.895836	37.15352291	28.70780582	31.76874071
2462	802.11g HT20	17.43	17.11	17.47	162.586396	22.110842	55.33501092	51.40436516	55.84701947
2422	802.11g HT40	15.51	14.61	14.98	95.9474138	19.8203327	35.56313186	28.90679882	31.47748314
2437	802.11g HT40	14.85	14.15	14.28	83.34249	19.2086647	30.54921113	26.00159563	26.79168325
2452	802.11g HT40	14.25	13.82	14.12	76.5289068	18.8382551	26.6072506	24.09905429	25.82260191

Table 24. Peak Power Output, Test Results, 2.4 GHz

Frequency (MHz)	Mode / Modulation Type	Port A Conducted Power (dBm)	Port B Conducted Power (dBm)	Port C Conducted Power (dBm)	Summed Conducted Power (mW)	Summed Conducted Power (dBm)	Port A (mW)	Port B (mW)	Port C (mW)
5745	802.11a	17.44	15.86	14.4	121.55269	20.8476459	55.46257	38.54784	27.54229
5785	802.11a	15.07	15.15	15.79	102.80217	20.120023	32.13661	32.73407	37.9315
5825	802.11a	13.31	13.2	15.77	80.079086	19.0351911	21.42891	20.89296	37.75722
5745	802.11n HT20	17.37	15.96	14.74	123.80668	20.9274408	54.57579	39.44573	29.78516
5785	802.11n HT20	14.84	14.6	15.11	91.753227	19.6262135	30.47895	28.84032	32.43396
5825	802.11n HT20	14.31	13.69	16.63	96.391424	19.840384	26.97739	23.38837	46.02566
5755	802.11n HT40	13.41	12.47	11.09	52.441294	17.196734	21.92805	17.66038	12.85287
5785	802.11n HT40	14.74	14.07	15.27	88.963334	19.4921105	29.78516	25.52701	33.65116
5815	802.11n HT40	13.4	12.91	13.69	64.809383	18.1163789	21.87762	19.54339	23.38837

Table 25. Peak Power Output, Test Results, 5.8 GHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) Radiated Spurious Emissions Requirements and Band Edge

Test Requirements: §15.247(d); §15.205: Emissions outside the frequency band.

§15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a).

§15.205(a): Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090–0.110-----	16.42–16.423	399.9–410	4.5–5.15
¹ 0.495–0.505-----	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905-----	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128-----	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775-----	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775-----	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218-----	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825-----	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225-----	123–138	2200–2300	14.47–14.5
8.291–8.294-----	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366-----	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675-----	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475-----	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293-----	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025-----	240–285	3345.8–3358.36	43–36.5
12.57675–12.57725-----	322–335.4	3600–4400	(²)

Table 26. Restricted Bands of Operation

¹ Until February 1, 1999, this restricted band shall be 0.490 – 0.510 MHz.

² Above 38.6

Test Requirement(s): § 15.209 (a): Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in Table 27.

Frequency (MHz)	§ 15.209(a), Radiated Emission Limits (dB μ V) @ 3m
30 - 88	40.00
88 - 216	43.50
216 - 960	46.00
Above 960	54.00

Table 27. Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a)

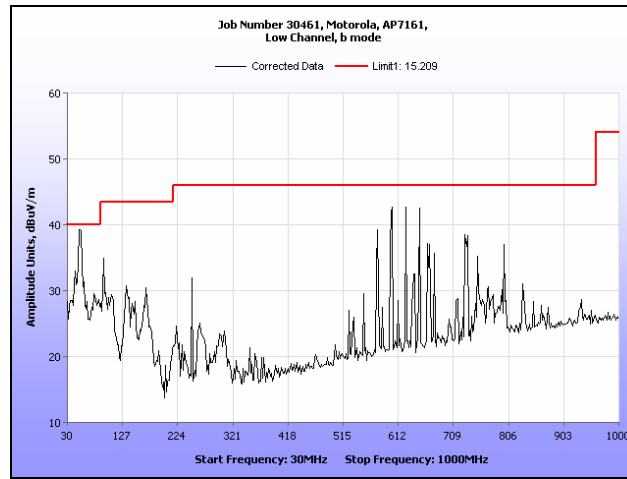
Test Procedures: The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line. Only noise floor was measured above 18 GHz.

Test Results: The EUT was completed with the Radiated Spurious Emission limits of § 15.247(d). No emissions were found beyond 18 GHz.

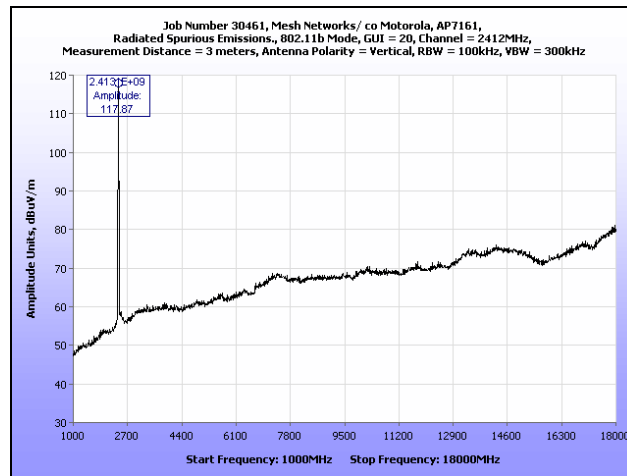
Test Engineer(s): Dan Youngcourt and Jeff Pratt

Test Date(s): 03/30/11

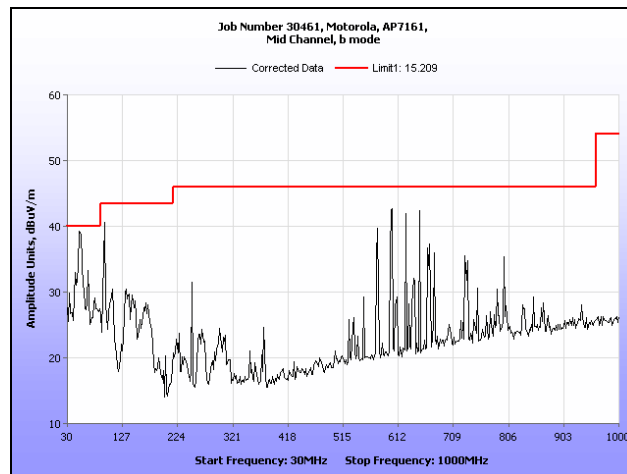
Radiated Spurious Emissions Test Results, 2.4 GHz



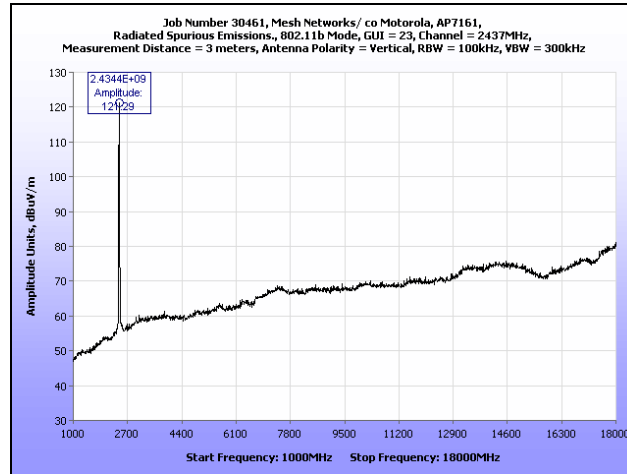
Plot 135. Radiated Spurious Emissions, 802.11b, Low Channel, 30 MHz – 1 GHz



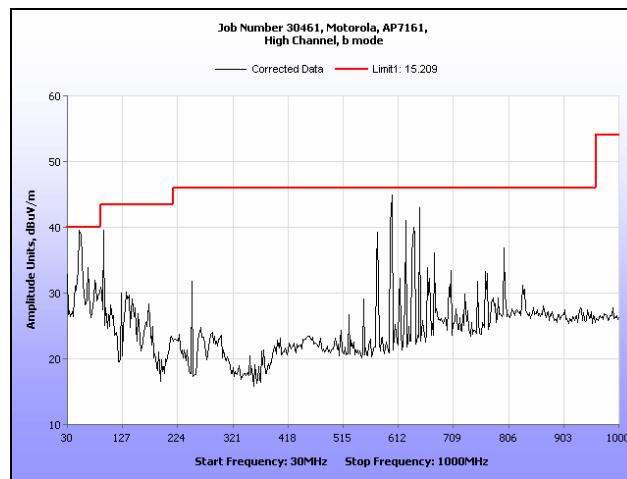
Plot 136. Radiated Spurious Emissions, 802.11b, Low Channel, 1 GHz – 18 GHz



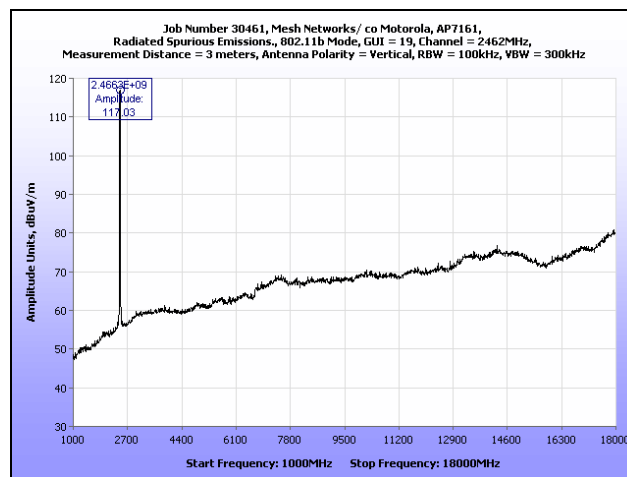
Plot 137. Radiated Spurious Emissions, 802.11b, Mid Channel, 30 MHz – 1 GHz



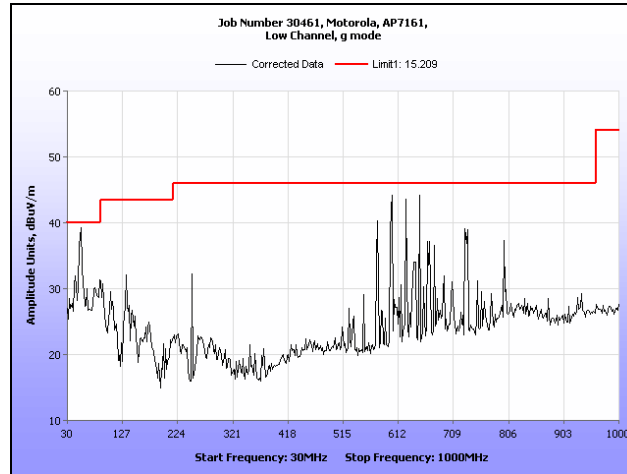
Plot 138. Radiated Spurious Emissions, 802.11b, Mid Channel, 1 GHz – 18 GHz



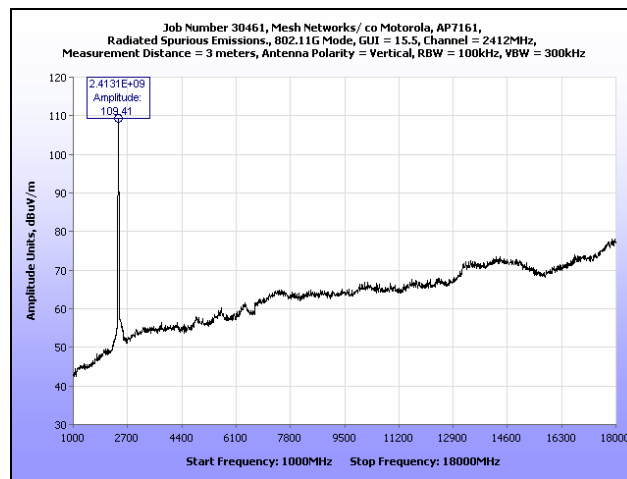
Plot 139. Radiated Spurious Emissions, 802.11b, High Channel, 30 MHz – 1 GHz



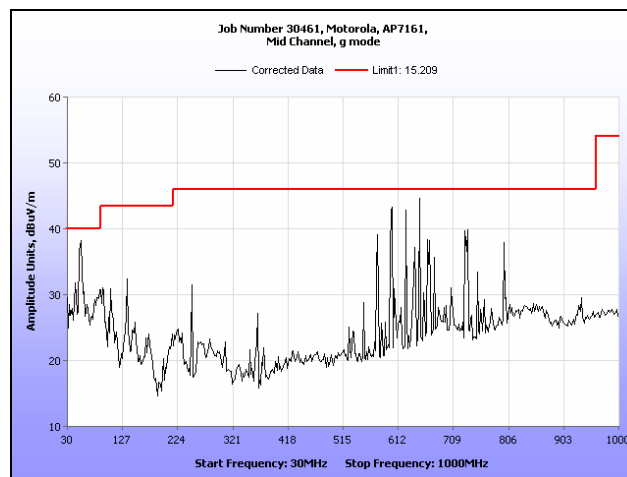
Plot 140. Radiated Spurious Emissions, 802.11b, High Channel, 1 GHz – 18 GHz



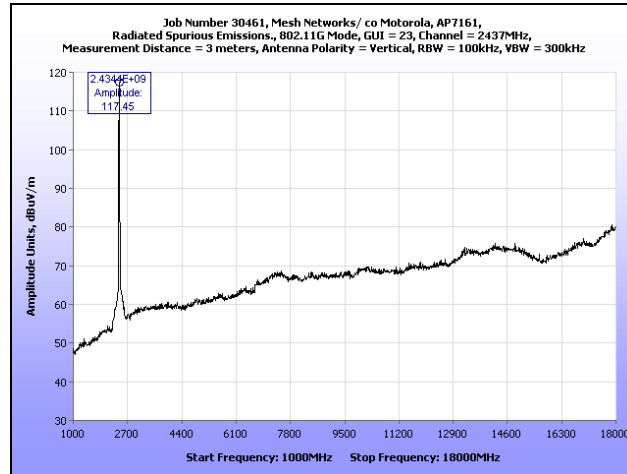
Plot 141. Radiated Spurious Emissions, 802.11g, Low Channel, 30 MHz – 1 GHz



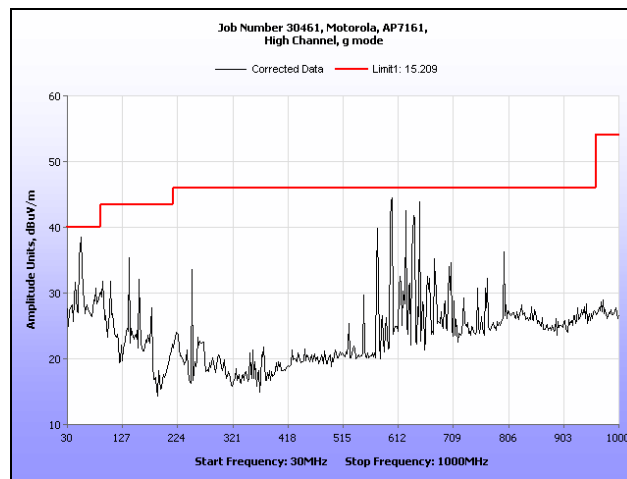
Plot 142. Radiated Spurious Emissions, 802.11g, Low Channel, 1 GHz – 18 GHz



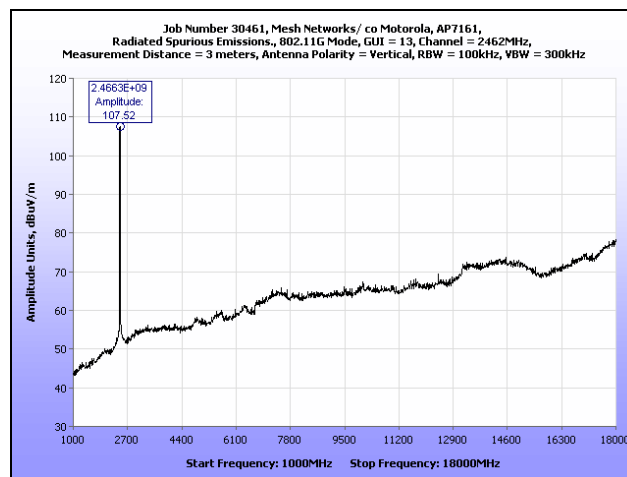
Plot 143. Radiated Spurious Emissions, 802.11g, Mid Channel, 30 MHz – 1 GHz



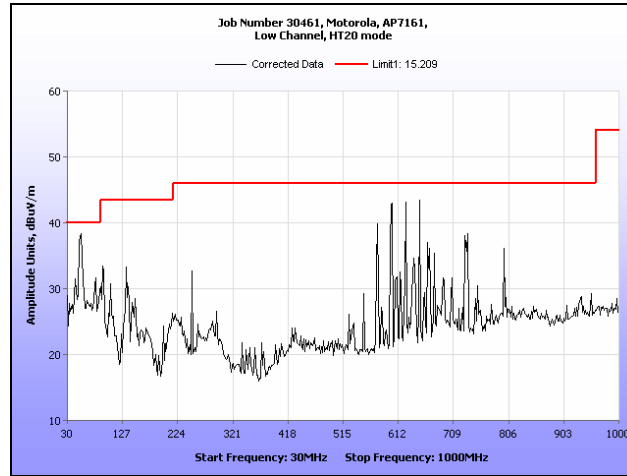
Plot 144. Radiated Spurious Emissions, 802.11g, Mid Channel, 1 GHz – 18 GHz



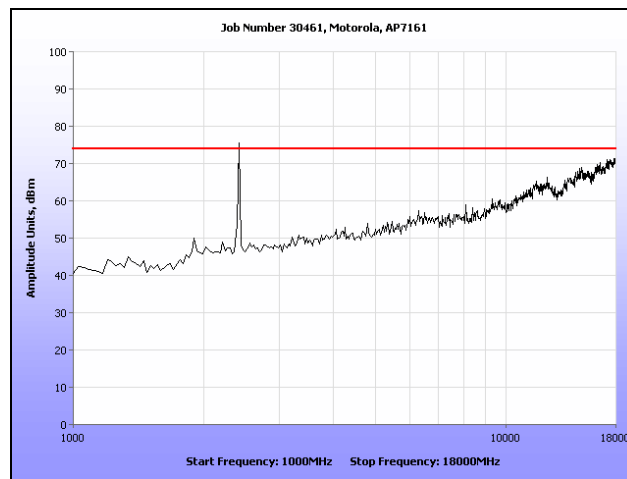
Plot 145. Radiated Spurious Emissions, 802.11g, High Channel, 30 MHz – 1 GHz



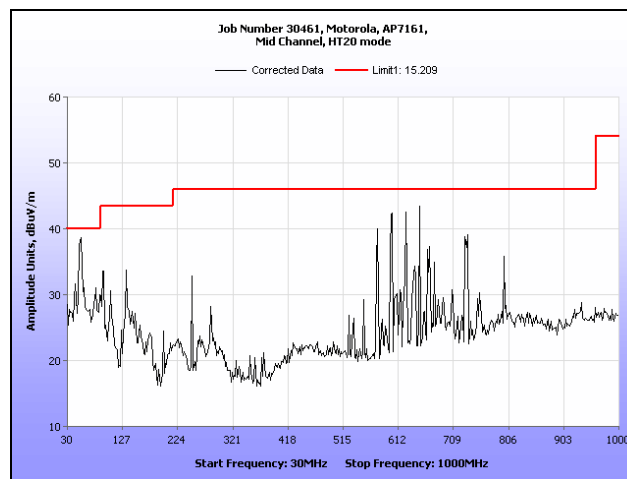
Plot 146. Radiated Spurious Emissions, 802.11g, High Channel, 1 GHz – 18 GHz



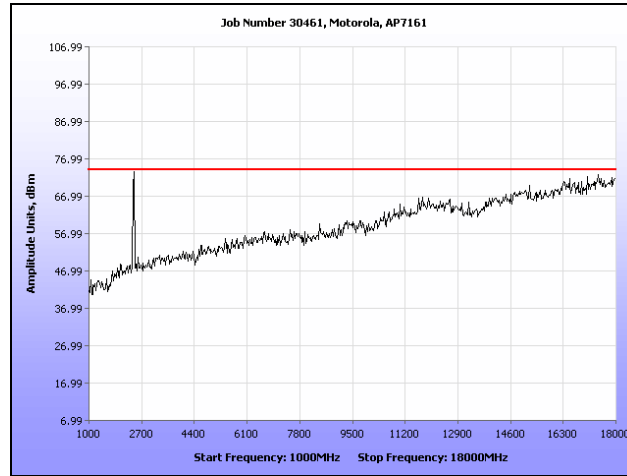
Plot 147. Radiated Spurious Emissions, 802.11g 20 MHz, Low Channel, 30 MHz – 1 GHz



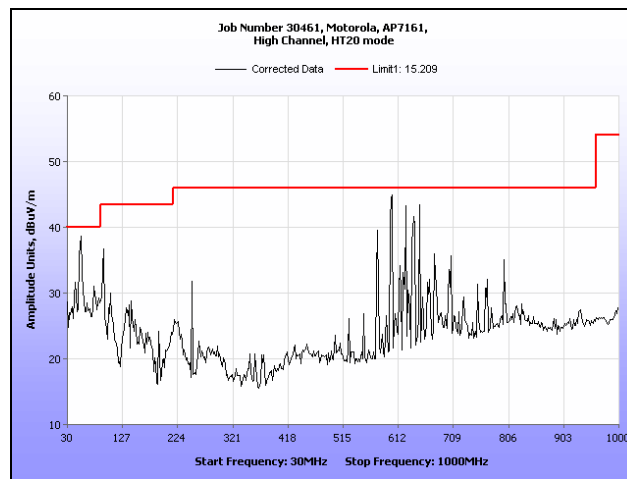
Plot 148. Radiated Spurious Emissions, 802.11g 20 MHz, Low Channel, 1 GHz – 18 GHz



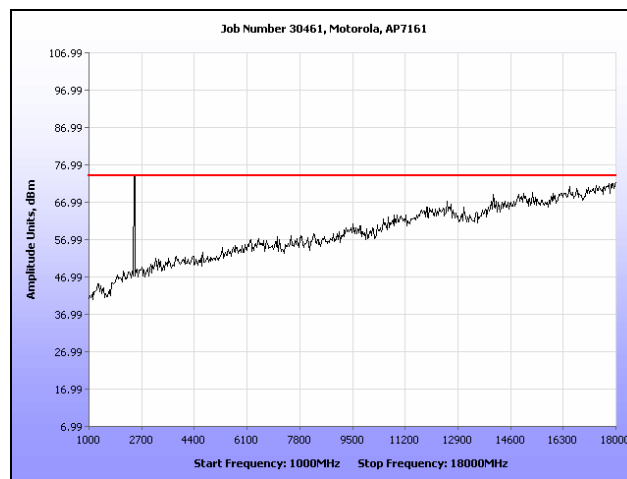
Plot 149. Radiated Spurious Emissions, 802.11g 20 MHz, Mid Channel, 30 MHz – 1 GHz



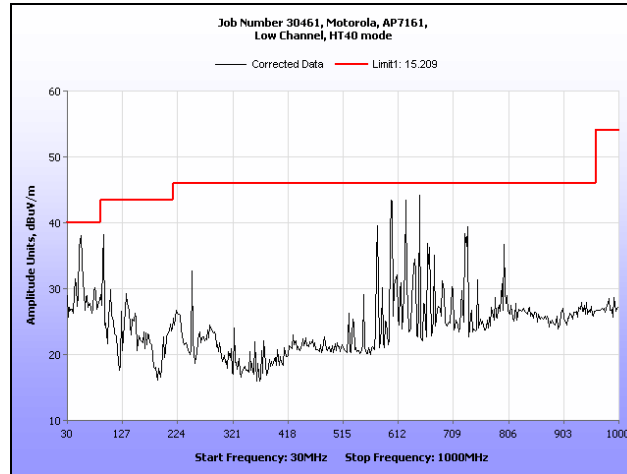
Plot 150. Radiated Spurious Emissions, 802.11g 20 MHz, Mid Channel, 1 GHz – 18 GHz



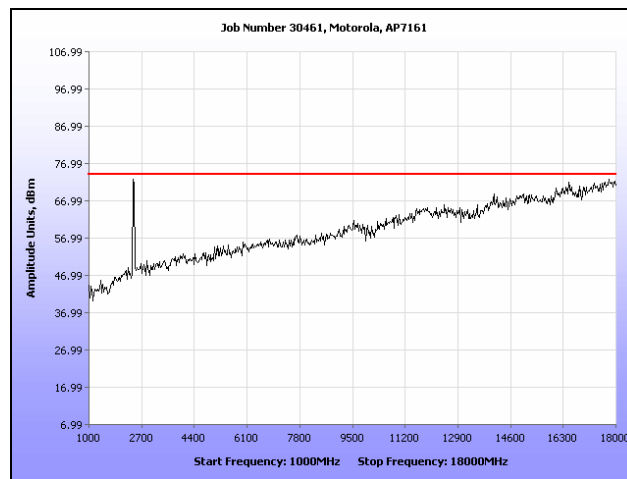
Plot 151. Radiated Spurious Emissions, 802.11g 20 MHz, High Channel, 30 MHz – 1 GHz



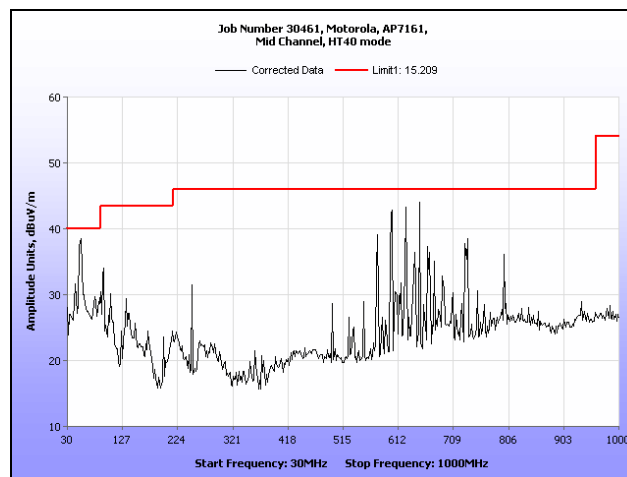
Plot 152. Radiated Spurious Emissions, 802.11g 20 MHz, High Channel, 1 GHz – 18 GHz



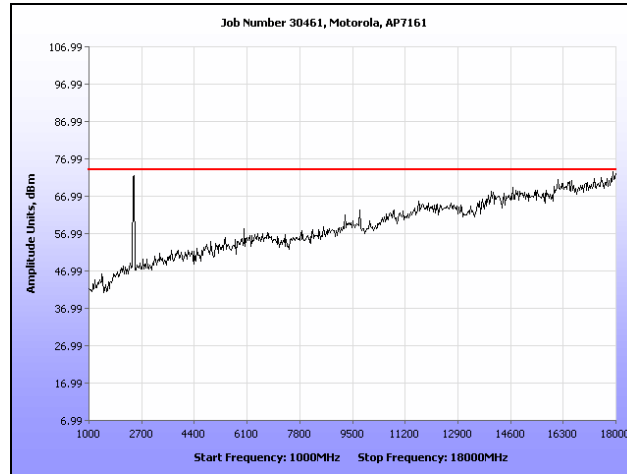
Plot 153. Radiated Spurious Emissions, 802.11g 40 MHz, Low Channel, 30 MHz – 1 GHz



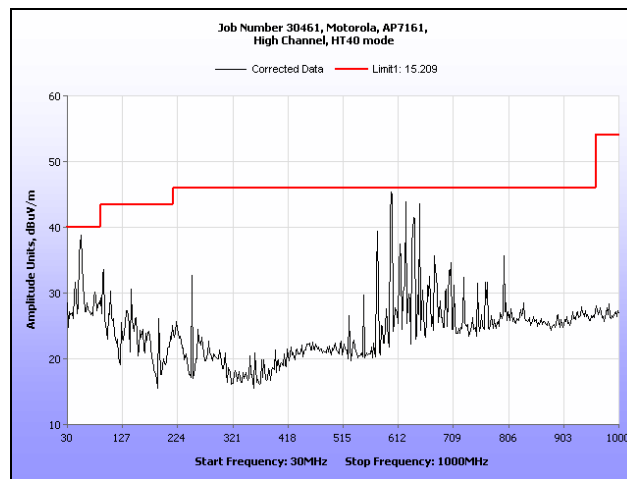
Plot 154. Radiated Spurious Emissions, 802.11g 40 MHz, Low Channel, 1 GHz – 18 GHz



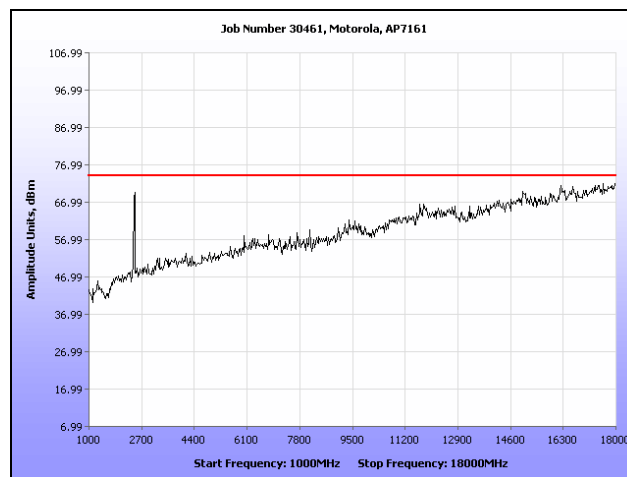
Plot 155. Radiated Spurious Emissions, 802.11g 40 MHz, Mid Channel, 30 MHz – 1 GHz



Plot 156. Radiated Spurious Emissions, 802.11g 40 MHz, Mid Channel, 1 GHz – 18 GHz

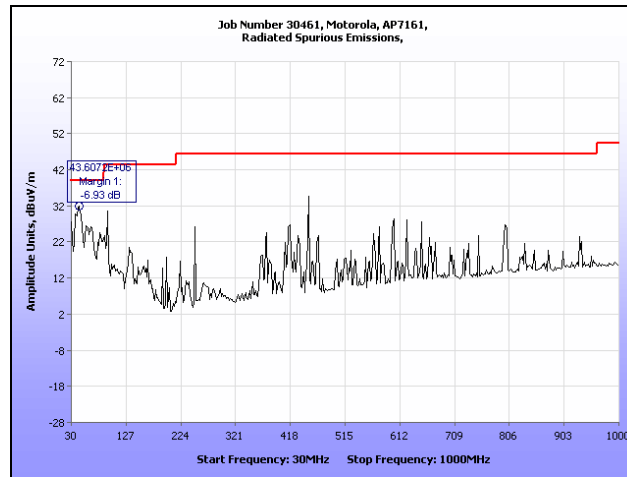


Plot 157. Radiated Spurious Emissions, 802.11g 40 MHz, High Channel, 30 MHz – 1 GHz

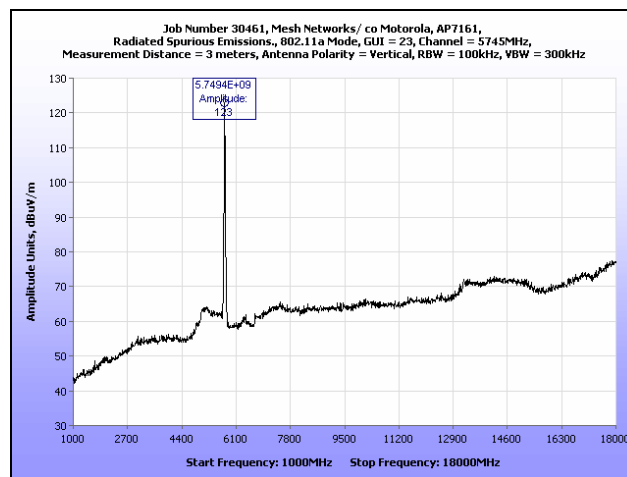


Plot 158. Radiated Spurious Emissions, 802.11g 40 MHz, High Channel, 1 GHz – 18 GHz

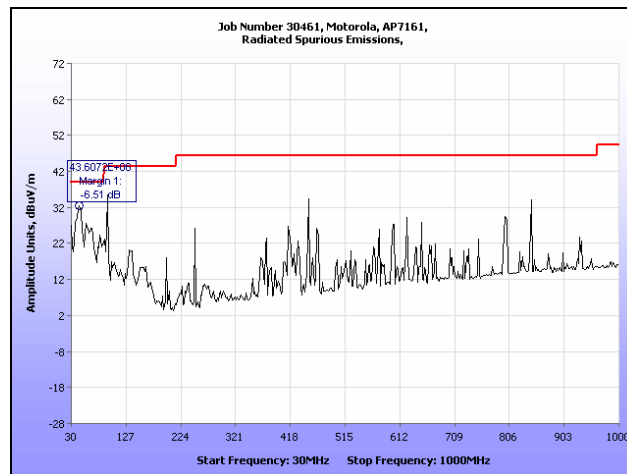
Radiated Spurious Emissions Test Results, 5.8 GHz



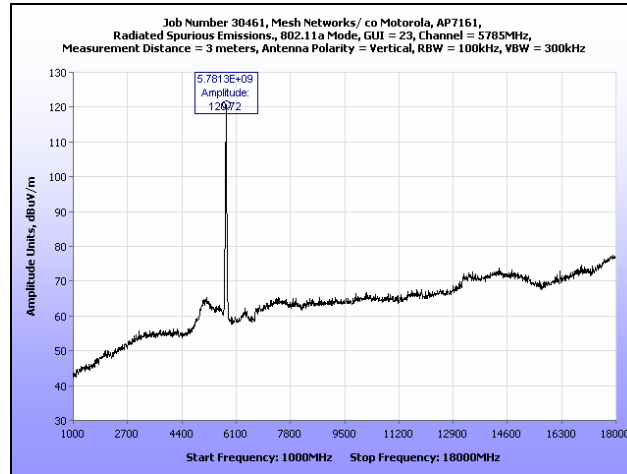
Plot 159. Radiated Spurious Emissions, 802.11a, Low Channel, 30 MHz – 1 GHz



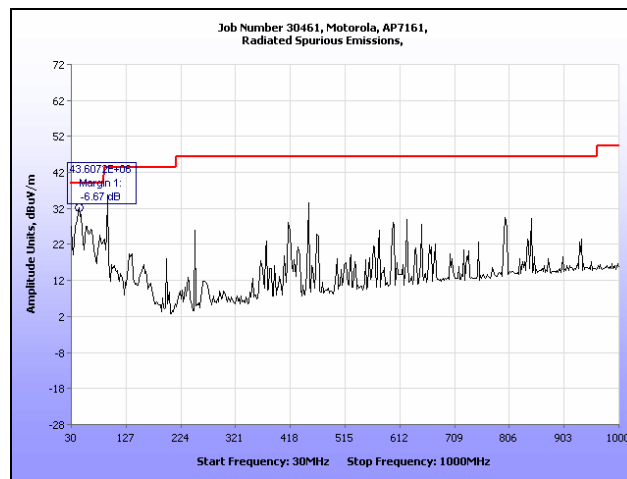
Plot 160. Radiated Spurious Emissions, 802.11a, Low Channel, 1 GHz – 18 GHz



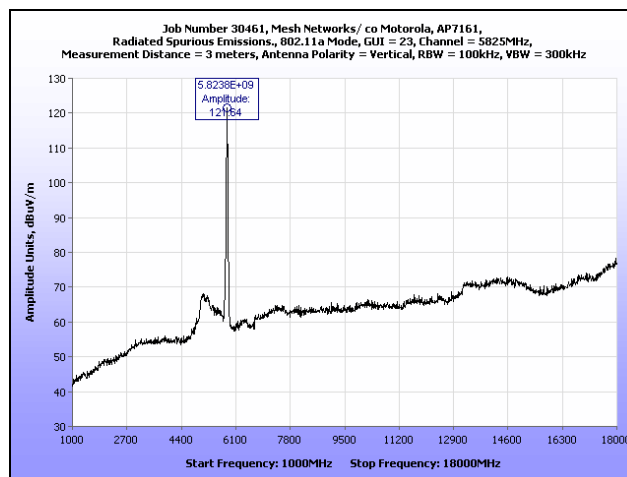
Plot 161. Radiated Spurious Emissions, 802.11a, Mid Channel, 30 MHz – 1 GHz



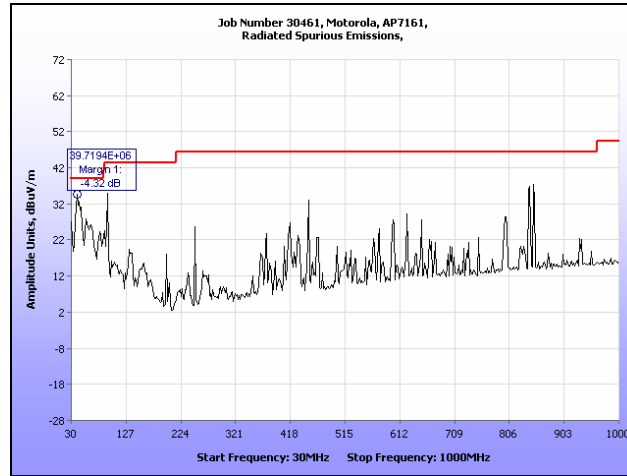
Plot 162. Radiated Spurious Emissions, 802.11a, Mid Channel, 1 GHz – 18 GHz



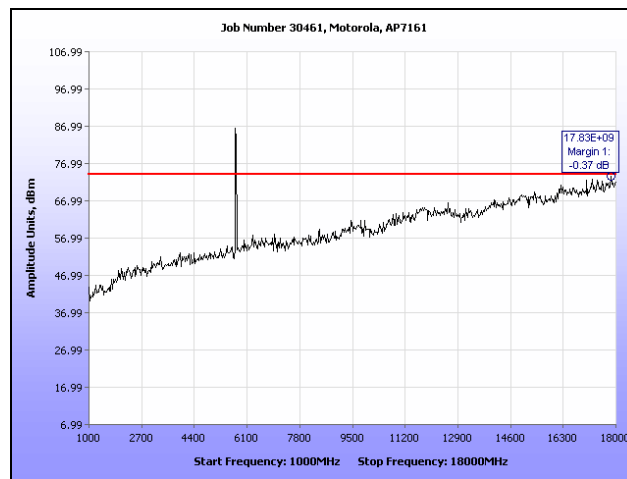
Plot 163. Radiated Spurious Emissions, 802.11a, High Channel, 30 MHz – 1 GHz



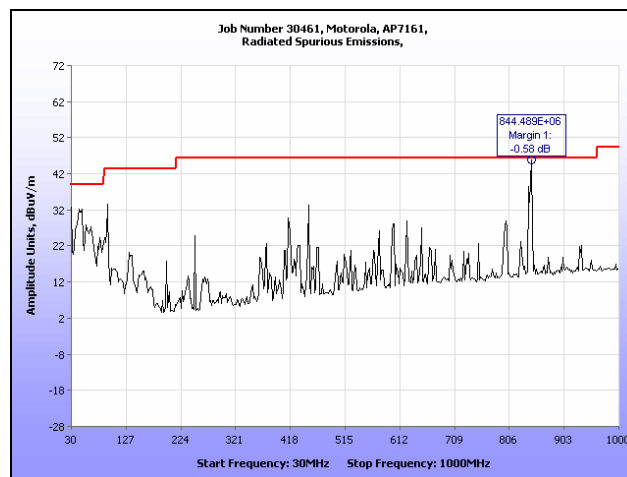
Plot 164. Radiated Spurious Emissions, 802.11a, High Channel, 1 GHz – 18 GHz



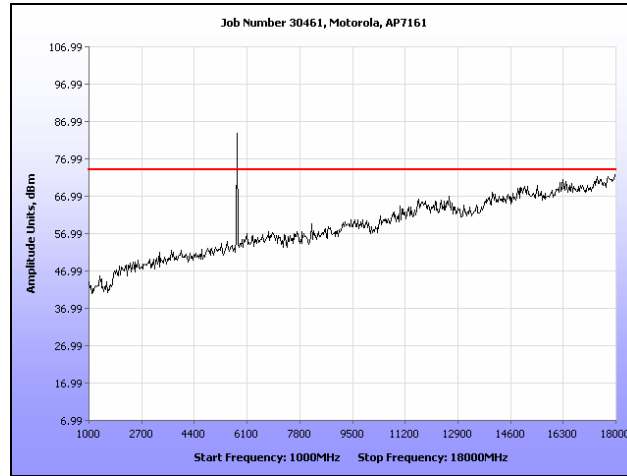
Plot 165. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 30 MHz – 1 GHz



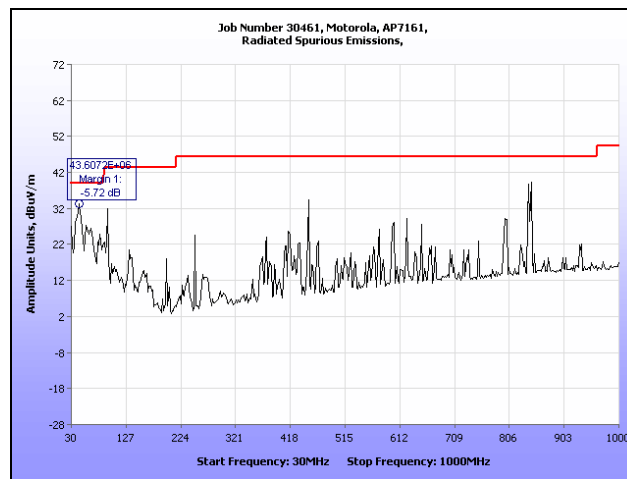
Plot 166. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 1 GHz – 18 GHz



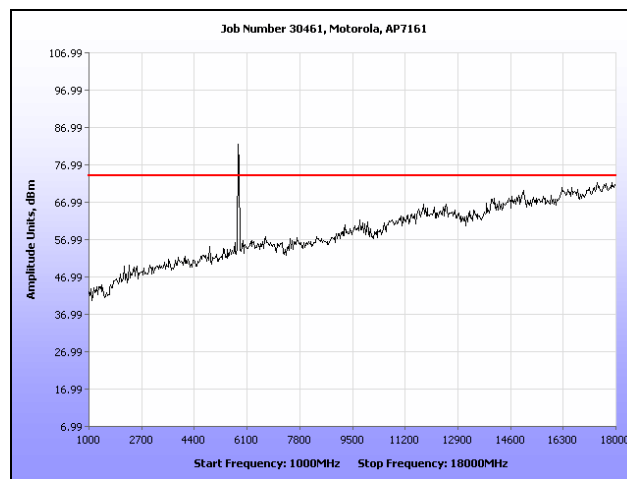
Plot 167. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 30 MHz – 1 GHz



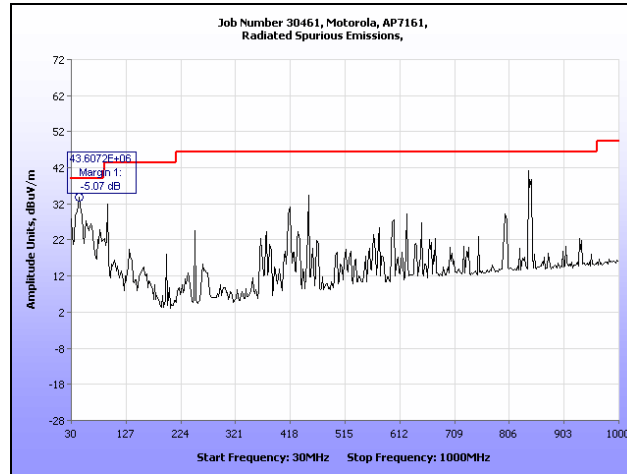
Plot 168. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 1 GHz – 18 GHz



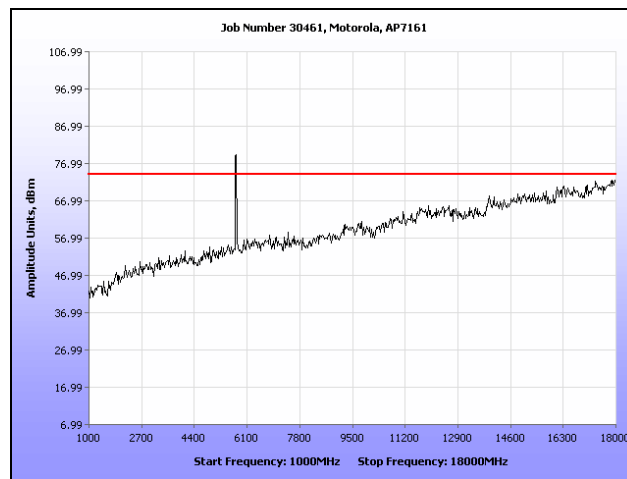
Plot 169. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 30 MHz – 1 GHz



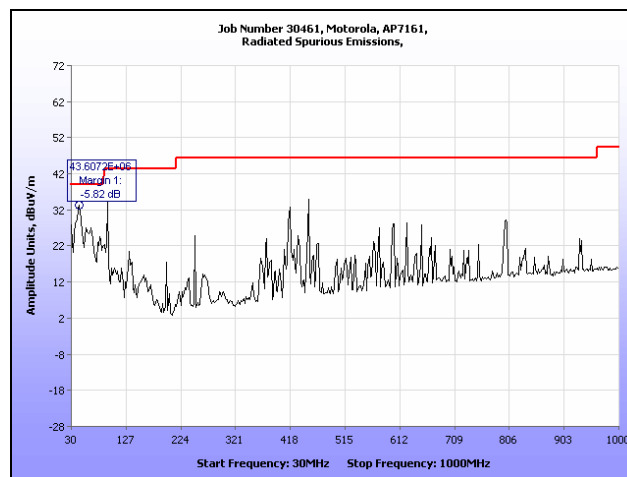
Plot 170. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 1 GHz – 18 GHz



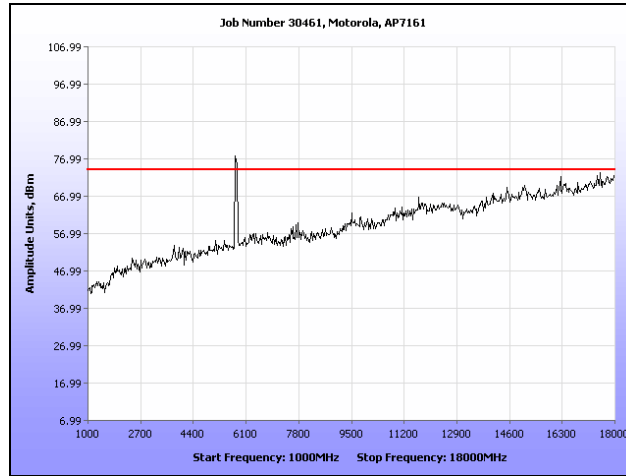
Plot 171. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 30 MHz – 1 GHz



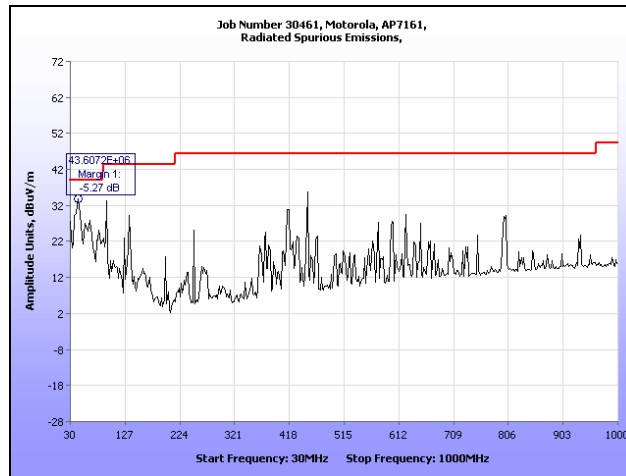
Plot 172. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 1 GHz – 18 GHz



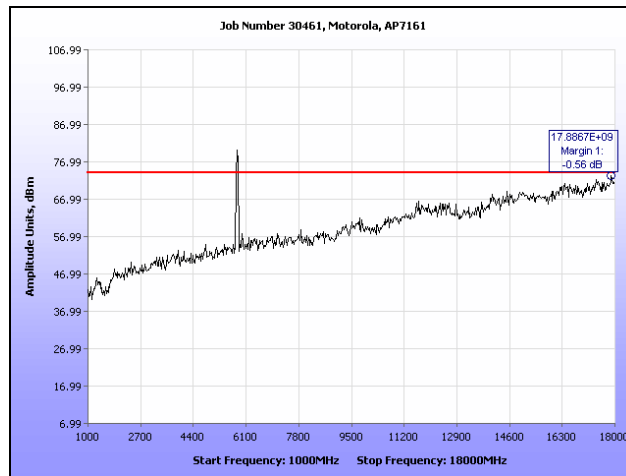
Plot 173. Radiated Spurious Emissions, 802.11n 40 MHz, Mid Channel, 30 MHz – 1 GHz



Plot 174. Radiated Spurious Emissions, 802.11n 40 MHz, Mid Channel, 1 GHz – 18 GHz



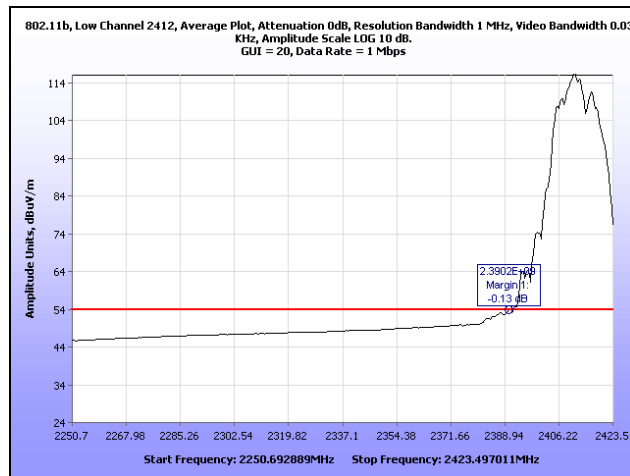
Plot 175. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 30 MHz – 1 GHz



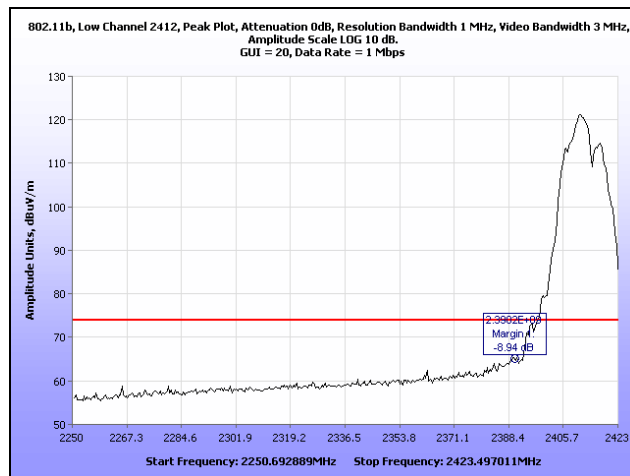
Plot 176. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 1 GHz – 18 GHz

Radiated Band Edge Measurements

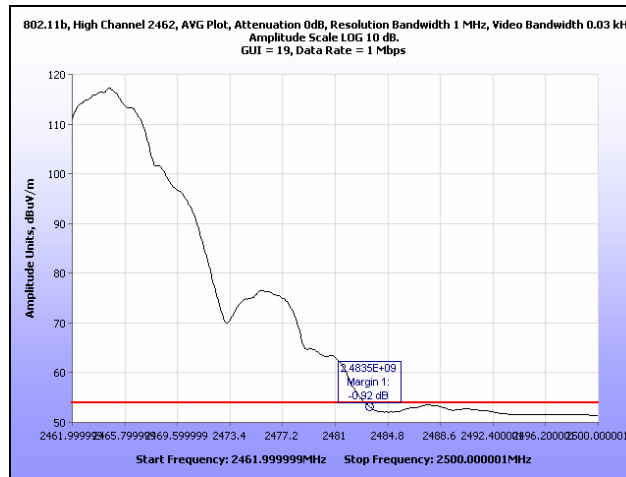
Test Procedures: The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line.



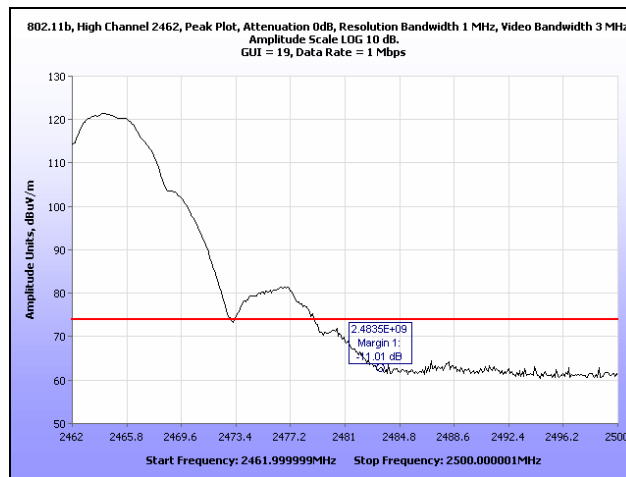
Plot 177. Radiated Restricted Band Edge, 802.11b, Low Channel, Average



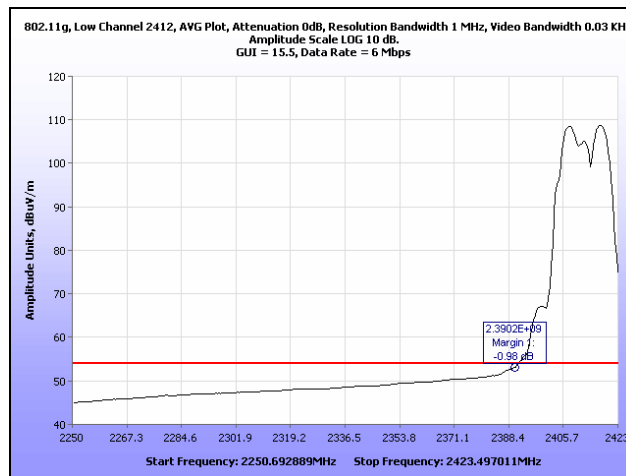
Plot 178. Radiated Restricted Band Edge, 802.11b, Low Channel, Peak



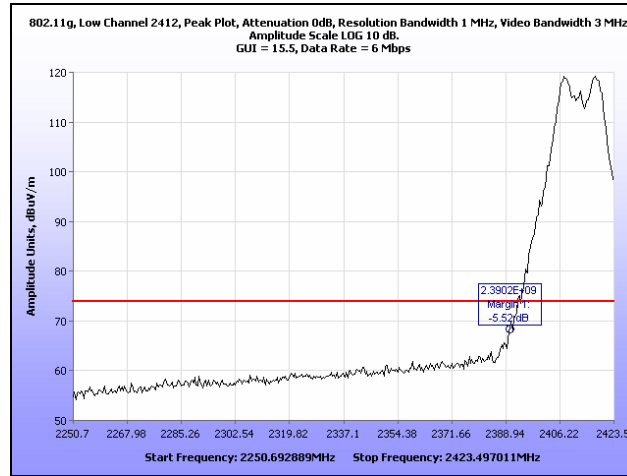
Plot 179. Radiated Restricted Band Edge, 802.11b, High Channel, Average



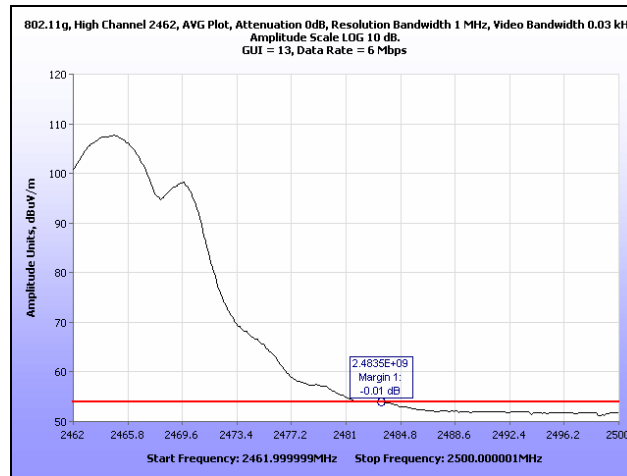
Plot 180. Radiated Restricted Band Edge, 802.11b, High Channel, Peak



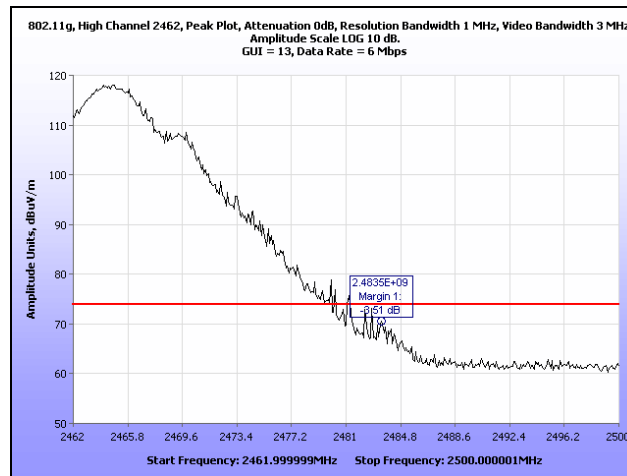
Plot 181. Radiated Restricted Band Edge, 802.11g, Low Channel, Average



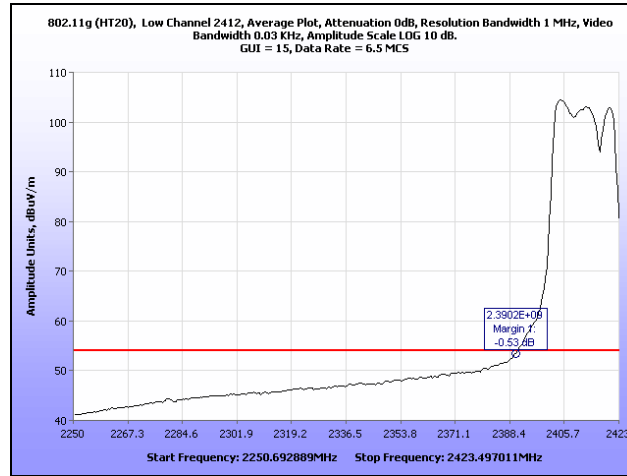
Plot 182. Radiated Restricted Band Edge, 802.11g, Low Channel, Peak



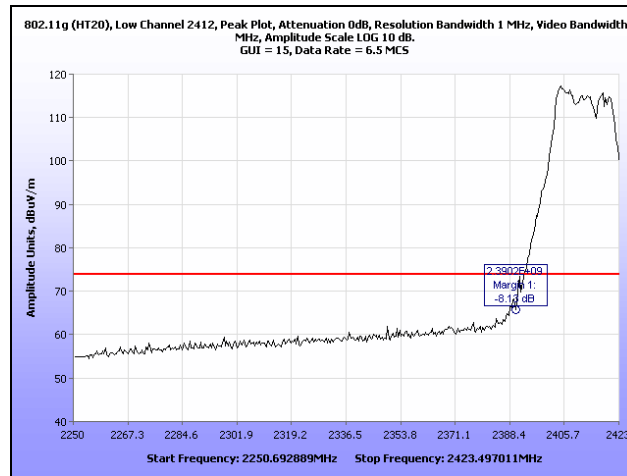
Plot 183. Radiated Restricted Band Edge, 802.11g, High Channel, Average



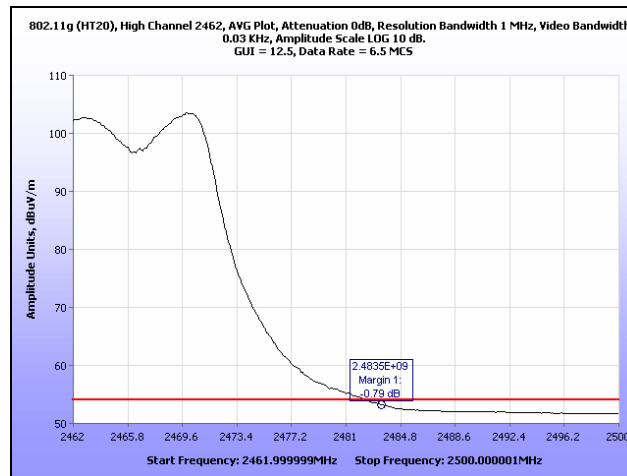
Plot 184. Radiated Restricted Band Edge, 802.11g, High Channel, Peak



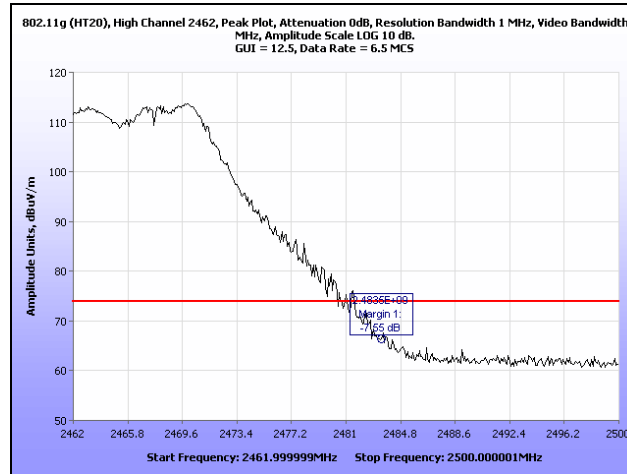
Plot 185. Radiated Restricted Band Edge, 802.11g (20 MHz), Low Channel, Average



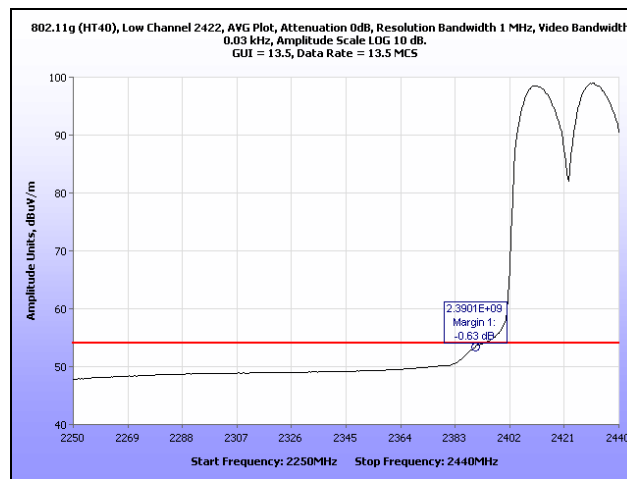
Plot 186. Radiated Restricted Band Edge, 802.11g (20 MHz), Low Channel, Peak



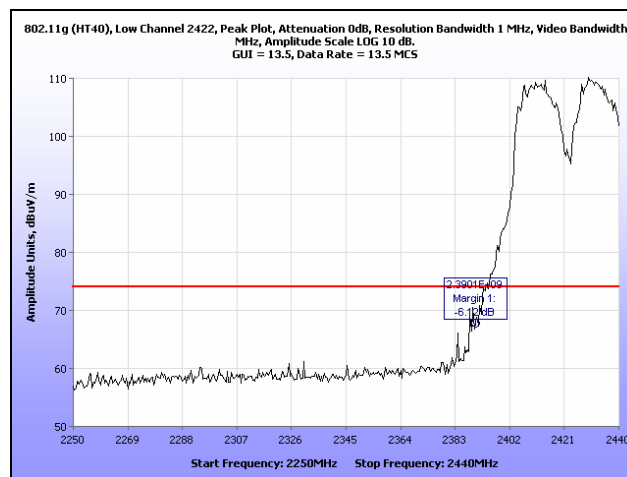
Plot 187. Radiated Restricted Band Edge, 802.11g (20 MHz), High Channel, Average



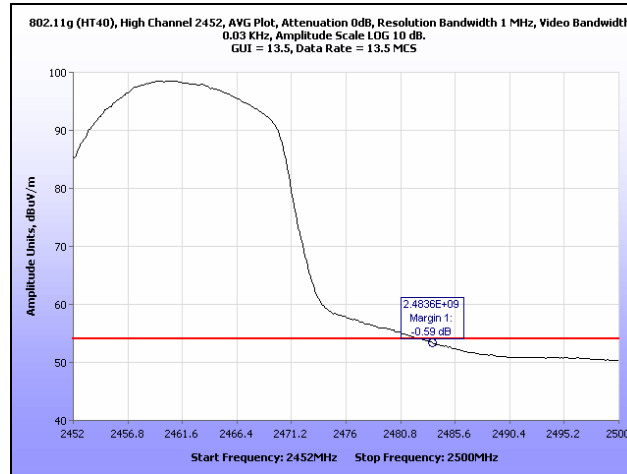
Plot 188. Radiated Restricted Band Edge, 802.11g (20 MHz), High Channel, Peak



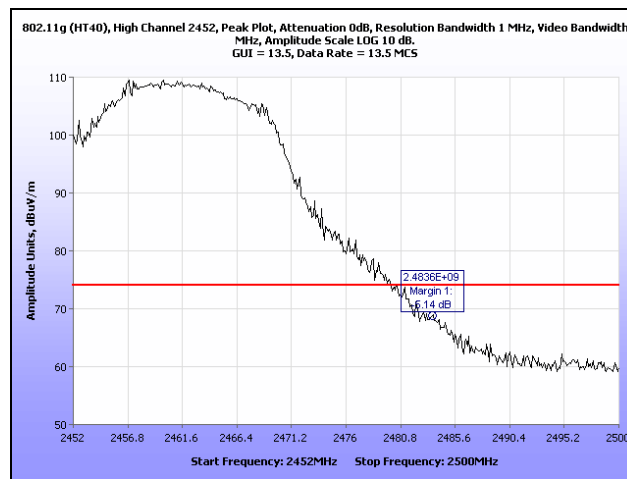
Plot 189. Radiated Restricted Band Edge, 802.11g (40 MHz), Low Channel, Average



Plot 190. Radiated Restricted Band Edge, 802.11g (40 MHz), Low Channel, Peak



Plot 191. Radiated Restricted Band Edge, 802.11g (40 MHz), High Channel, Average



Plot 192. Radiated Restricted Band Edge, 802.11g (40 MHz), High Channel, Peak

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) RF Conducted Spurious Emissions Requirements and Band Edge

Test Requirement: **15.247(d)** In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Test Procedure: For intentional radiators with a digital device portion which operates below 10 GHz, the spectrum was investigated as per §15.33(a)(1) and §15.33(a)(4); i.e., the lowest RF signal generated or used in the device up to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Since the EUT had an integral antenna, conducted measurements could not be performed. Measurements needed to be taken radiated. An antenna was located 3 m away from the EUT and plots were taken. The EUT was rotated through all three orthogonal axes. The plots were corrected for both antenna correction factor and cable loss.

See following pages for detailed test results with RF Conducted Spurious Emissions.

Test Results: The EUT was compliant with the Conducted Spurious Emission limits of §15.247(d).

Test Engineer(s): Jeff Pratt

Test Date(s): 03/07/11

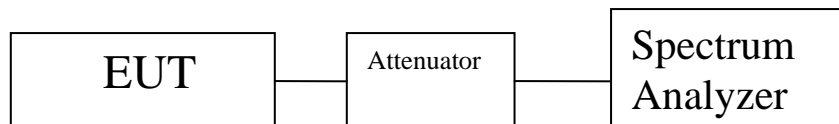
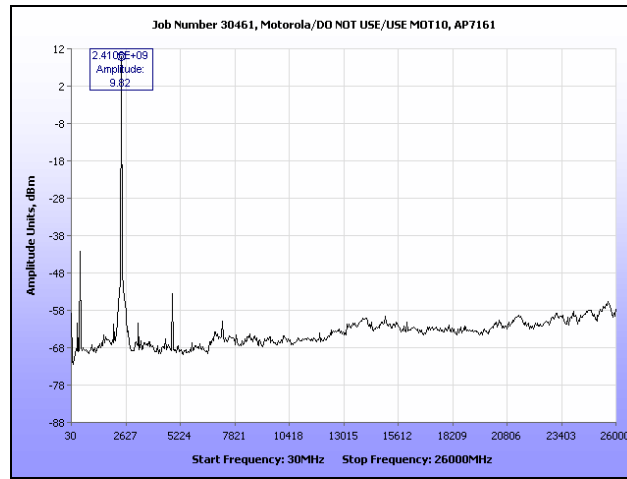
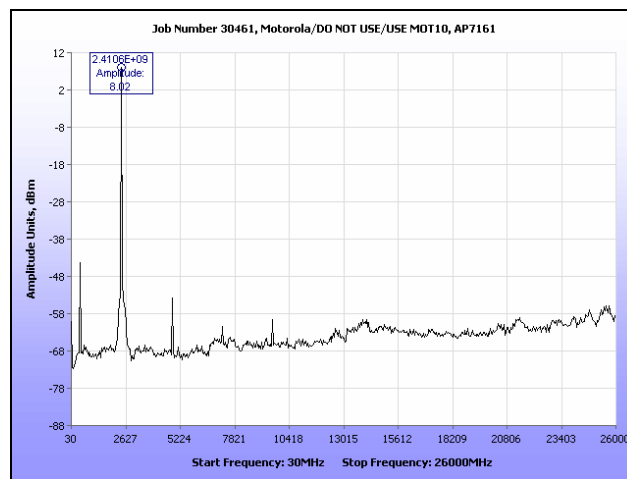


Figure 4. Block Diagram, Conducted Spurious Emissions Test Setup

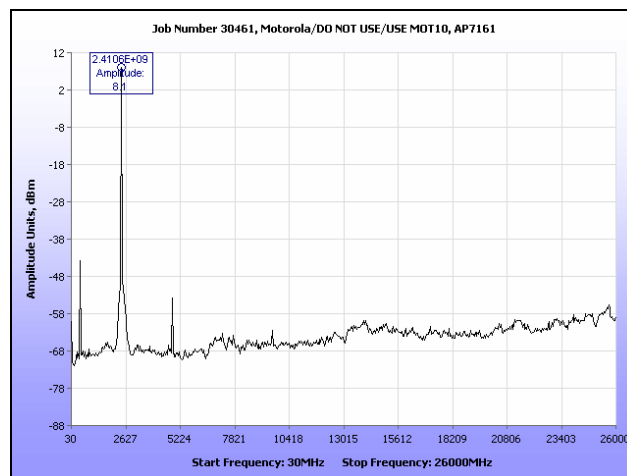
Conducted Spurious Emissions Test Results, 2.4 GHz



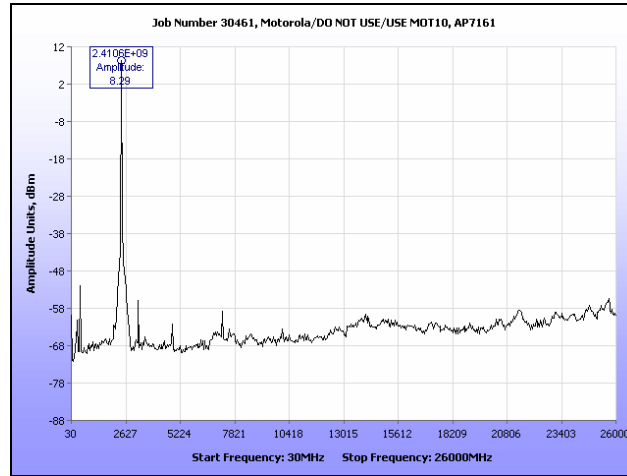
Plot 193. Conducted Spurious Emissions, Low Channel, 802.11b, R3-A



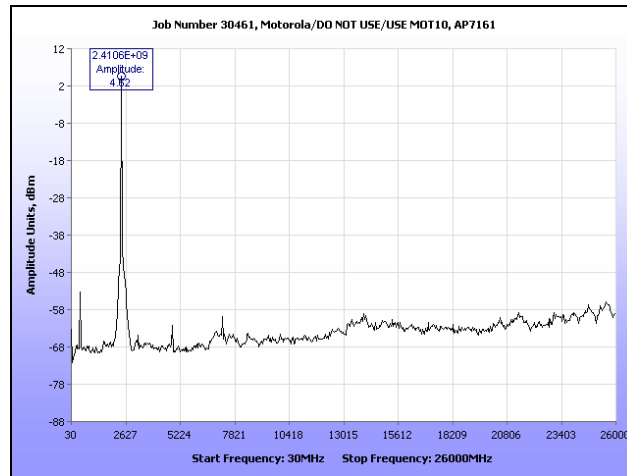
Plot 194. Conducted Spurious Emissions, Low Channel, 802.11b, R3-B



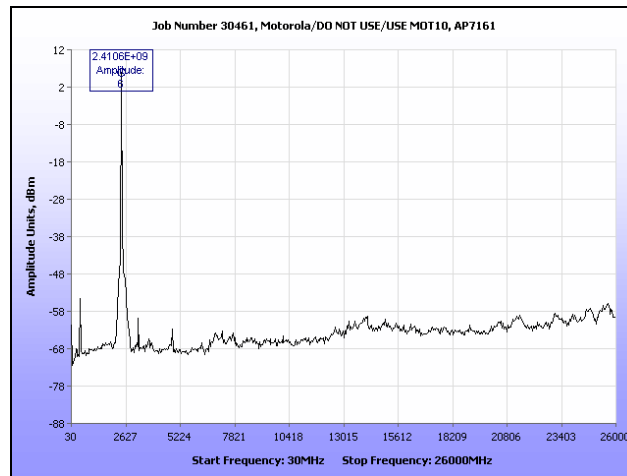
Plot 195. Conducted Spurious Emissions, Low Channel, 802.11b, R3-C



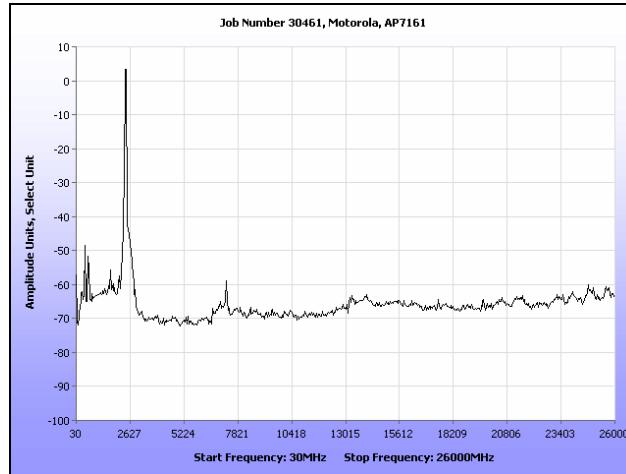
Plot 196. Conducted Spurious Emissions, Low Channel, 802.11g 20 MHz, R3-A



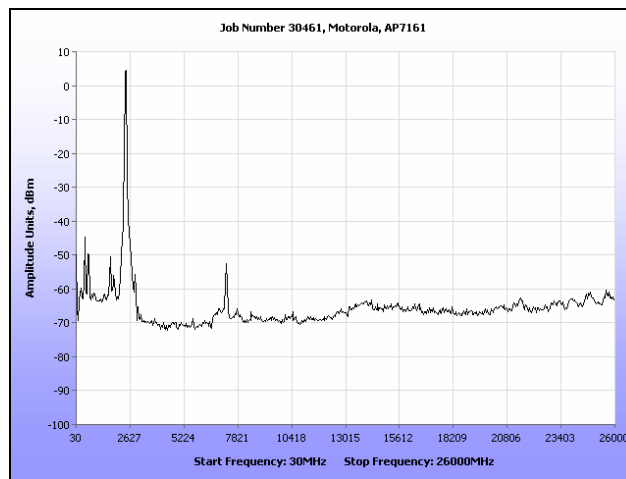
Plot 197. Conducted Spurious Emissions, Low Channel, 802.11g 20 MHz, R3-B



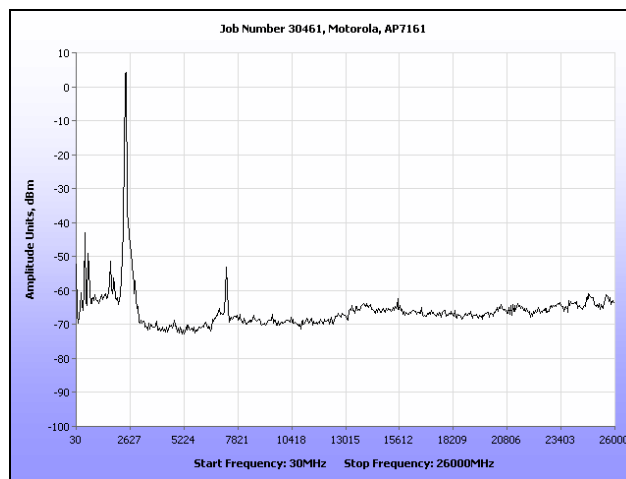
Plot 198. Conducted Spurious Emissions, Low Channel, 802.11g 20 MHz, R3-C



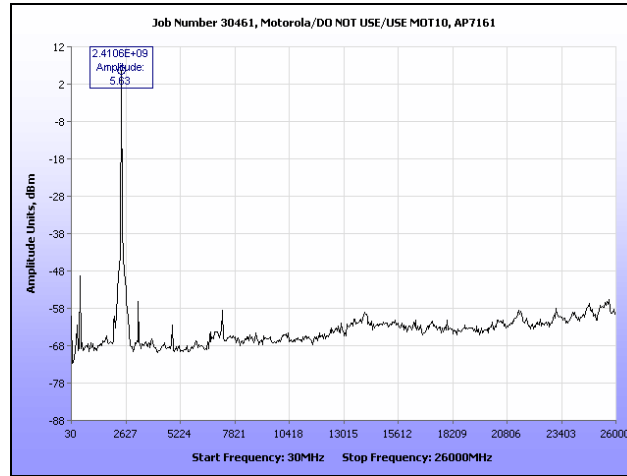
Plot 199. Conducted Spurious Emissions, Low Channel, 802.11g 40 MHz, R3-A



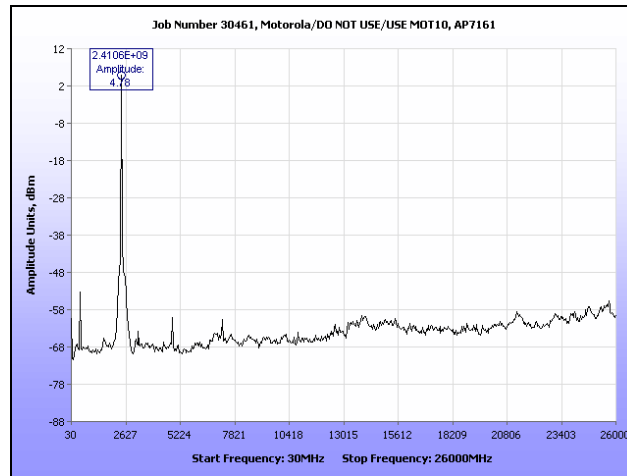
Plot 200. Conducted Spurious Emissions, Low Channel, 802.11g 40 MHz, R3-B



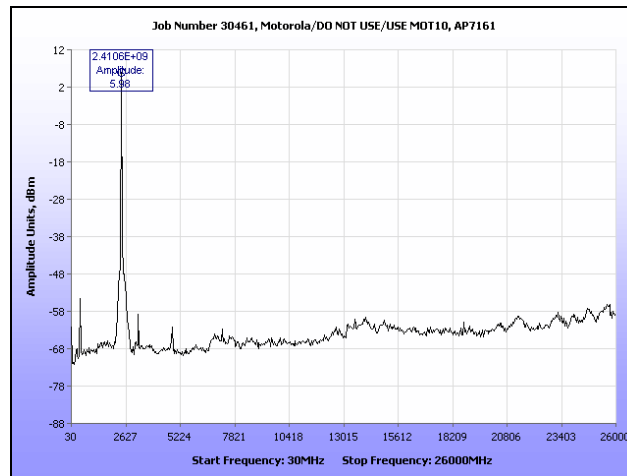
Plot 201. Conducted Spurious Emissions, Low Channel, 802.11g 40 MHz, R3-C



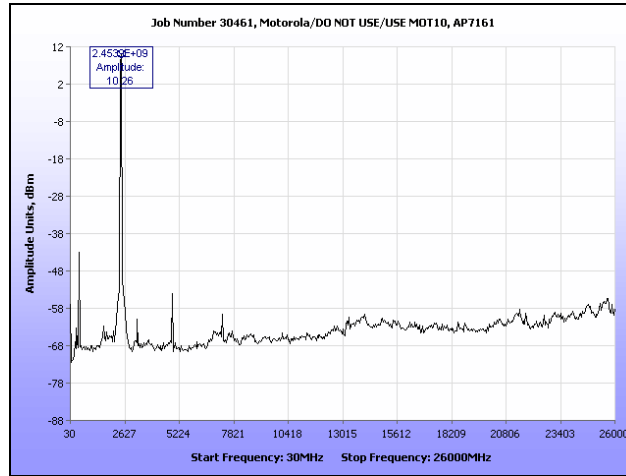
Plot 202. Conducted Spurious Emissions, Low Channel, 802.11g, R3-A



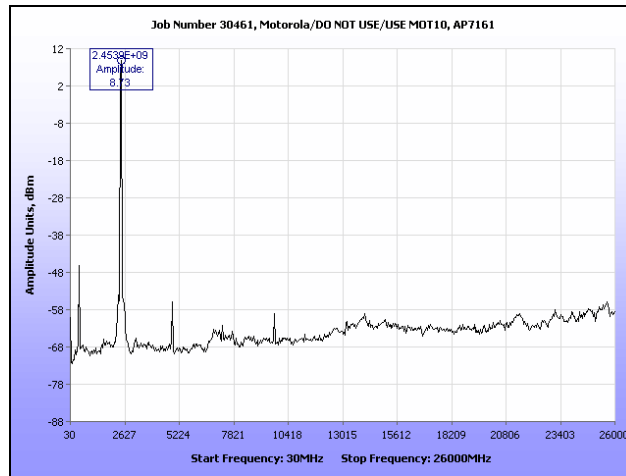
Plot 203. Conducted Spurious Emissions, Low Channel, 802.11g, R3-B



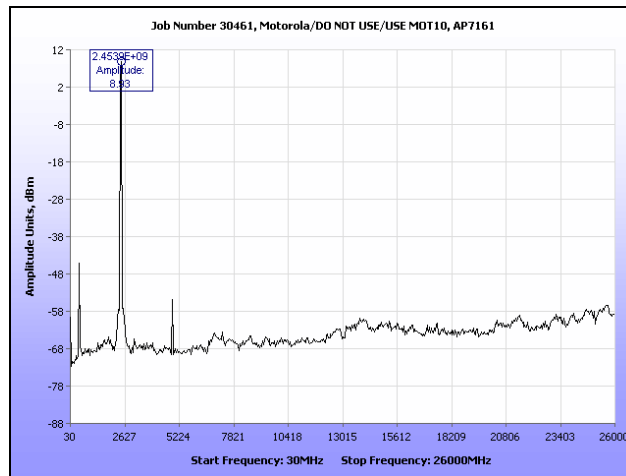
Plot 204. Conducted Spurious Emissions, Low Channel, 802.11g, R3-C



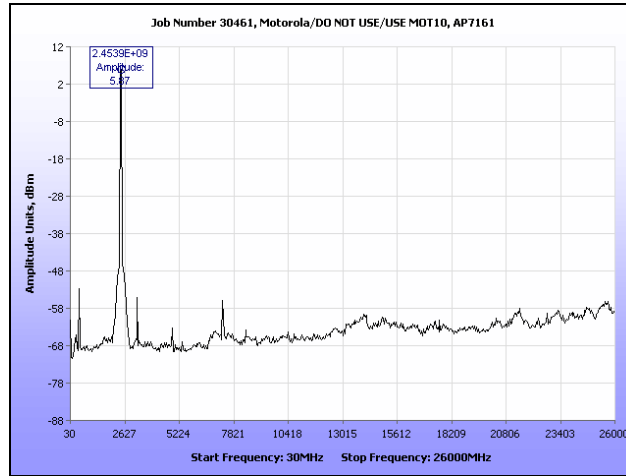
Plot 205. Conducted Spurious Emissions, Mid Channel, 802.11b, R3-A



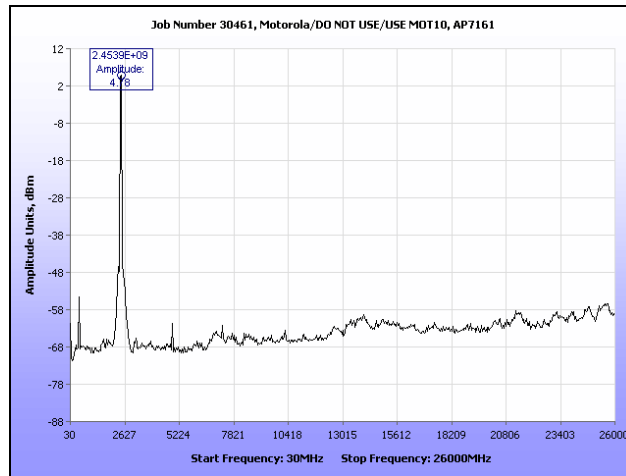
Plot 206. Conducted Spurious Emissions, Mid Channel, 802.11b, R3-B



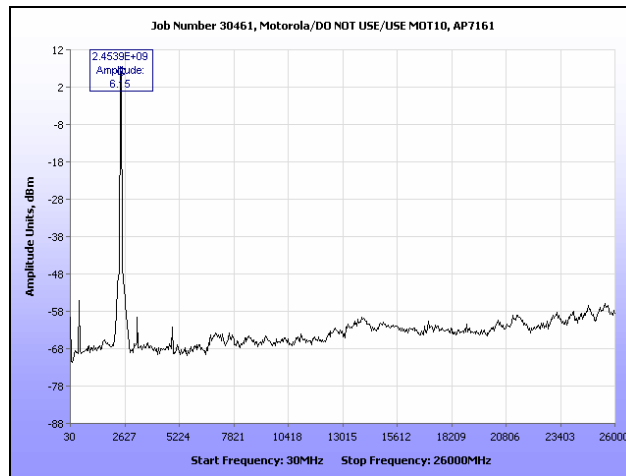
Plot 207. Conducted Spurious Emissions, Mid Channel, 802.11b, R3-C



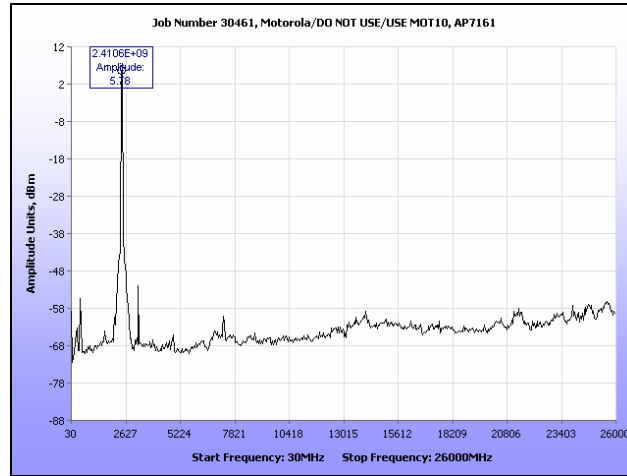
Plot 208. Conducted Spurious Emissions, Mid Channel, 802.11g 20 MHz, R3-A



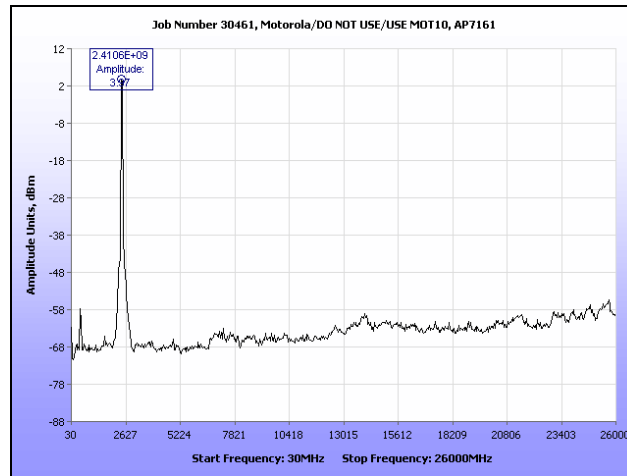
Plot 209. Conducted Spurious Emissions, Mid Channel, 802.11g 20 MHz, R3-B



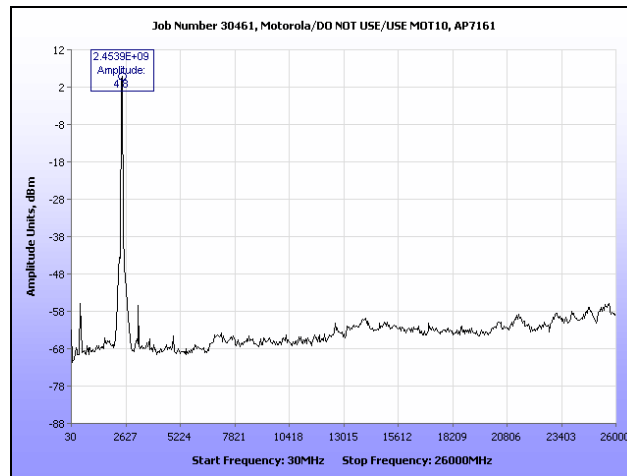
Plot 210. Conducted Spurious Emissions, Mid Channel, 802.11g 20 MHz, R3-C



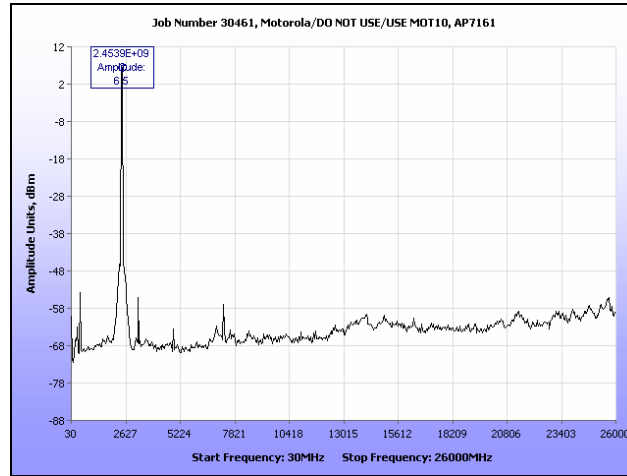
Plot 211. Conducted Spurious Emissions, Mid Channel, 802.11g 40 MHz, R3-A



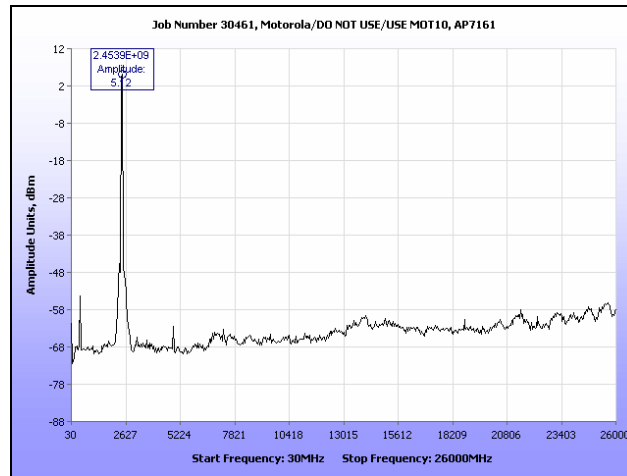
Plot 212. Conducted Spurious Emissions, Mid Channel, 802.11g 40 MHz, R3-B



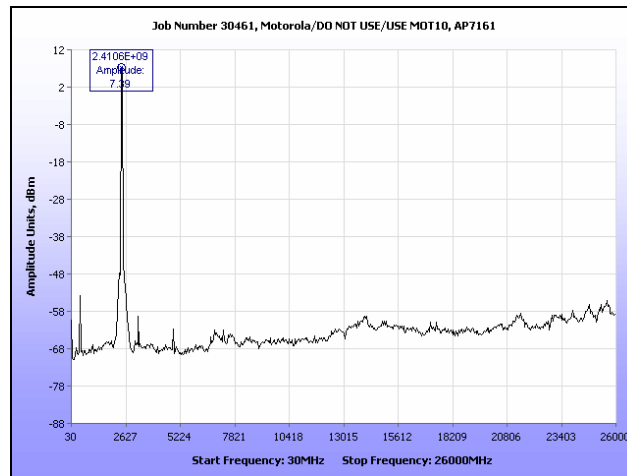
Plot 213. Conducted Spurious Emissions, Mid Channel, 802.11g 40 MHz, R3-C



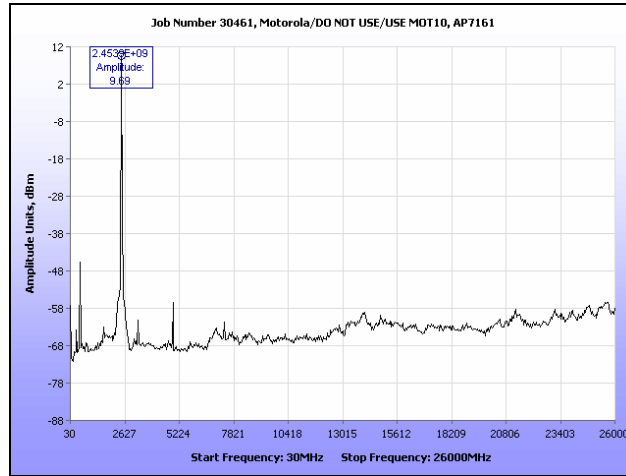
Plot 214. Conducted Spurious Emissions, Mid Channel, 802.11g, R3-A



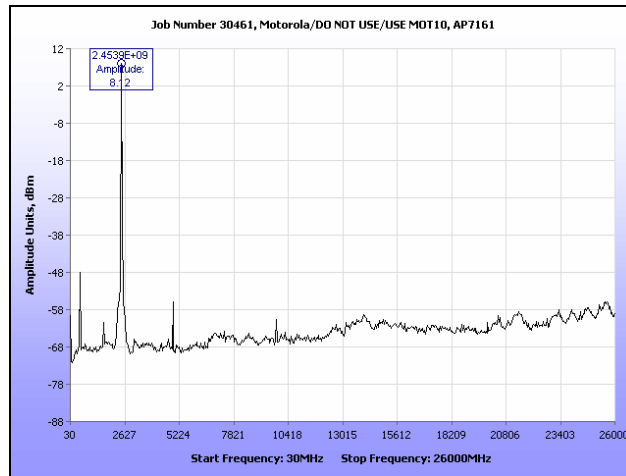
Plot 215. Conducted Spurious Emissions, Mid Channel, 802.11g, R3-B



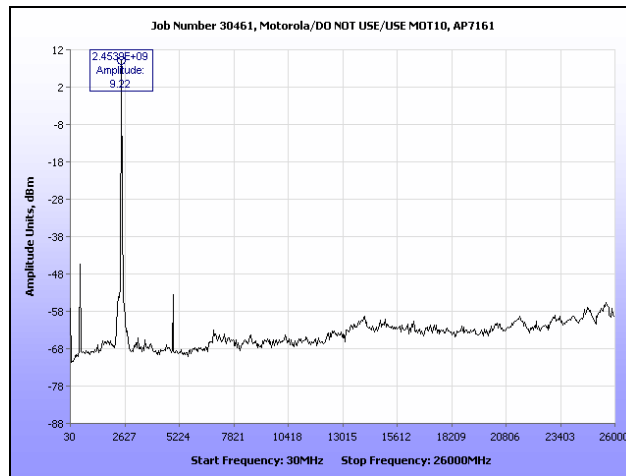
Plot 216. Conducted Spurious Emissions, Mid Channel, 802.11g, R3-C



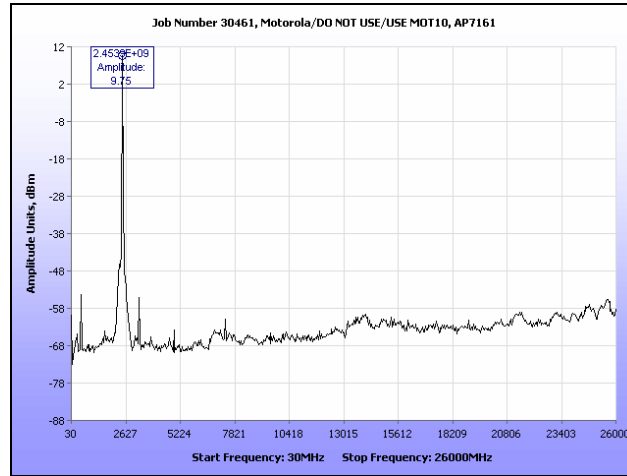
Plot 217. Conducted Spurious Emissions, High Channel, 802.11b, R3-A



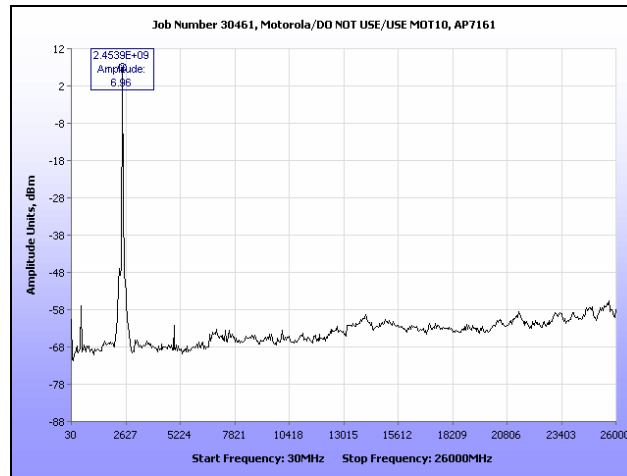
Plot 218. Conducted Spurious Emissions, High Channel, 802.11b, R3-B



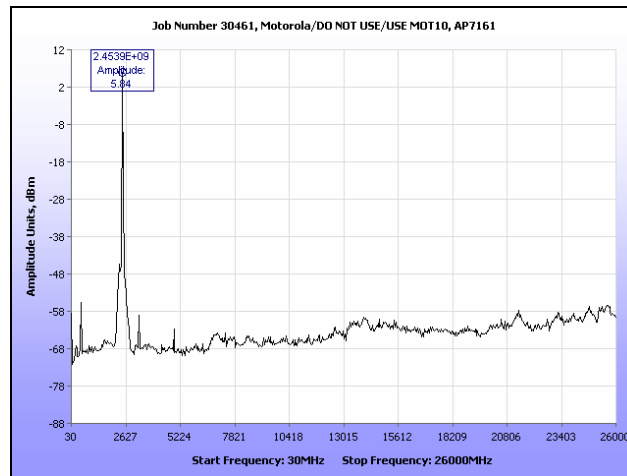
Plot 219. Conducted Spurious Emissions, High Channel, 802.11b, R3-C



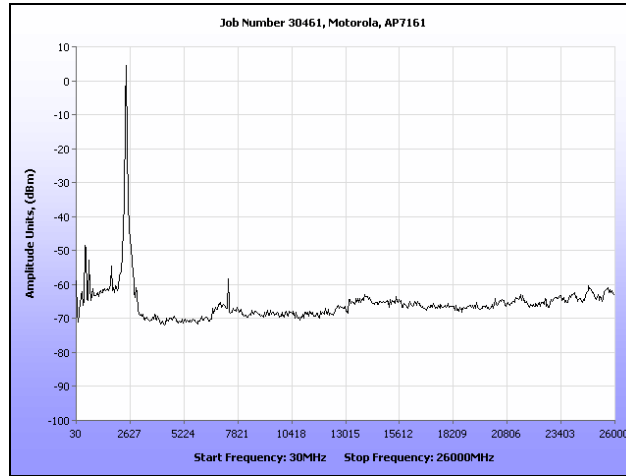
Plot 220. Conducted Spurious Emissions, High Channel, 802.11g 20 MHz, R3-A



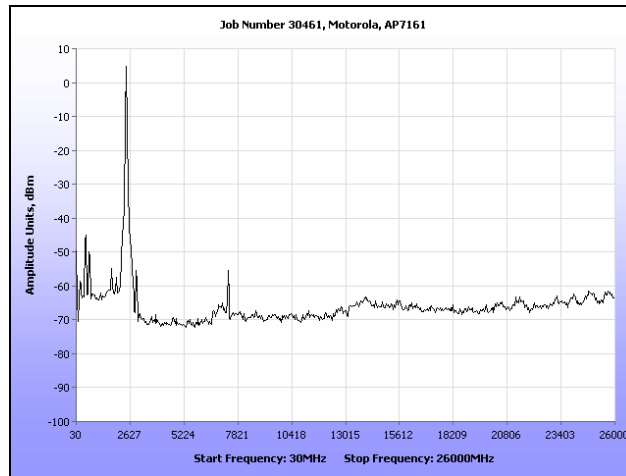
Plot 221. Conducted Spurious Emissions, High Channel, 802.11g 20 MHz, R3-B



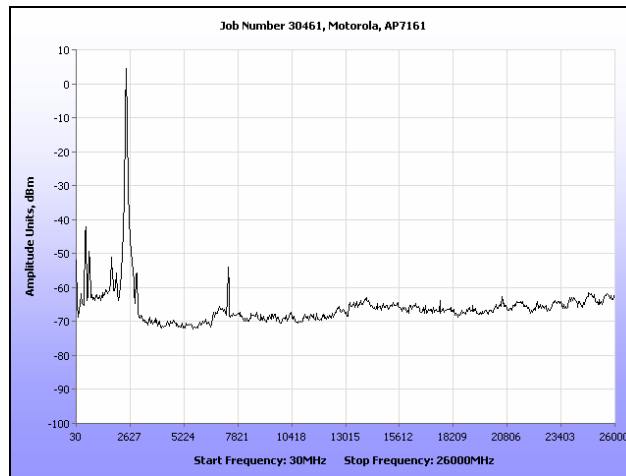
Plot 222. Conducted Spurious Emissions, High Channel, 802.11g 20 MHz, R3-C



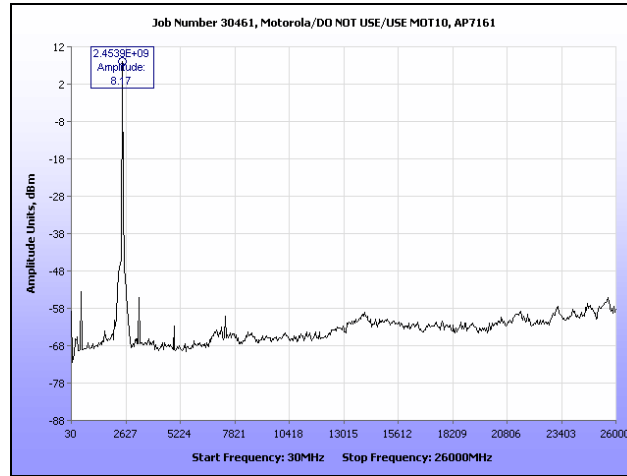
Plot 223. Conducted Spurious Emissions, High Channel, 802.11g 40 MHz, R3-A



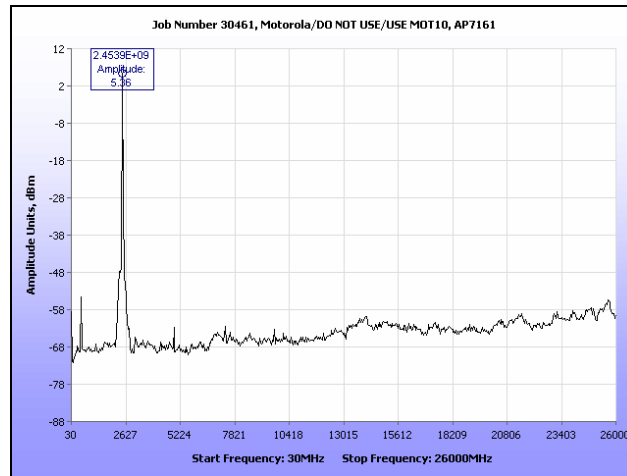
Plot 224. Conducted Spurious Emissions, High Channel, 802.11g 40 MHz, R3-B



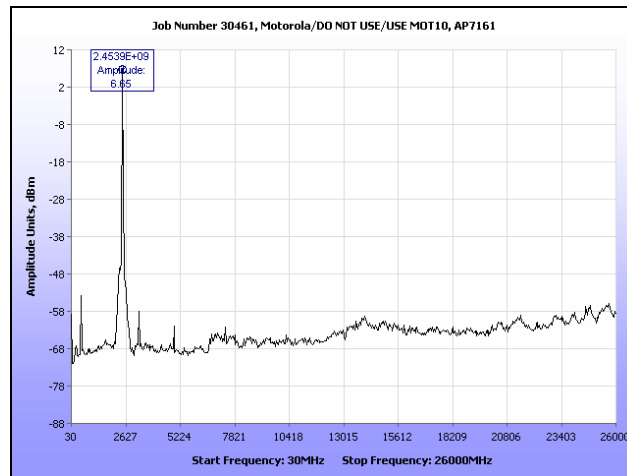
Plot 225. Conducted Spurious Emissions, High Channel, 802.11g 40 MHz, R3-C



Plot 226. Conducted Spurious Emissions, High Channel, 802.11g, R3-A

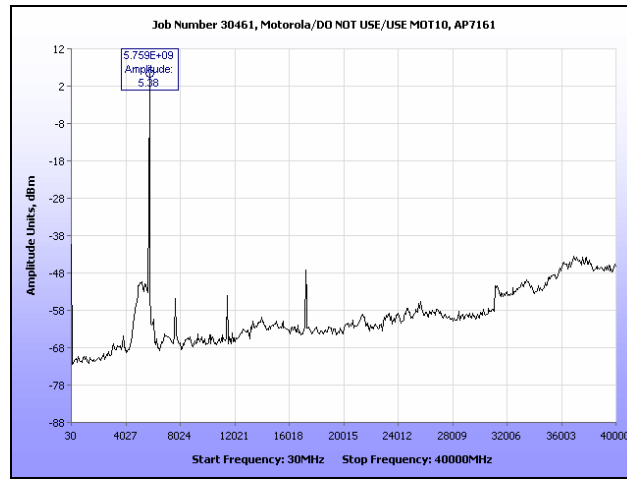


Plot 227. Conducted Spurious Emissions, High Channel, 802.11g, R3-B

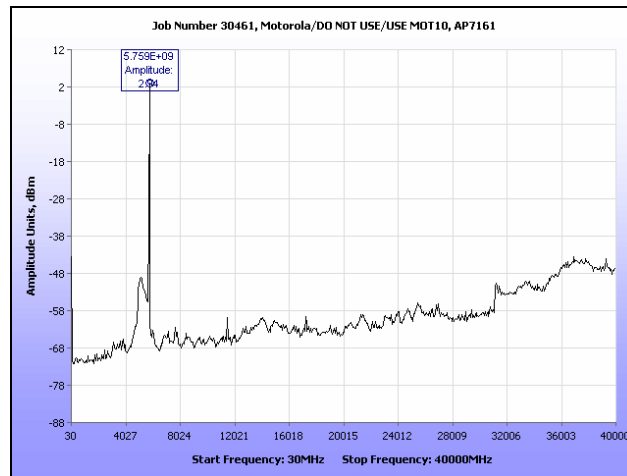


Plot 228. Conducted Spurious Emissions, High Channel, 802.11g, R3-C

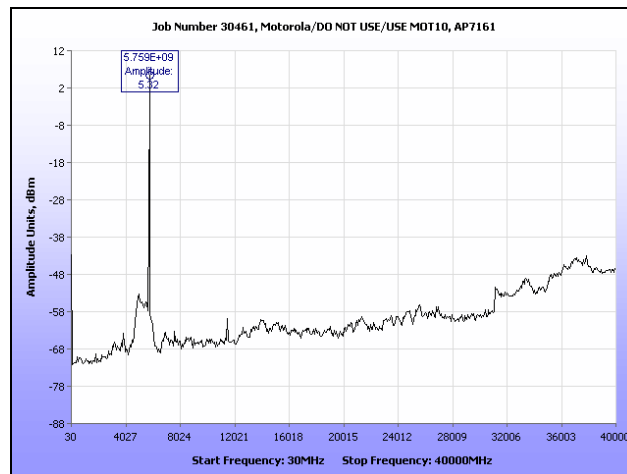
Conducted Spurious Emissions Test Results, 5.8 GHz



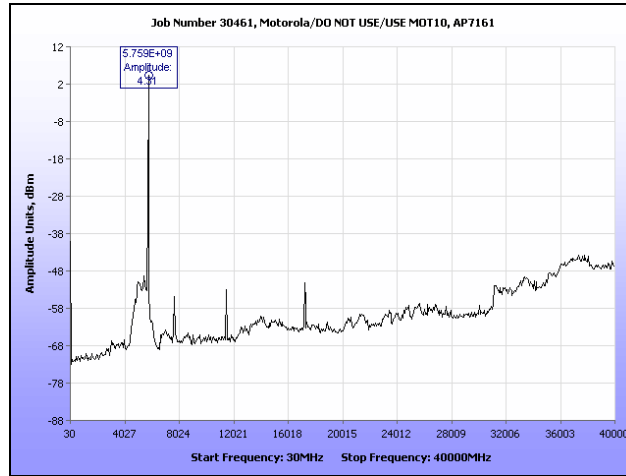
Plot 229. Conducted Spurious Emissions, Low Channel, 802.11a, R3-A



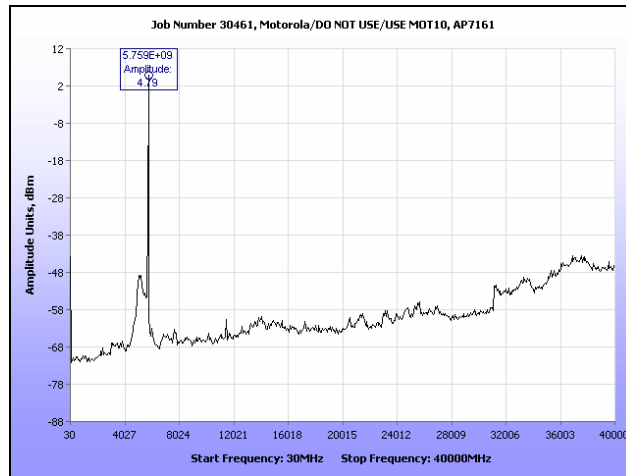
Plot 230. Conducted Spurious Emissions, Low Channel, 802.11a, R3-B



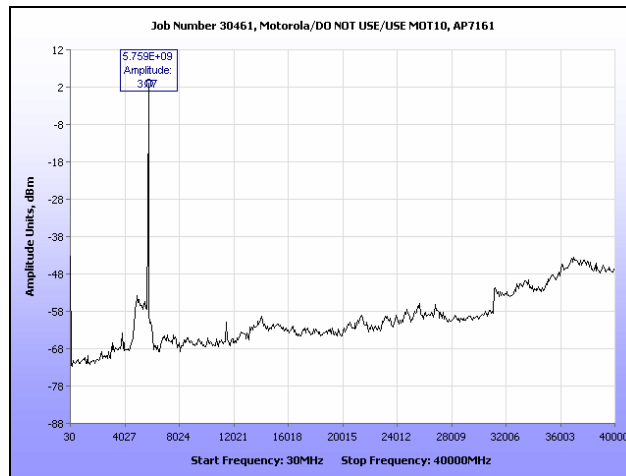
Plot 231. Conducted Spurious Emissions, Low Channel, 802.11a, R3-C



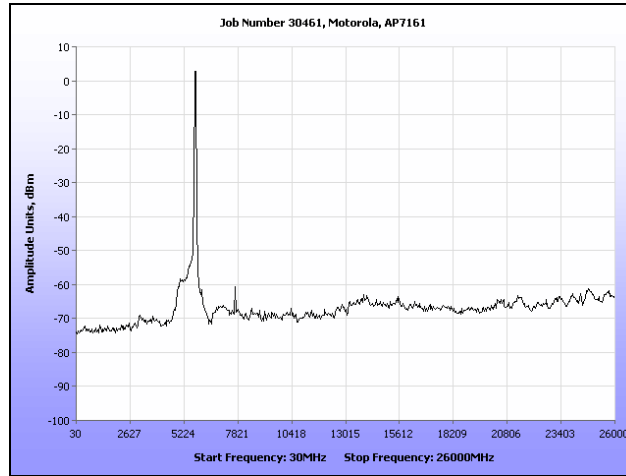
Plot 232. Conducted Spurious Emissions, Low Channel, 802.11n 20 MHz, R3-A



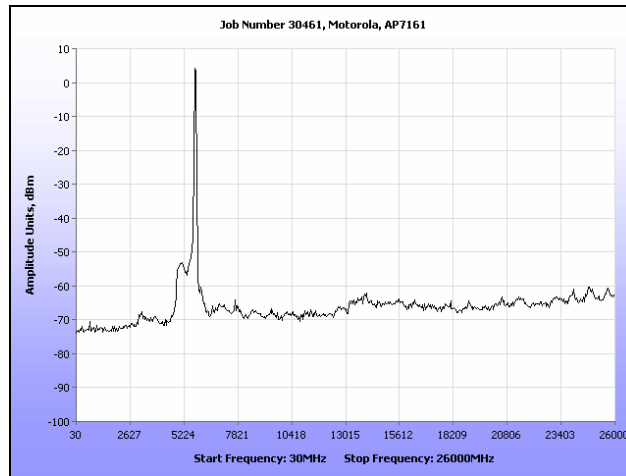
Plot 233. Conducted Spurious Emissions, Low Channel, 802.11n 20 MHz, R3-B



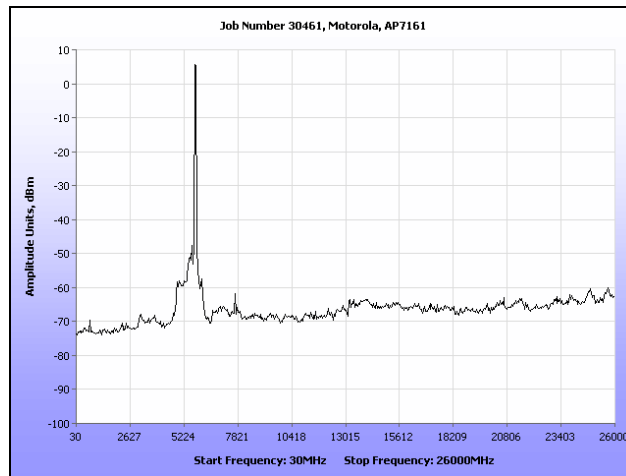
Plot 234. Conducted Spurious Emissions, Low Channel, 802.11n 20 MHz, R3-C



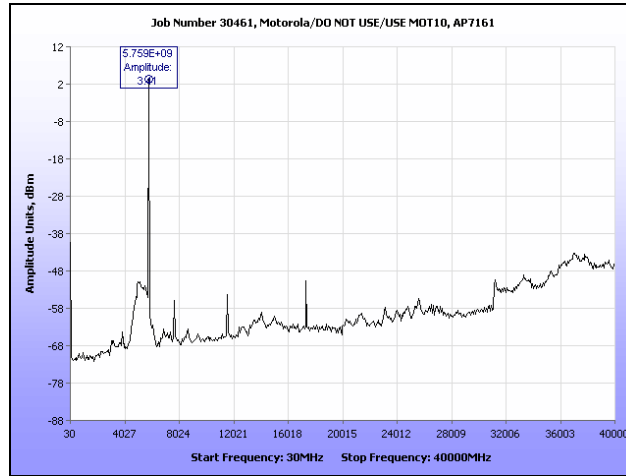
Plot 235. Conducted Spurious Emissions, Low Channel, 802.11n 40 MHz, R3-A



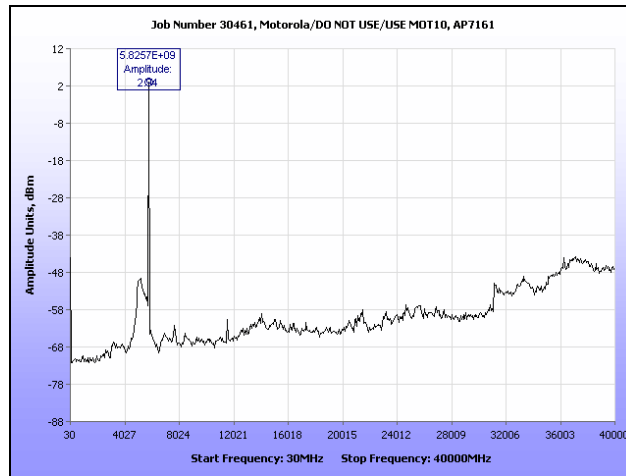
Plot 236. Conducted Spurious Emissions, Low Channel, 802.11n 40 MHz, R3-B



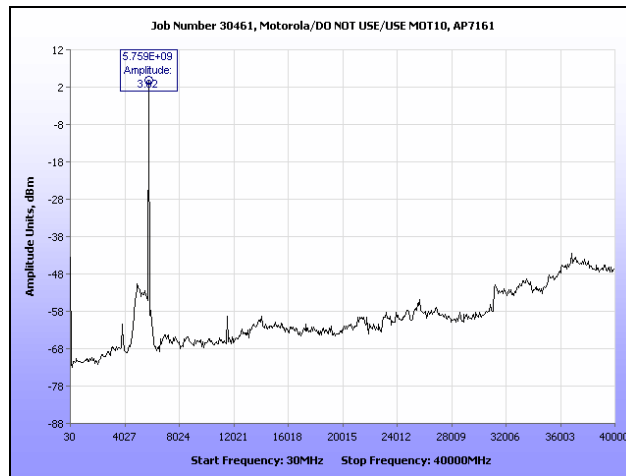
Plot 237. Conducted Spurious Emissions, Low Channel, 802.11n 40 MHz, R3-C



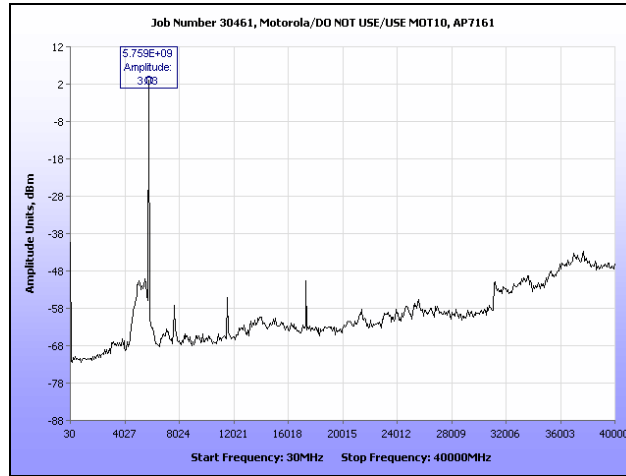
Plot 238. Conducted Spurious Emissions, Mid Channel, 802.11a, R3-A



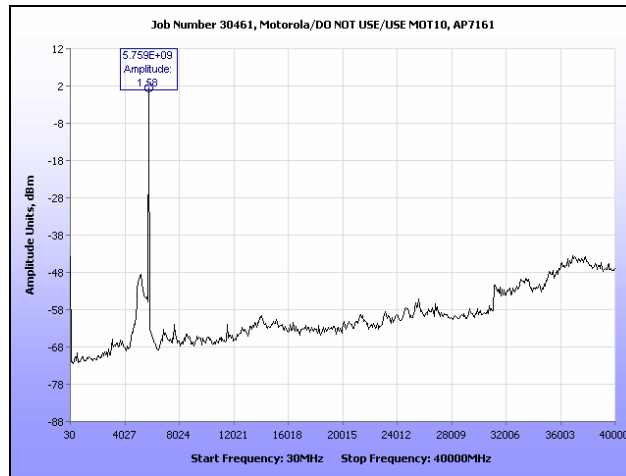
Plot 239. Conducted Spurious Emissions, Mid Channel, 802.11a, R3-B



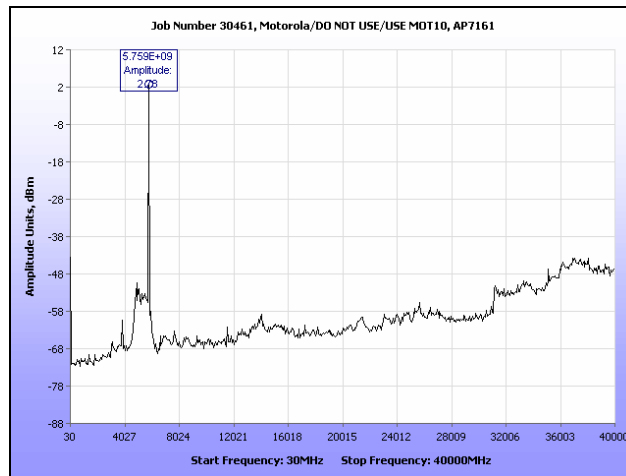
Plot 240. Conducted Spurious Emissions, Mid Channel, 802.11a, R3-C



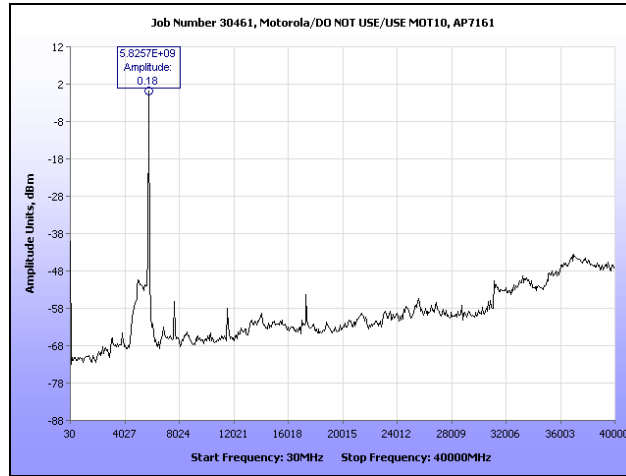
Plot 241. Conducted Spurious Emissions, Mid Channel, 802.11n 20 MHz, R3-A



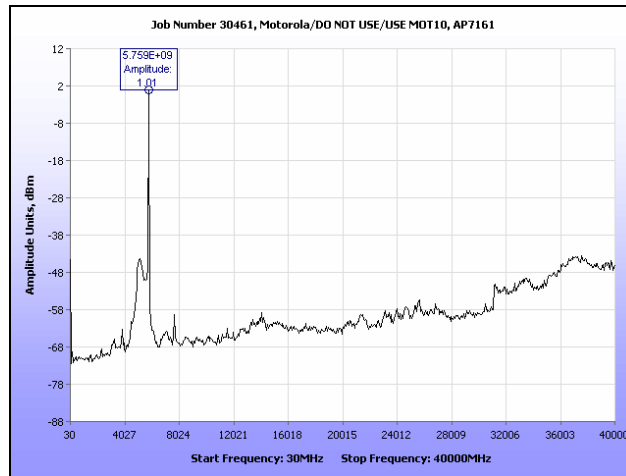
Plot 242. Conducted Spurious Emissions, Mid Channel, 802.11n 20 MHz, R3-B



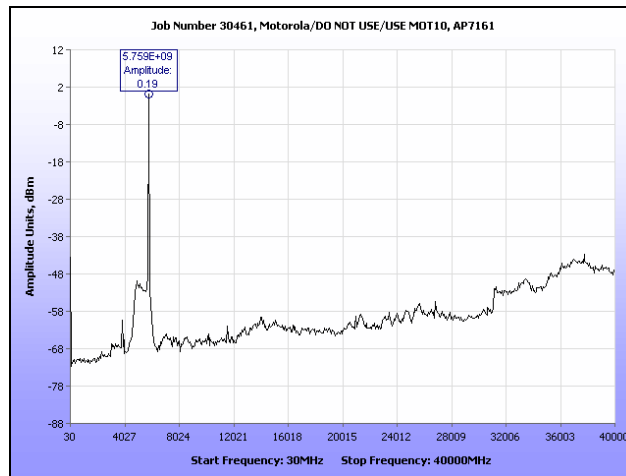
Plot 243. Conducted Spurious Emissions, Mid Channel, 802.11n 20 MHz, R3-C



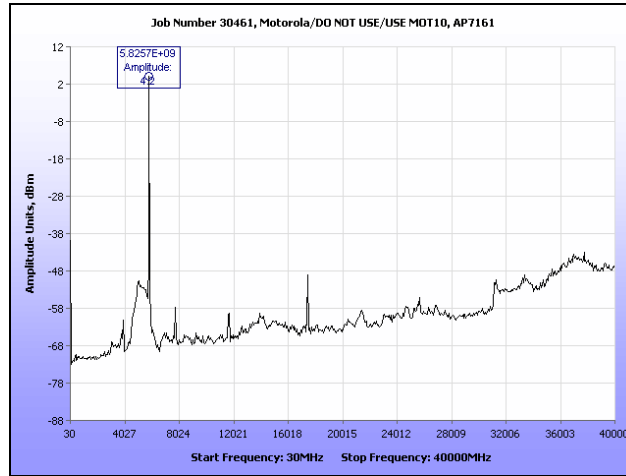
Plot 244. Conducted Spurious Emissions, Mid Channel, 802.11n 40 MHz, R3-A



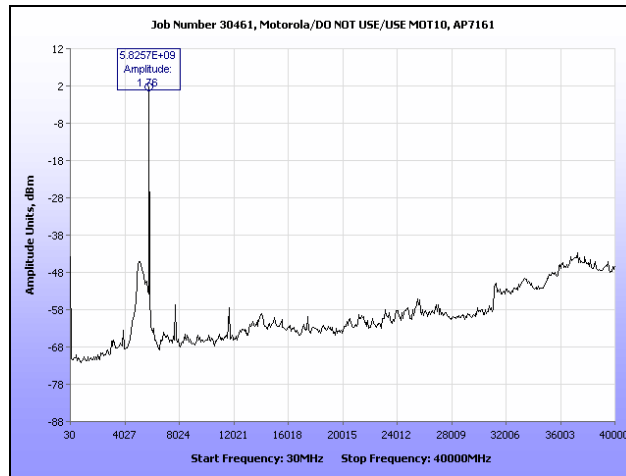
Plot 245. Conducted Spurious Emissions, Mid Channel, 802.11n 40 MHz, R3-B



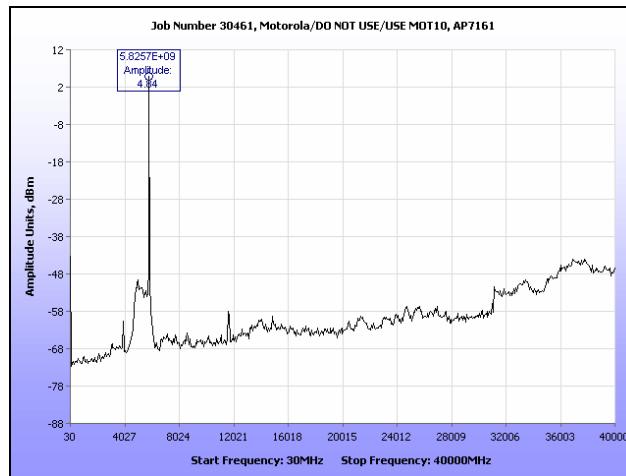
Plot 246. Conducted Spurious Emissions, Mid Channel, 802.11n 40 MHz, R3-C



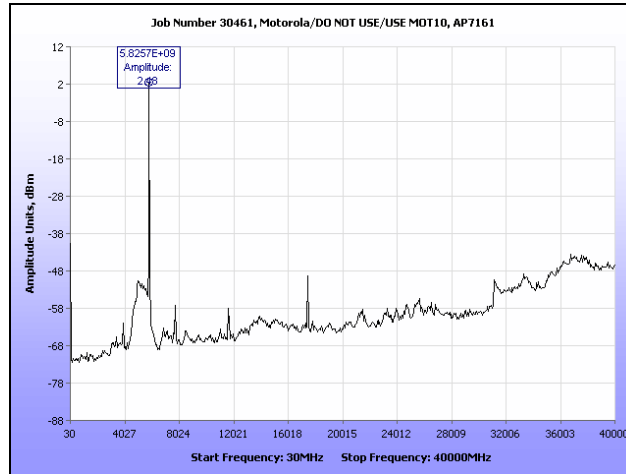
Plot 247. Conducted Spurious Emissions, High Channel, 802.11a, R3-A



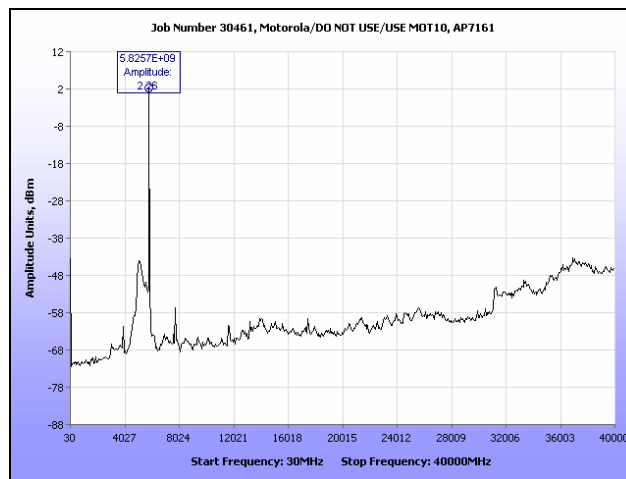
Plot 248. Conducted Spurious Emissions, High Channel, 802.11a, R3-B



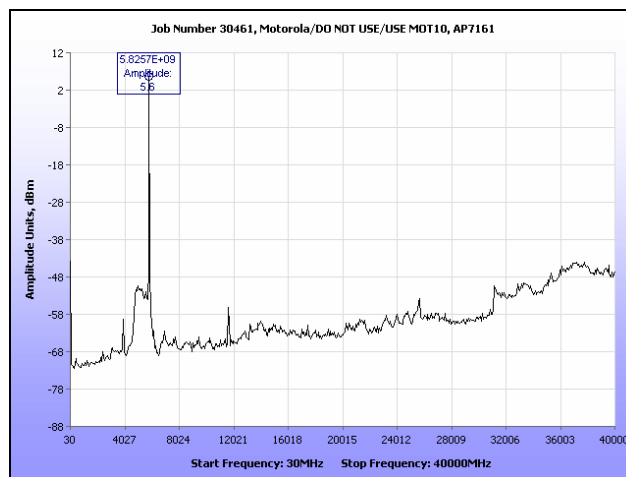
Plot 249. Conducted Spurious Emissions, High Channel, 802.11a, R3-C



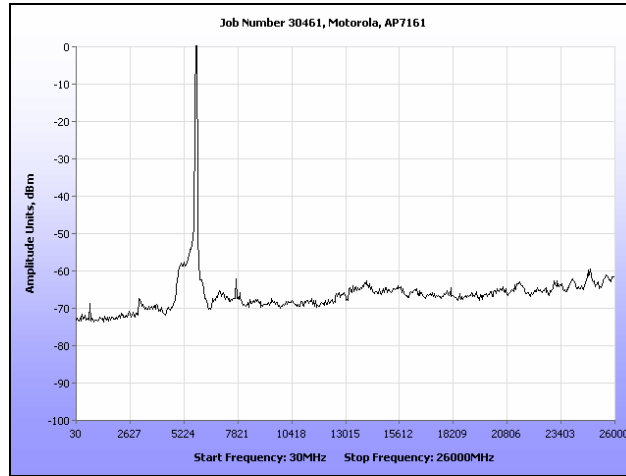
Plot 250. Conducted Spurious Emissions, High Channel, 802.11n 20 MHz, R3-A



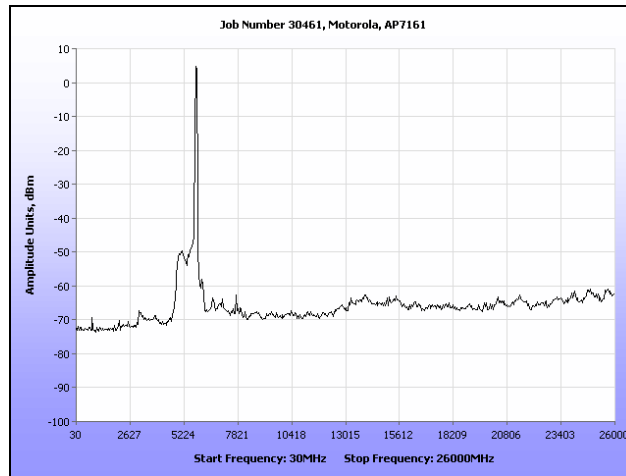
Plot 251. Conducted Spurious Emissions, High Channel, 802.11n 20 MHz, R3-B



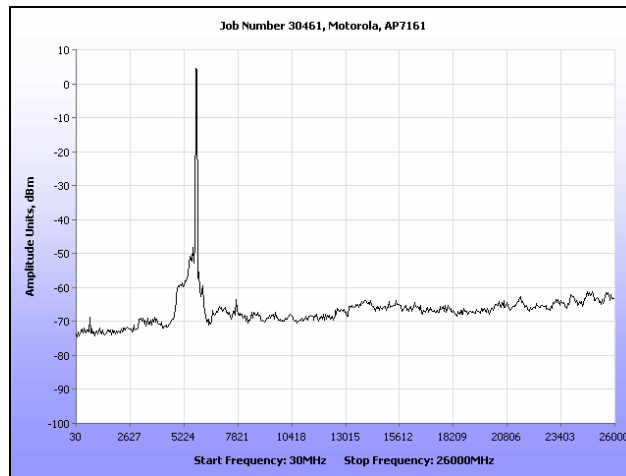
Plot 252. Conducted Spurious Emissions, High Channel, 802.11n 20 MHz, R3-C



Plot 253. Conducted Spurious Emissions, High Channel, 802.11n 40 MHz, R3-A

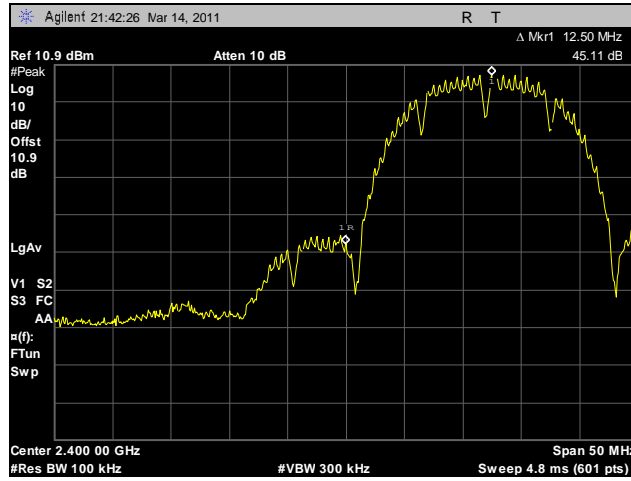


Plot 254. Conducted Spurious Emissions, High Channel, 802.11n 40 MHz, R3-B

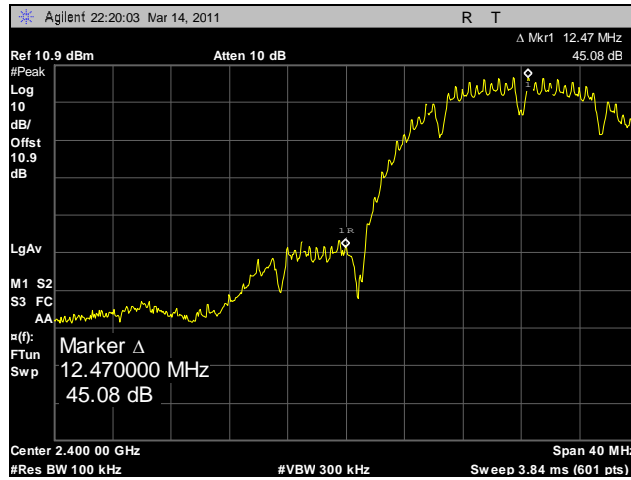


Plot 255. Conducted Spurious Emissions, High Channel, 802.11n 40 MHz, R3-C

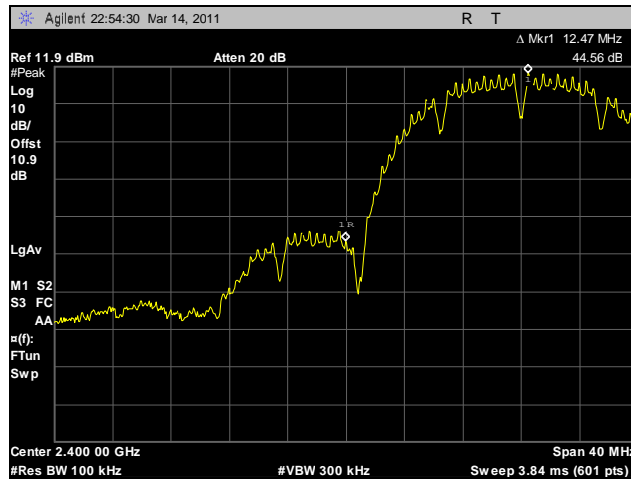
Conducted Band Edge Test Results. 2.4 GHz



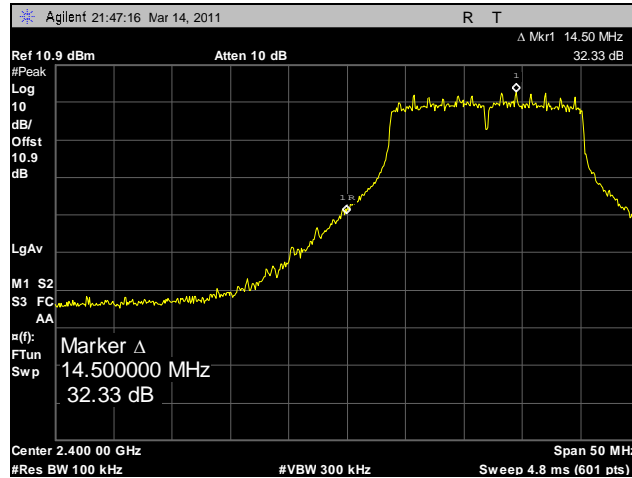
Plot 256. Conducted Band Edge, Low Channel, 802.11b, Port A



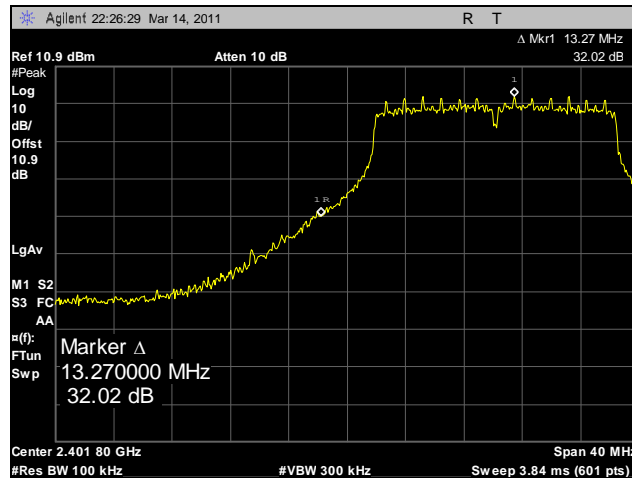
Plot 257. Conducted Band Edge, Low Channel, 802.11b, Port B



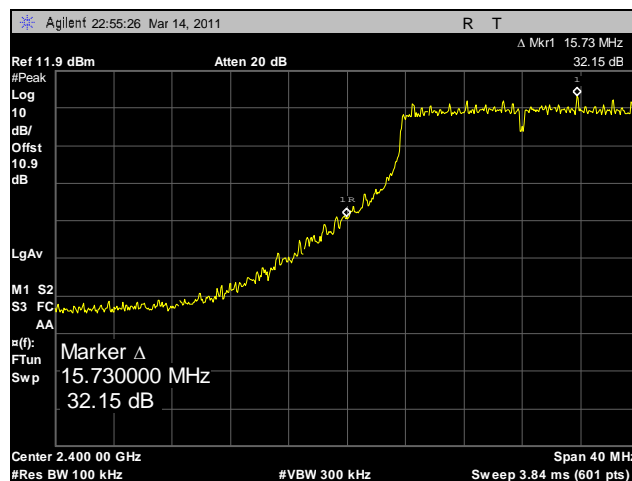
Plot 258. Conducted Band Edge, Low Channel, 802.11b, Port C



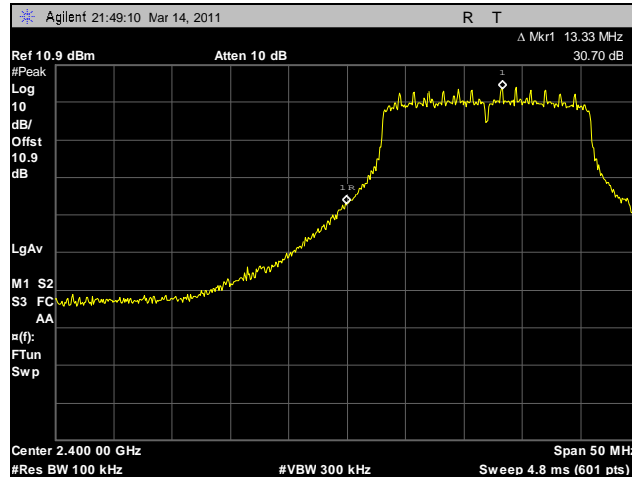
Plot 259. Conducted Band Edge, Low Channel, 802.11g, Port A



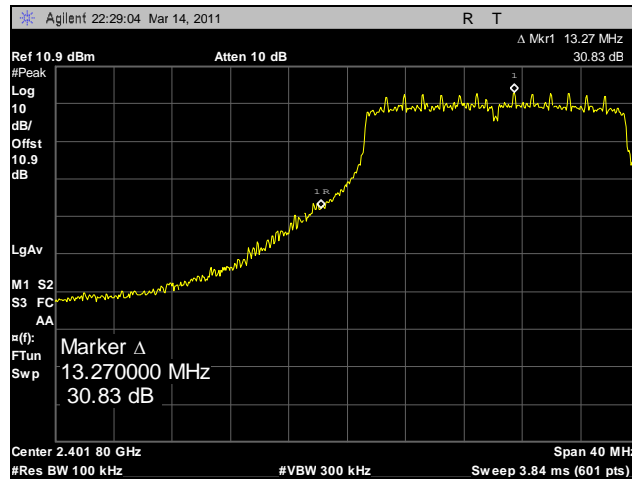
Plot 260. Conducted Band Edge, Low Channel, 802.11g, Port B



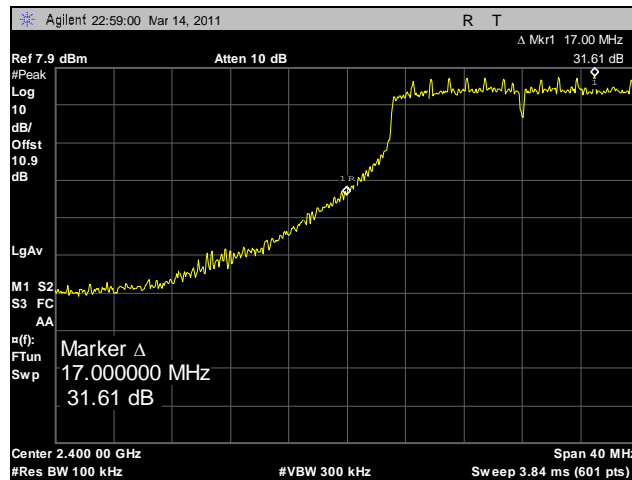
Plot 261. Conducted Band Edge, Low Channel, 802.11g, Port C



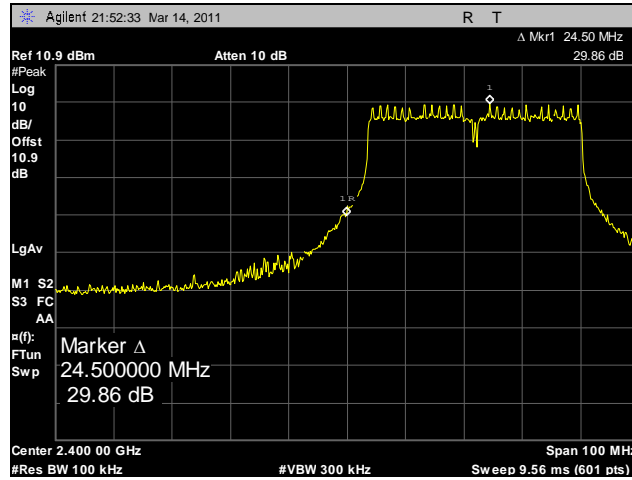
Plot 262. Conducted Band Edge, Low Channel, 802.11g 20 MHz, Port A



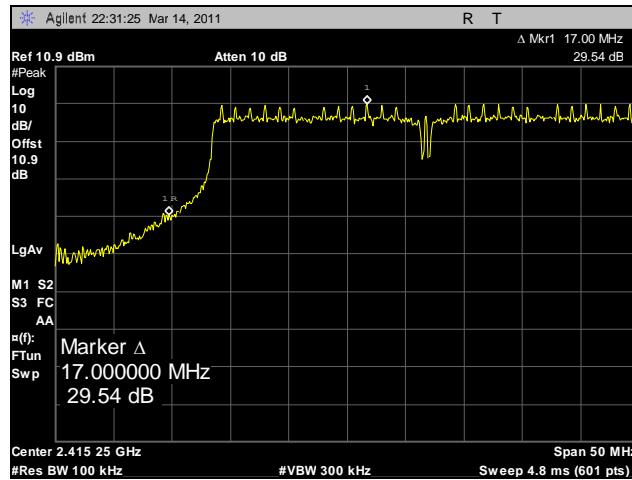
Plot 263. Conducted Band Edge, Low Channel, 802.11g 20 MHz, Port B



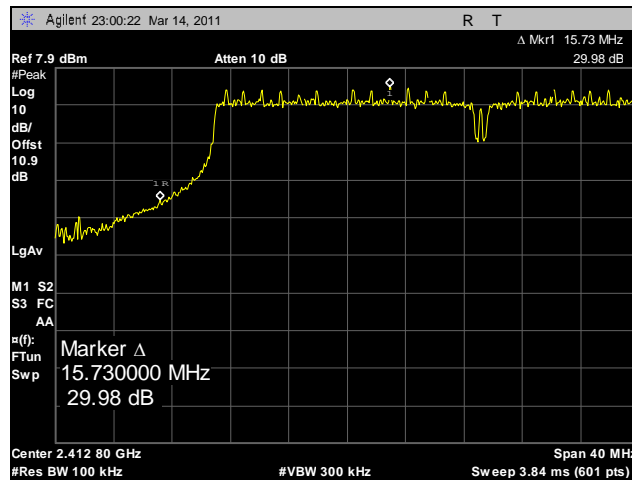
Plot 264. Conducted Band Edge, Low Channel, 802.11g 20 MHz, Port C



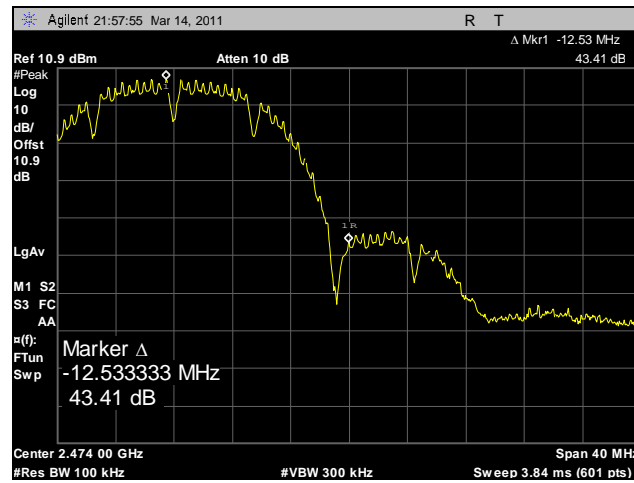
Plot 265. Conducted Band Edge, Low Channel, 802.11g 40 MHZ, Port A



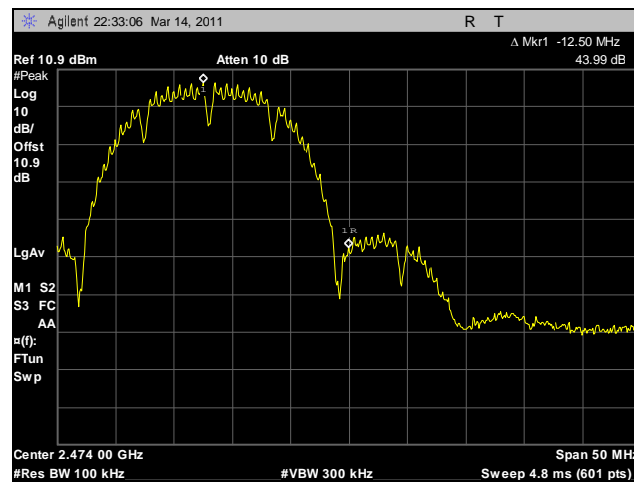
Plot 266. Conducted Band Edge, Low Channel, 802.11g 40 MHZ, Port B



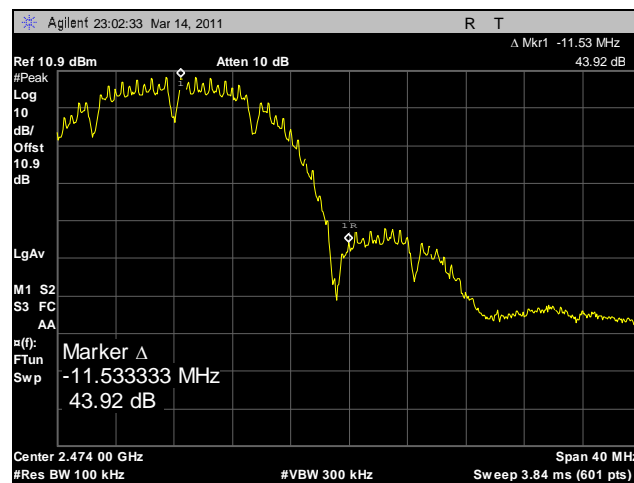
Plot 267. Conducted Band Edge, Low Channel, 802.11g 40 MHZ, Port C



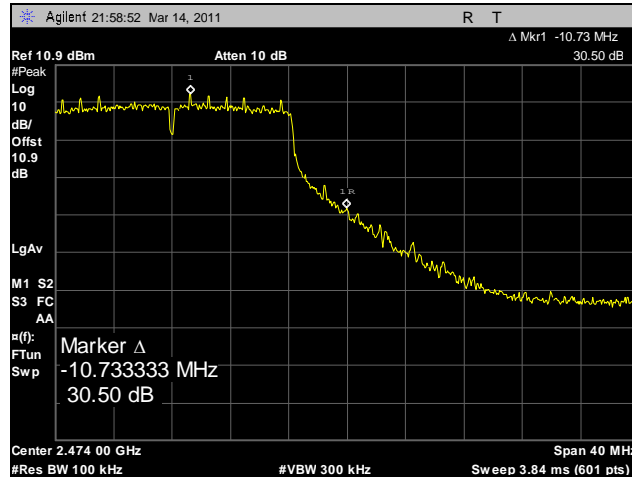
Plot 268. Conducted Band Edge, High Channel, 802.11b, Port A



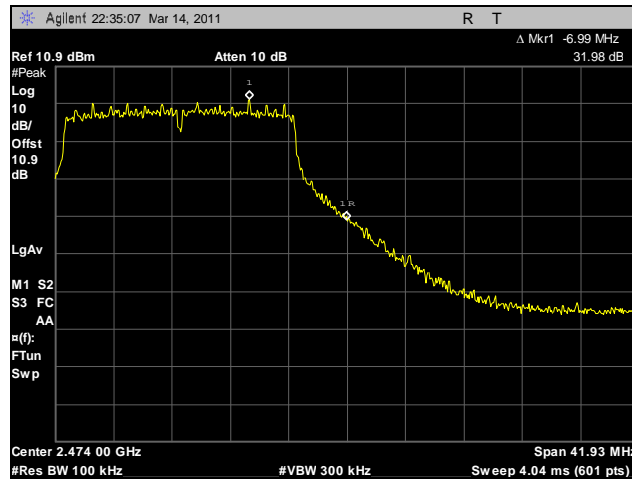
Plot 269. Conducted Band Edge, High Channel, 802.11g, Port B



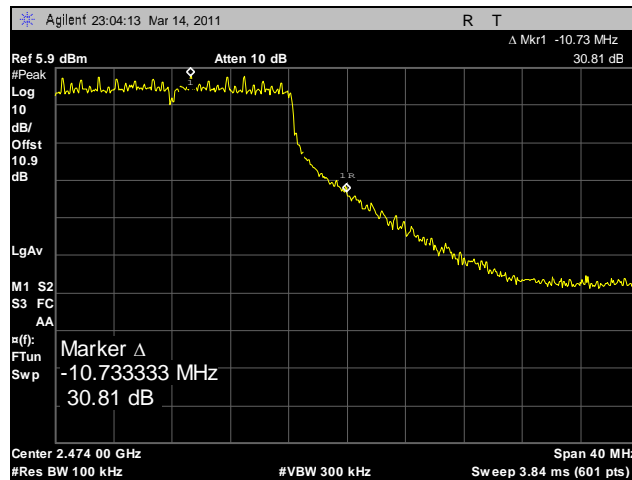
Plot 270. Conducted Band Edge, High Channel, 802.11b, Port C



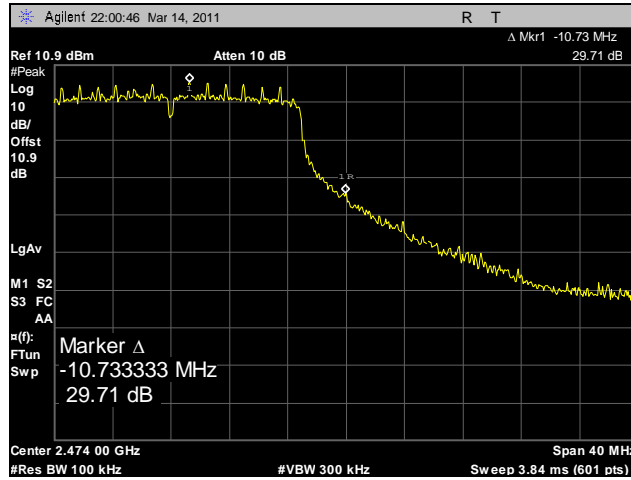
Plot 271. Conducted Band Edge, High Channel, 802.11g, Port A



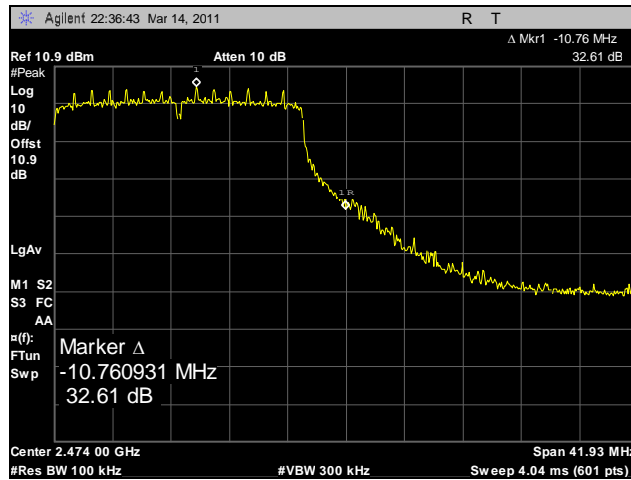
Plot 272. Conducted Band Edge, High Channel, 802.11g, Port B



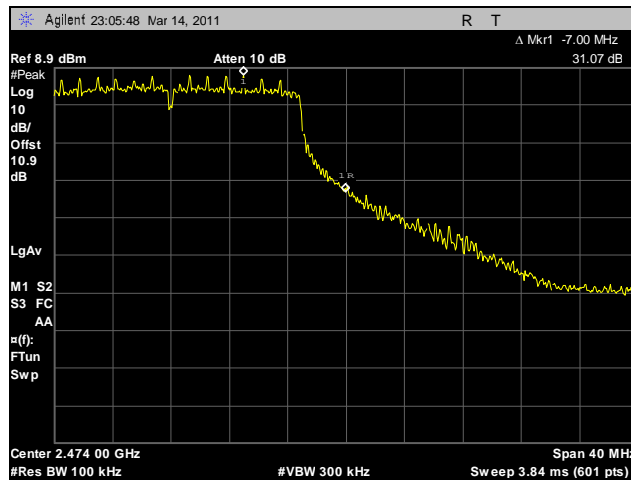
Plot 273. Conducted Band Edge, High Channel, 802.11g, Port C



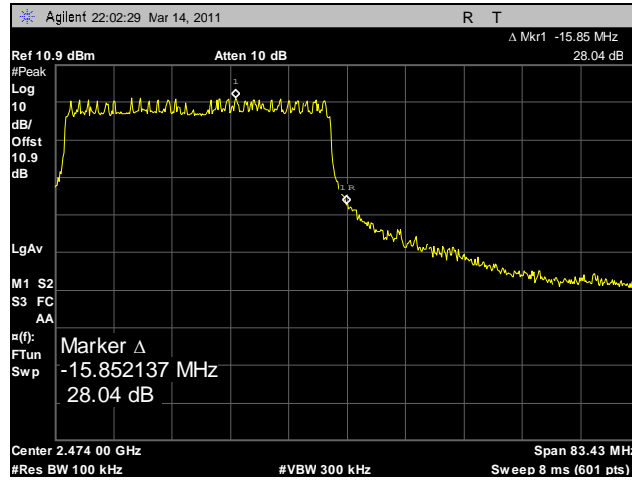
Plot 274. Conducted Band Edge, High Channel, 802.11g 20 MHz, Port A



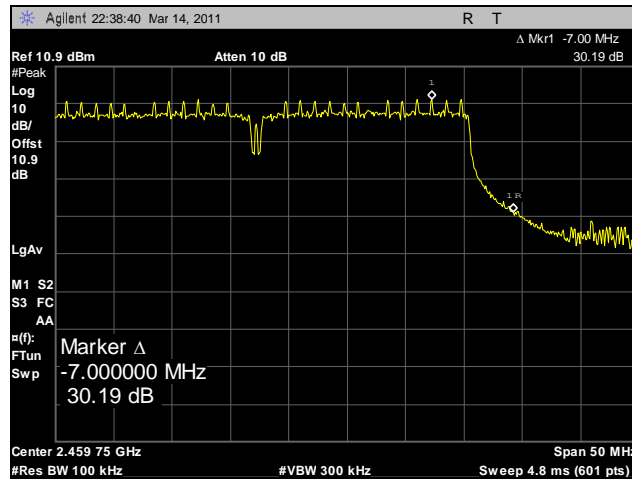
Plot 275. Conducted Band Edge, High Channel, 802.11g 20 MHz, Port B



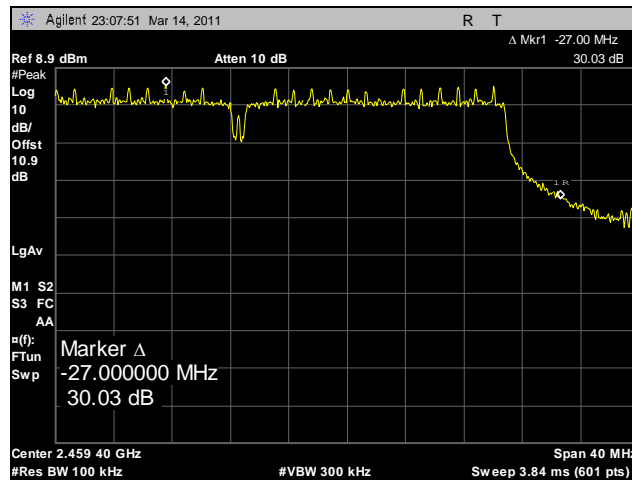
Plot 276. Conducted Band Edge, High Channel, 802.11g 20 MHz, Port C



Plot 277. Conducted Band Edge, High Channel, 802.11g 40 MHz, Port A

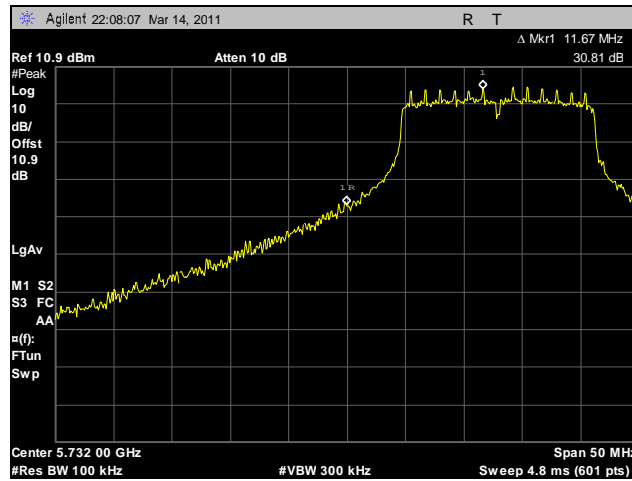


Plot 278. Conducted Band Edge, High Channel, 802.11g 40 MHz, Port B

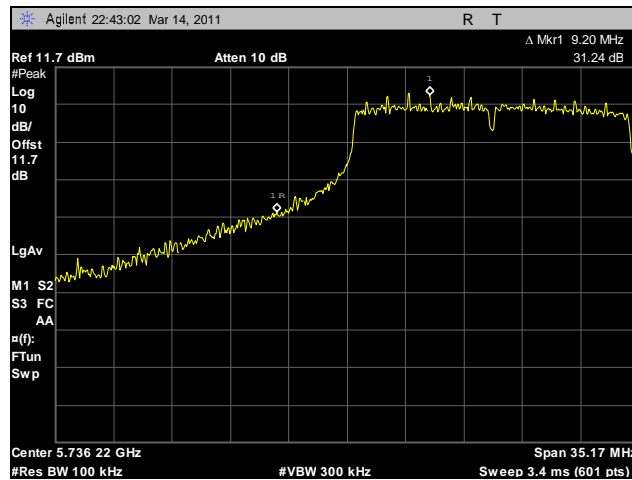


Plot 279. Conducted Band Edge, High Channel, 802.11g 40 MHz, Port C

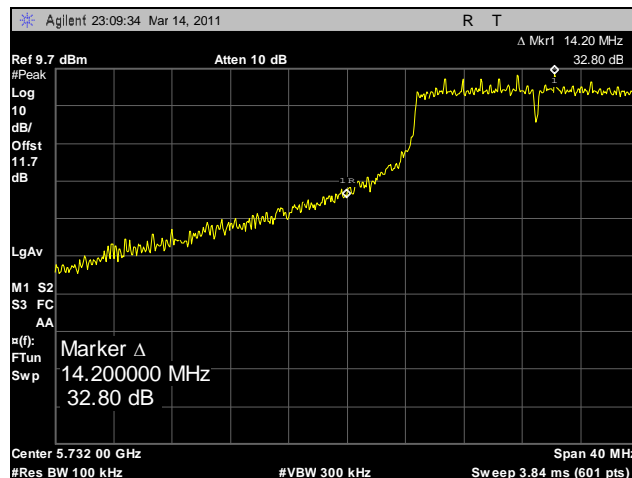
Conducted Band Edge Test Results. 5.8 GHz



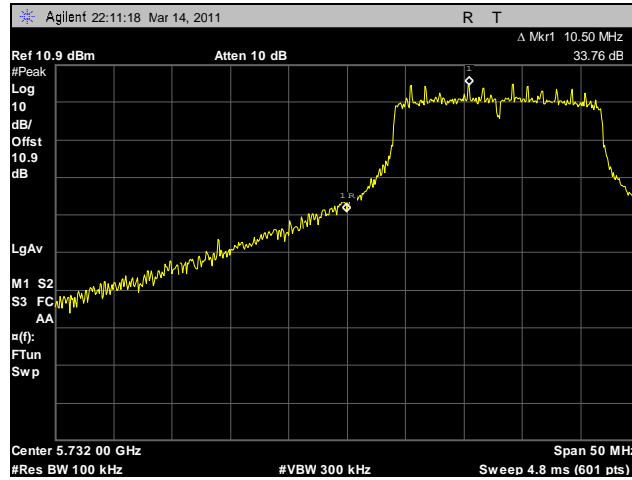
Plot 280. Conducted Band Edge, Low Channel, 802.11a, Port A



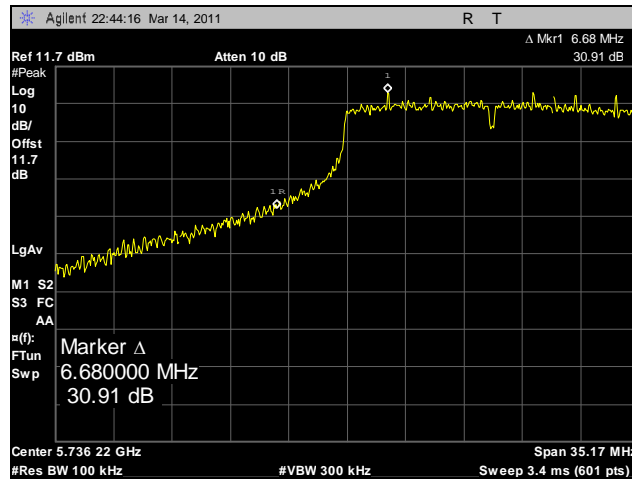
Plot 281. Conducted Band Edge, Low Channel, 802.11a, Port B



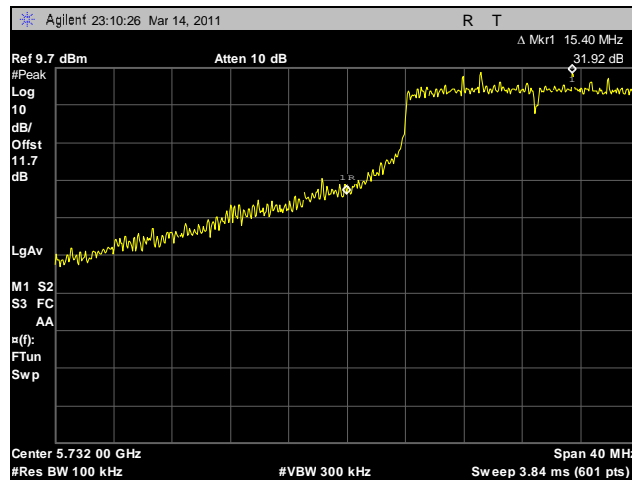
Plot 282. Conducted Band Edge, Low Channel, 802.11a, Port C



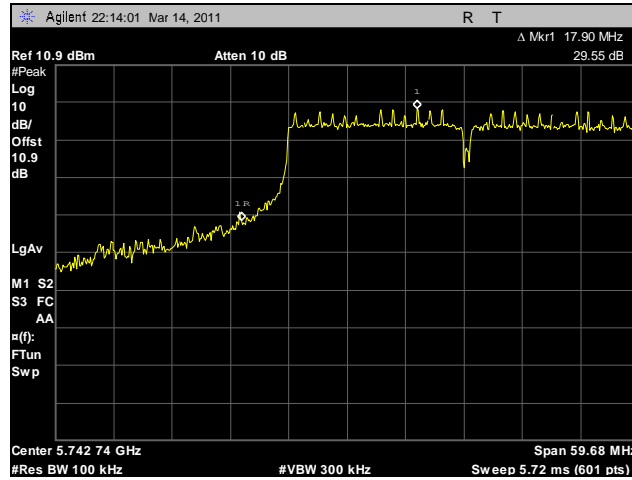
Plot 283. Conducted Band Edge, Low Channel, 802.11g 20 MHz, Port A



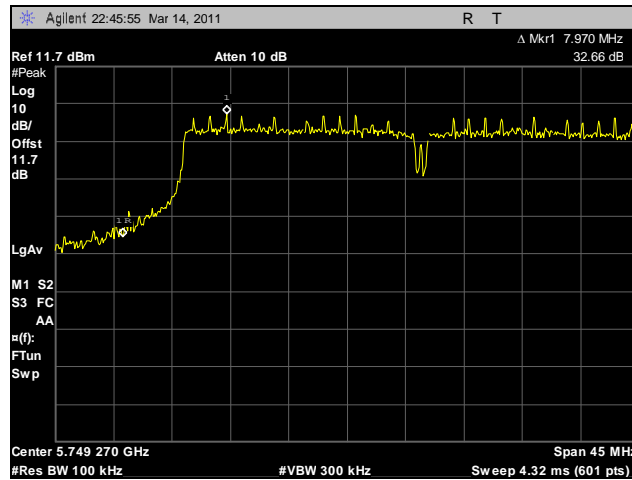
Plot 284. Conducted Band Edge, Low Channel, 802.11g 20 MHz, Port B



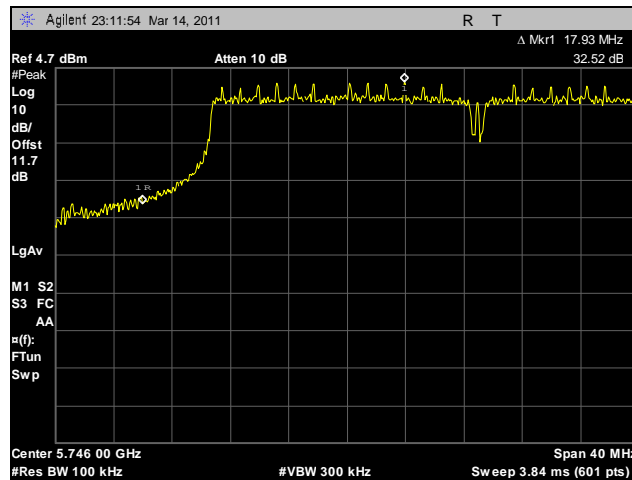
Plot 285. Conducted Band Edge, Low Channel, 802.11g 20 MHz, Port C



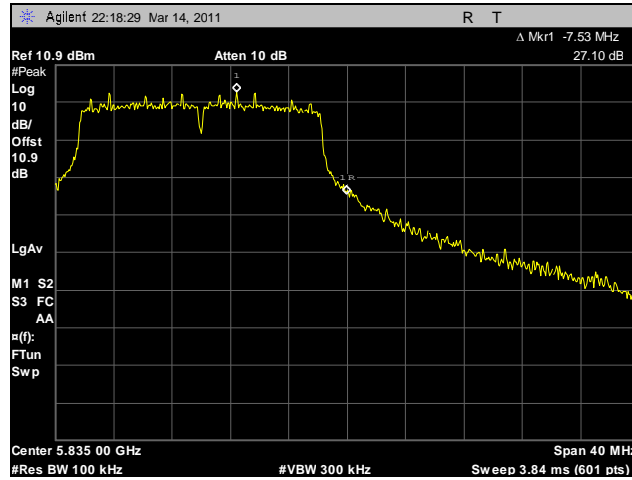
Plot 286. Conducted Band Edge, Low Channel, 802.11g 40 MHZ, Port A



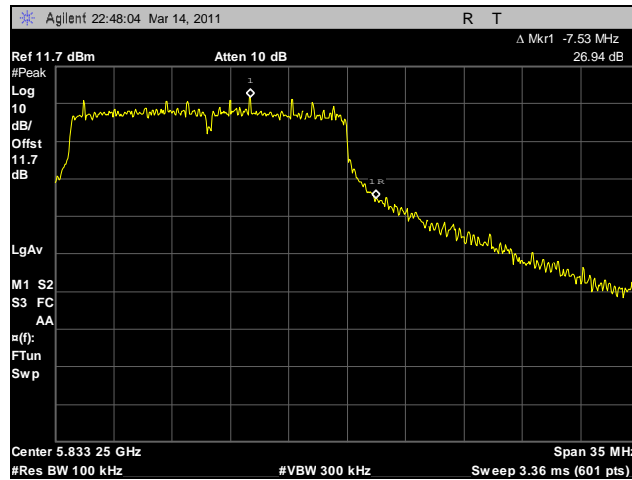
Plot 287. Conducted Band Edge, Low Channel, 802.11g 40 MHZ, Port B



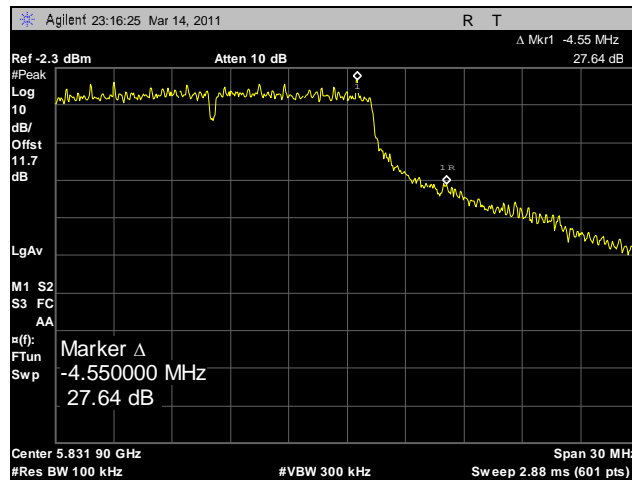
Plot 288. Conducted Band Edge, Low Channel, 802.11g 40 MHZ, Port C



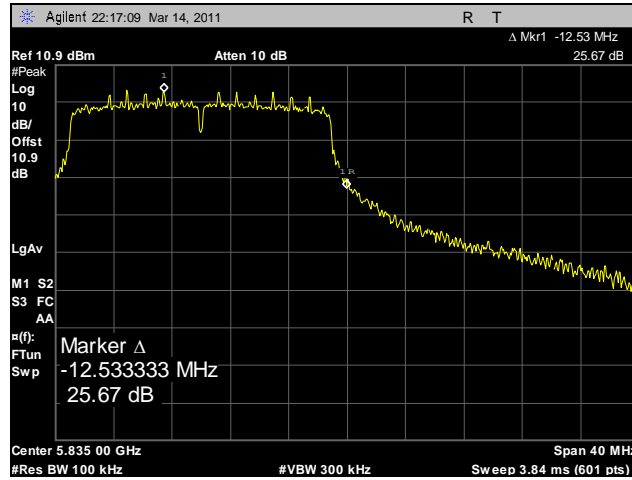
Plot 289. Conducted Band Edge, High Channel, 802.11a, Port A



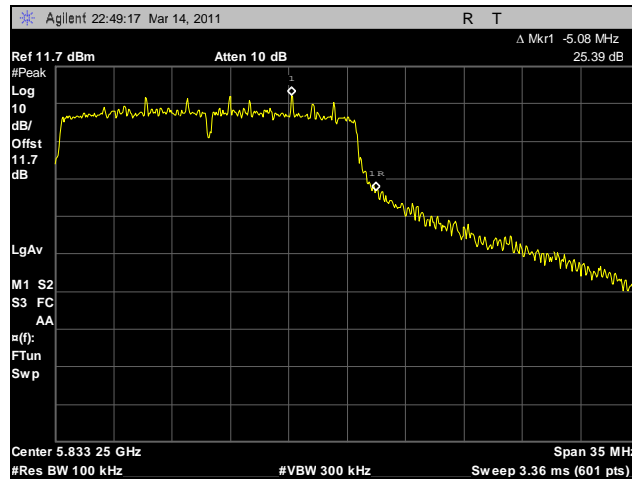
Plot 290. Conducted Band Edge, High Channel, 802.11a, Port B



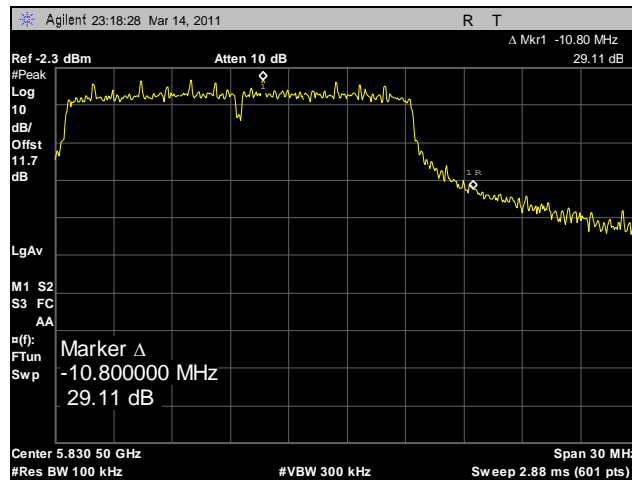
Plot 291. Conducted Band Edge, High Channel, 802.11a, Port C



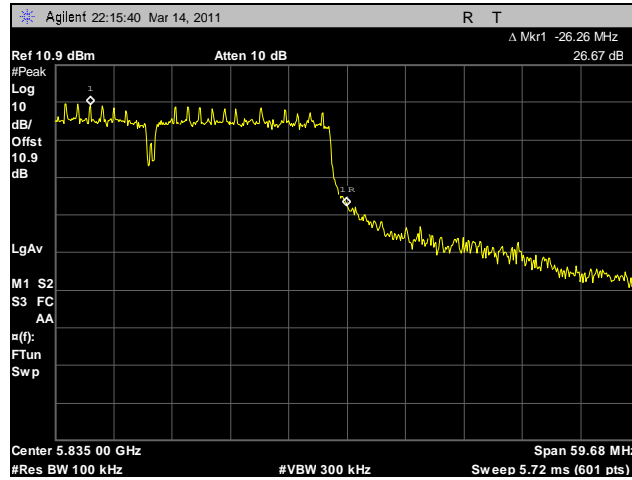
Plot 292. Conducted Band Edge, High Channel, 802.11g 20 MHz, Port A



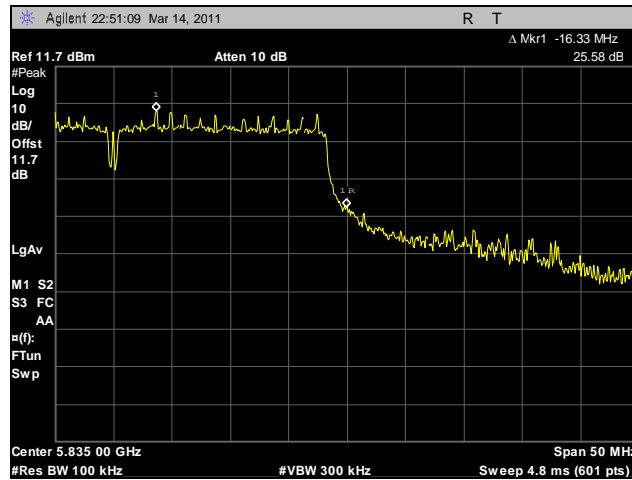
Plot 293. Conducted Band Edge, High Channel, 802.11g 20 MHz, Port B



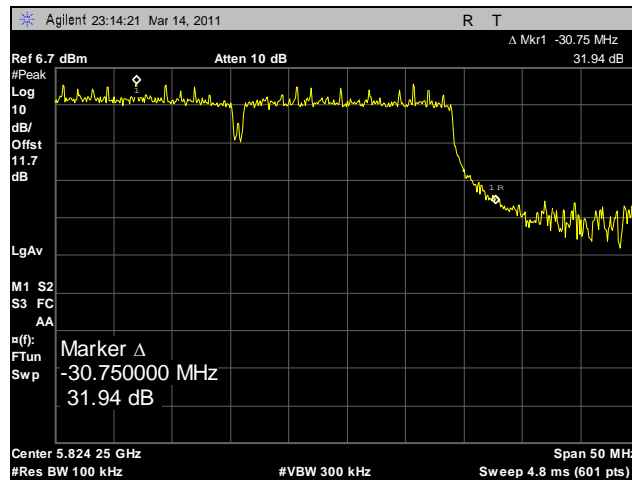
Plot 294. Conducted Band Edge, High Channel, 802.11g 20 MHz, Port C



Plot 295. Conducted Band Edge, High Channel, 802.11g 40 MHz, Port A



Plot 296. Conducted Band Edge, High Channel, 802.11g 40 MHz, Port B



Plot 297. Conducted Band Edge, High Channel, 802.11g 40 MHz, Port C

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(e) Peak Power Spectral Density

Test Requirements: §15.247(e): For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

Test Procedure: The transmitter was connected directly to a Spectrum Analyzer through an attenuator. The power level was set to the maximum level throughout each of the 100 sweeps of power averaging. The RBW was set to 3 kHz and a VBW set to 9 kHz or greater. The spectrum analyzer was set to an auto sweep time and a peak detector was used. Measurements were carried out at the low, mid and high channels.

Test Results: The EUT was compliant with the peak power spectral density limits of § 15.247 (e).
The peak power spectral density was determined from plots on the following page(s).

Test Engineer: Jeff Pratt and Dan Youngcourt

Test Date: 03/07/11

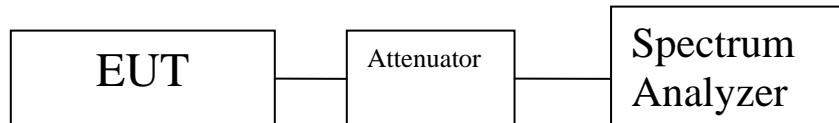


Figure 5. Block Diagram, Peak Power Spectral Density Test Setup

Peak Power Spectral Density Test Results

Frequency (MHz)	Mode/Modulation Type	Maximum Allowable Spectral Density w/ 8dBi gain (dBm)	Port A Spectral Density (dBm)	Port B Spectral Density (dBm)	Port C Spectral Density (dBm)	Summed Spectral Density (dBm)	Port A Spectral Density (mW)	Port B Spectral Density (mW)	Port C Spectral Density (mW)	Summed Spectral Density (mW)
2412	802.11b	1.23	-5.49	-6.69	-8.09	-1.864	0.282	0.214	0.155	0.652
2437	802.11b	1.23	-4.09	-6.37	-6.12	-0.630	0.390	0.231	0.244	0.865
2462	802.11b	1.23	-6.21	-6.13	-5.41	-1.130	0.239	0.244	0.288	0.771
2412	802.11g	1.23	-3.61	-5.24	-8.45	-0.567	0.436	0.299	0.143	0.878
2437	802.11g	1.23	-6.51	-3.53	-9.95	-1.146	0.223	0.444	0.101	0.768
2462	802.11g	1.23	-3.43	-5.45	-5.99	-0.040	0.454	0.285	0.252	0.991
2412	802.11g HT20	1.23	-8.56	-5.43	-9.66	-2.726	0.139	0.286	0.108	0.534
2437	802.11g HT20	1.23	-6.61	-3.75	-10.55	-1.378	0.218	0.422	0.088	0.728
2462	802.11g HT20	1.23	-5.63	-7.77	-4.56	-1.021	0.274	0.167	0.350	0.791
2422	802.11g HT40	1.23	-5.35	-9.32	-14.47	-3.522	0.292	0.117	0.036	0.444
2437	802.11g HT40	1.23	-3.52	-6.09	-14.9	-1.408	0.445	0.246	0.032	0.723
2452	802.11g HT40	1.23	-3.57	-10.81	-14.22	-2.515	0.440	0.083	0.038	0.560

Table 28. Peak Power Spectral Density, Test Results, 2.4 GHz

Frequency (MHz)	Mode / Modulation Type	Maximum Spectral Density w/ 10dBi gain (dBm / MHz)	Port A Spectral Density (dBm / MHz)	Port B Spectral Density (dBm / MHz)	Port C Spectral Density (dBm / MHz)	Summed Spectral Density (mW / MHz)	Summed Spectral Density (dBm / MHz)	Relative Margin (dB)	Port A SD (mW / MHz)	Port B SD (mW / MHz)	Port C SD (mW / MHz)
5745	802.11a	-0.77	-8.65	-11.74	-12.61	0.25827447	-5.8791852	-5.1091852	0.13645831	0.06698846	0.0548277
5785	802.11a	-0.77	-10.89	-12.36	-12.4	0.19709086	-7.0533351	-6.2833351	0.08147043	0.05807644	0.05754399
5825	802.11a	-0.77	-11.27	-5.91	-9.04	0.45583163	-3.4119554	-2.6419554	0.07464488	0.2564484	0.12473835
5745	802.11n HT20	-0.77	-8.08	-12.48	-10.88	0.2937485	-5.3202435	-4.5502435	0.15559656	0.0564937	0.08165824
5785	802.11n HT20	-0.77	-7.22	-10.2	-3.6	0.72168568	-1.4165191	-0.6465191	0.18967059	0.09549926	0.43651583
5825	802.11n HT20	-0.77	-9.89	-5.67	-8.4	0.51812833	-2.8556266	-2.0856266	0.10256519	0.27101916	0.14454398
5755	802.11n HT40	-0.77	-11.26	-9.88	-10.37	0.26945184	-5.6951885	-4.9251885	0.07481695	0.10280163	0.09183326
5785	802.11n HT40	-0.77	-11.93	-9.07	-3.34	0.65144754	-1.8612055	-1.0912055	0.06412096	0.12387966	0.46344692
5815	802.11n HT40	-0.77	-8.92	-7.38	-10.79	0.3944112	-4.0405076	-3.2705076	0.12823306	0.18281002	0.08336812

Table 29. Peak Power Spectral Density, Test Results, 5.8 GHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(i) Maximum Permissible Exposure

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 @ 2400-2483.5 MHz; highest conducted power = 22.48dBm (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm² or 10 W/m²**

Gain of Antenna Elements @ 2.4GHz = 8 dBi
of Antenna Elements = 3
EUT maximum antenna gain = 8dBi + 10*log(3)dBi = 12.77 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/cm²)
P = Power Input to antenna (177.22mW)
G = Antenna Gain (18.92 numeric)

$$R = (177.22 * 18.92 / 4 * 3.14 * 1.0)^{1/2} = (3353.0024 / 12.56)^{1/2} = 16.34 \text{ cm}$$

MPE Limit Calculation: EUT's operating frequencies @ 5725-5850 MHz; highest conducted power = 20.93dBm (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm² or 10 W/m²**

Gain of Antenna Elements @ 5.8GHz = 10 dBi
off 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/cm²)
P = Power Input to antenna (123.81mW)
G = Antenna Gain (29.99 numeric)

$$R = (123.81 * 29.99 / 4 * 3.14 * 1.0)^{1/2} = (3712.96 / 12.56)^{1/2} = 17.19 \text{ cm}$$

Electromagnetic Compatibility Criteria for Intentional Radiators

RSS-GEN Receiver Spurious Emissions Requirements

Test Requirements: 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 30.

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

Table 30. 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 Procedures: The EUT was programmed for receive mode only. Conducted measurements were taken at the antenna port of the EUT. 100 kHz resolution bandwidth was used from 30 MHz - 1 GHz and 300 kHz resolution was used for measurements done above 1 GHz. All plots are corrected for cable loss.

Test Results: Equipment is compliant with the Receiver Spurious Emissions Requirements of RSS-GEN.

Test Engineer(s): Jeff Pratt

Test Date(s): 03/07/11

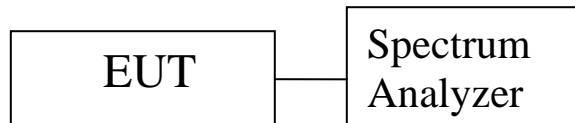
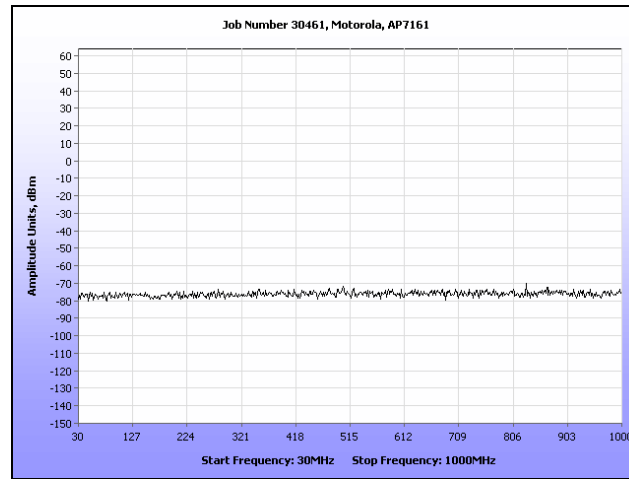
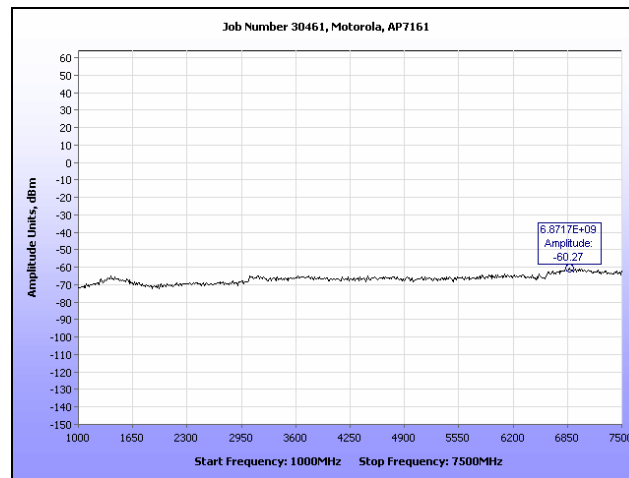


Figure 6. Block Diagram, Conducted Receiver Spurious Emissions Test Setup

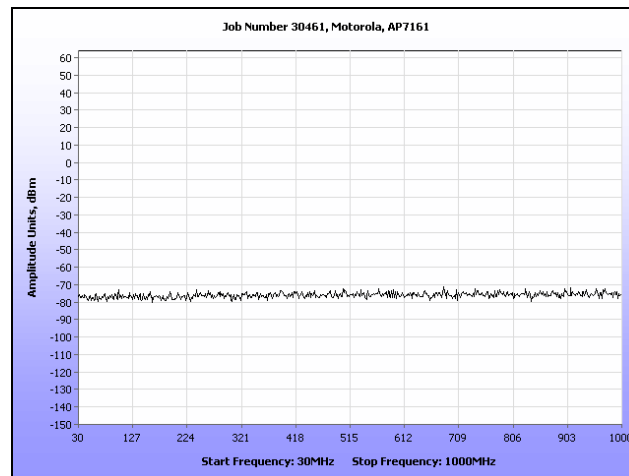
Conducted Receiver Spurious Emissions, 2.4 GHz



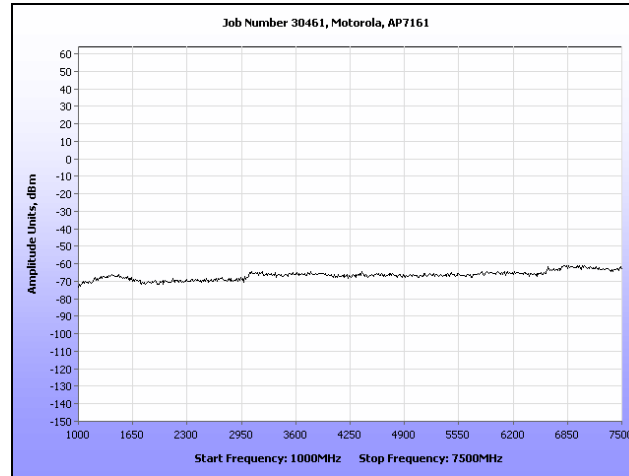
Plot 298. Receiver Spurious Emission, Port A, 30 MHz – 1 GHz



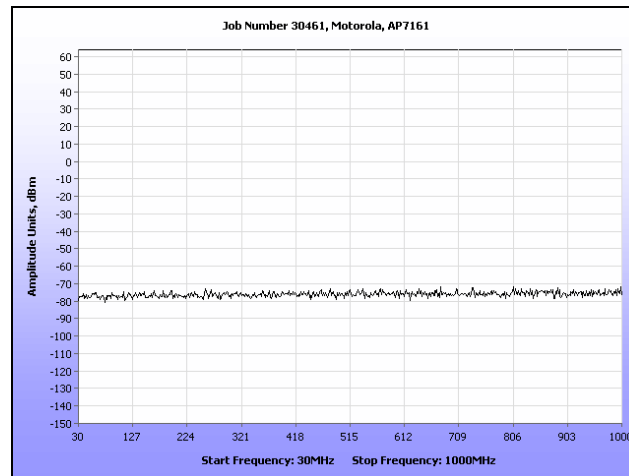
Plot 299. Receiver Spurious Emission, Port A, 1 GHz - 7.5 GHz



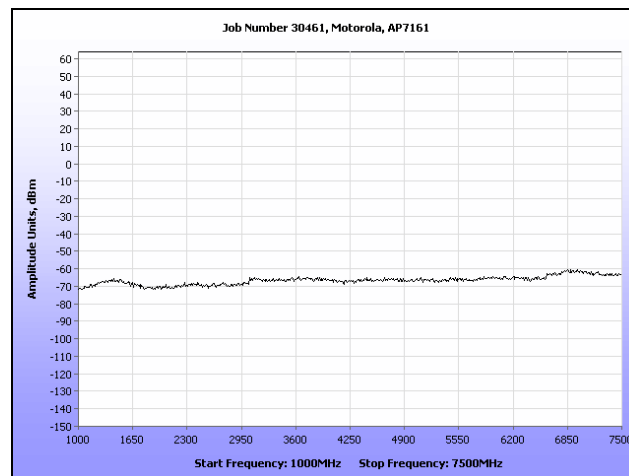
Plot 300. Receiver Spurious Emission, Port B, 30 MHz – 1 GHz



Plot 301. Receiver Spurious Emission, Port B, 1 GHz - 7.5 GHz

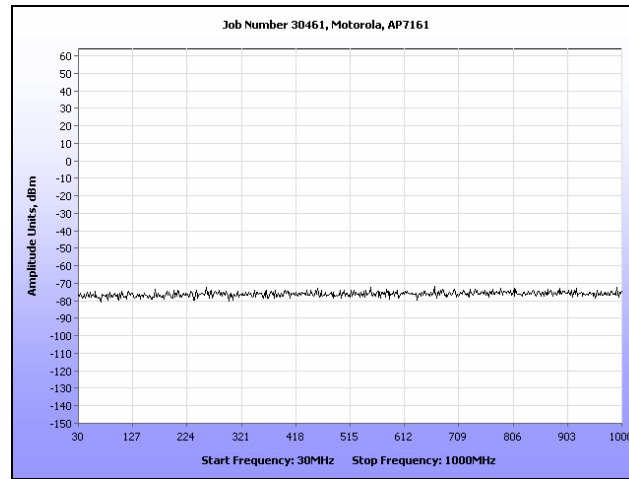


Plot 302. Receiver Spurious Emission, Port C, 30 MHz - 1 GHz

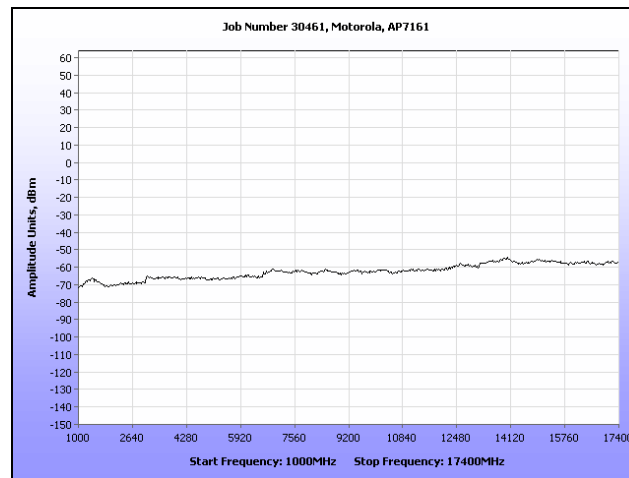


Plot 303. Receiver Spurious Emission, Port C, 1 - 7.5 GHz

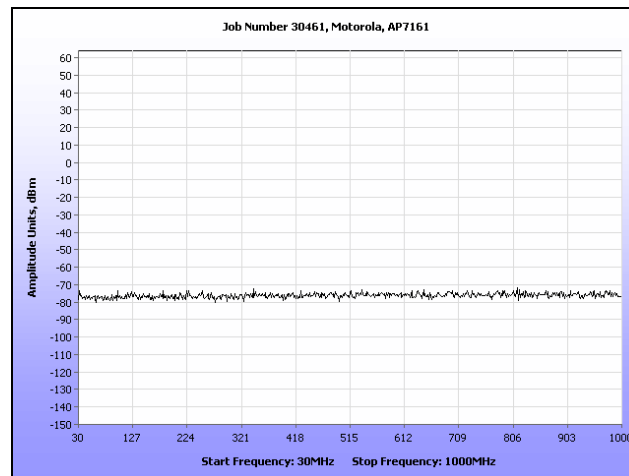
Conducted Receiver Spurious Emissions, 5.8 GHz



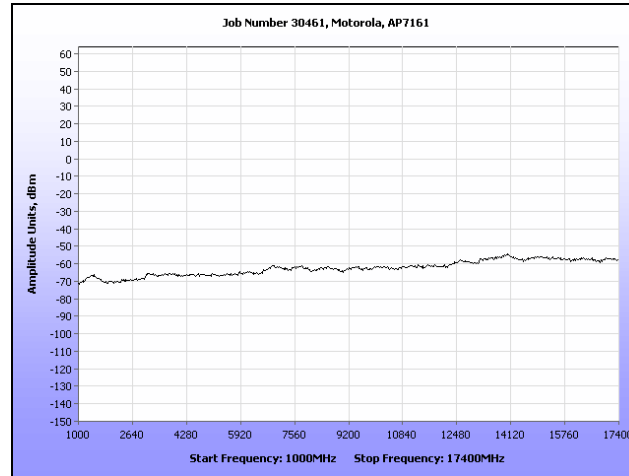
Plot 304. Receiver Spurious Emission, Port A, 30 MHz – 1 GHz



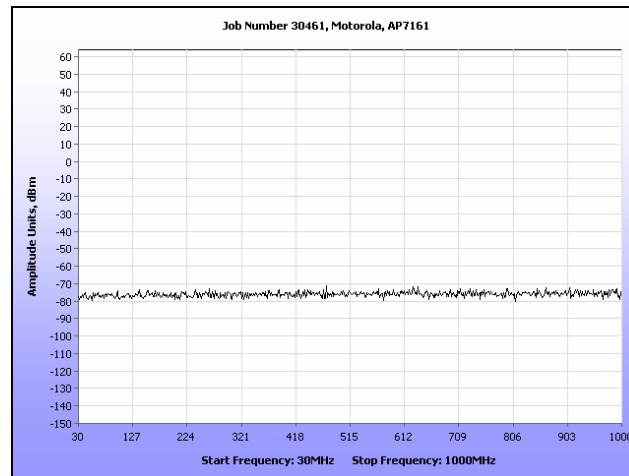
Plot 305. Receiver Spurious Emission, Port A, 1 GHz - 17.4 GHz



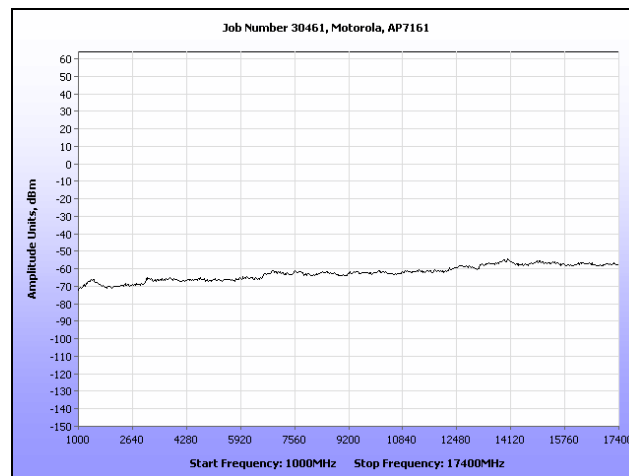
Plot 306. Receiver Spurious Emission, Port B, 30 MHz – 1 GHz



Plot 307. Receiver Spurious Emission, Port B, 1 GHz - 17.4 GHz



Plot 308. Receiver Spurious Emission, Port C, 30 MHz - 1 GHz



Plot 309. Receiver Spurious Emission, Port C, 1 GHz - 17.4 GHz

IV. Test Equipment

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
1T4612	SPECTRUM ANALYZER	AGILENT	E4407B	9/27/2010	9/27/2011
1T4149	HIGH-FREQUENCY ANECHOIC CHAMBER	RAY-PROOF	81	SEE NOTE	
1T2511	ANTENNA; HORN	EMCO	3115	8/31/2010	8/31/2011
1T4621	ESA-E SERIES SPECTRUM ANALYZER	AGILENT	E4402B	05/10/2010	05/10/2011
1T4502	COMB GENERATOR	COM-POWER	CGC-255	10/06/2010	10/06/2011
1T4565	LISN (24 AMP)	SOLAR ELECTRONICS	9252-50-R-24-BNC	10/28/2010	10/28/2011
1T4633	THERMO/HYGRO/BAROMETER	CONTROL COMPANY	02-401	03/11/2010	03/11/2012
1S2200	MULTI-DEVICE CONTROLLER	EMCO	2090	SEE NOTE	
1T4214	SHIELD ROOM #4	UNIVERSAL SHIELD INC	N/A	N/A	
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	05/25/2010	05/25/2011
1T4627	THERMO/HYGROMETER	CONTROL COMPANY	S6-627-9	10/09/2009	10/09/2011
1T4751	ANTENNA - BILOG	SUNOL SCIENCES	JB6	11/03/2010	11/03/2011

Table 31. Test Equipment List

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

V. Certification & User's Manual Information

Certification & User's Manual Information

A. 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 proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

Certification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — 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.

§ 2.907 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.

Certification & User's Manual Information

§ 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.

Certification & User's Manual Information

1. 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.

Verification & User's Manual Information

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 A 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 A 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 commercial 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

- (b) 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.

ICES-003 Procedural & Labeling Requirements

From the Industry Canada Electromagnetic Compatibility Advisory Bulletin entitled, "Implementation and Interpretation of the Interference-Causing Equipment Standard for Digital Apparatus, ICES-003" (EMCAB-3, Issue 2, July 1995):

"At present, CISPR 22: 2002 and ICES technical requirements are essentially equivalent. Therefore, if you have CISPR 22: 2002 approval by meeting CISPR Publication 22, the only additional requirements are: to attach a note to the report of the test results for compliance, indicating that these results are deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference-Causing Equipment Regulations; to maintain these records on file for the requisite five year period; and to provide the device with a notice of compliance in accordance with ICES-003."

Procedural Requirements:

According to Industry Canada's Interference Causing Equipment Standard for Digital Apparatus ICES-003 Issue 4, February 2004:

- Section 6.1: A record of the measurements and results, showing the date that the measurements were completed, shall be retained by the manufacturer or importer for a period of at least five years from the date shown in the record and made available for examination on the request of the Minister.
- Section 6.2: A written notice indicating compliance must accompany each unit of digital apparatus to the end user. The notice shall be in the form of a label that is affixed to the apparatus. Where because of insufficient space or other constraints it is not feasible to affix a label to the apparatus, the notice may be in the form of a statement in the user's manual.

Labeling Requirements:

The suggested text for the notice, in English and in French, is provided below, from the Annex of ICES-003:

This Class [²] digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe [¹] est conforme à la norme NMB-003 du Canada.

² Insert either A or B but not both as appropriate for the equipment requirements.

End of Report