6.4 Power Spectral Density

§15.247(e)

Test Overview and Limit

The peak power density is measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle (>98%), at maximum power, and at the appropriate frequencies. All data rates were investigated and the worst case configuration results are reported in this section.

The maximum permissible power spectral density is 8 dBm in any 3 kHz band.

Test Procedure Used

KDB 558074 v03r02 – Section 10.2 Method PKPSD
KDB 662911 v02r01 – Section E)2) Measure-and-Sum Technique

Test Settings

1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the DTS channel bandwidth
3. RBW = 10kHz
4. VBW = 1MHz
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

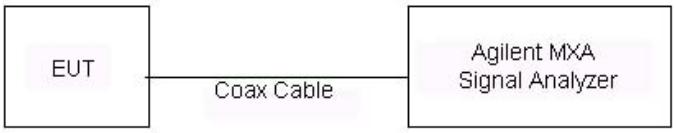

Figure 6-3. Test Instrument & Measurement Setup

Test Notes

None

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Antenna-1 Power Spectral Density Measurements

Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]	Pass / Fail
2412	1	b	1	-0.25	8.00	-8.25	Pass
2437	6	b	1	0.48	8.00	-7.52	Pass
2462	11	b	1	0.39	8.00	-7.61	Pass
2412	1	g	6	-6.08	8.00	-14.08	Pass
2437	6	g	6	-6.34	8.00	-14.34	Pass
2462	11	g	6	-5.86	8.00	-13.86	Pass
2412	1	n	6.5/7.2 (MCS0)	-6.61	8.00	-14.61	Pass
2437	6	n	6.5/7.2 (MCS0)	-7.55	8.00	-15.55	Pass
2462	11	n	6.5/7.2 (MCS0)	-7.60	8.00	-15.60	Pass
5745	149	a	6	-9.49	8.00	-17.49	Pass
5785	157	a	6	-10.96	8.00	-18.96	Pass
5825	165	a	6	-9.50	8.00	-17.50	Pass
5745	149	n (20MHz)	6.5/7.2 (MCS0)	-9.61	8.00	-17.61	Pass
5785	157	n (20MHz)	6.5/7.2 (MCS0)	-10.87	8.00	-18.87	Pass
5825	165	n (20MHz)	6.5/7.2 (MCS0)	-10.90	8.00	-18.90	Pass
5755	151	n (40MHz)	13.5/15 (MCS0)	-13.86	8.00	-21.86	Pass
5795	159	n (40MHz)	13.5/15 (MCS0)	-12.93	8.00	-20.93	Pass
5775	155	ac (80MHz)	29.3/32.5 (MCS0)	-16.72	8.00	-24.72	Pass

Table 6-28. Conducted Power Density Measurements

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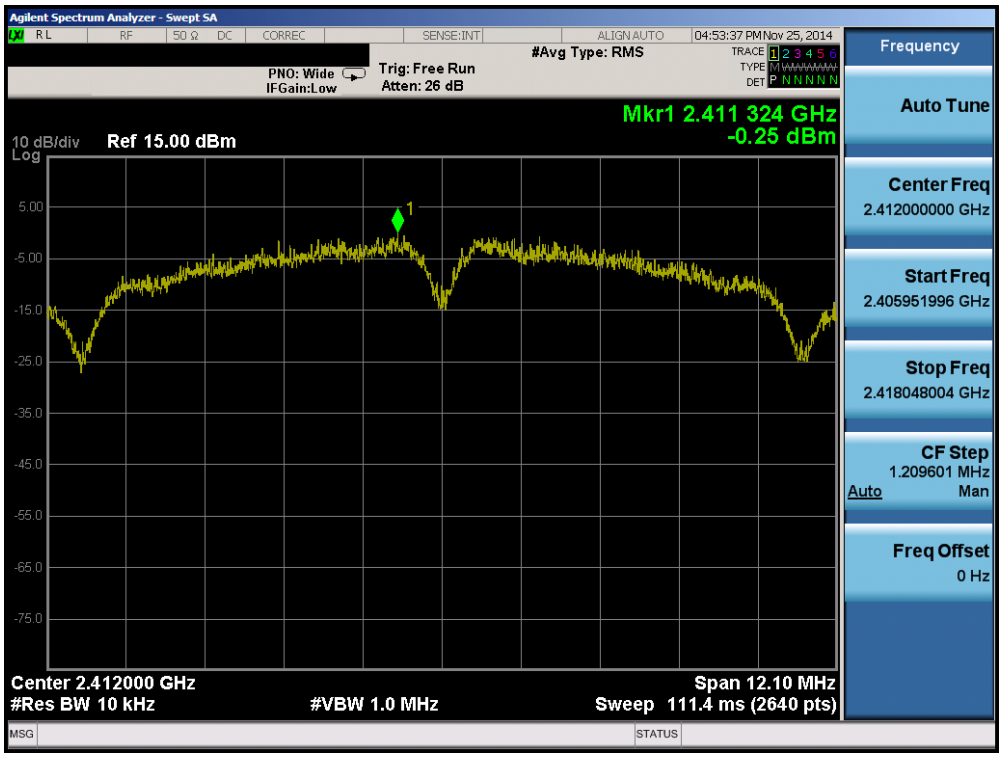
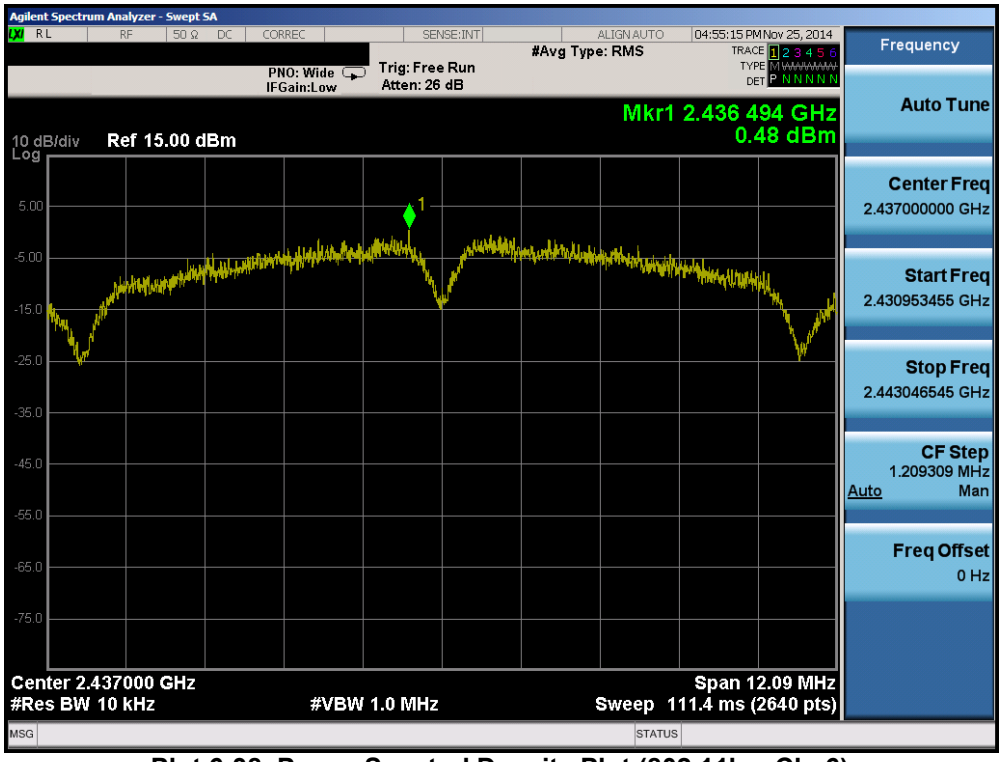


Plot 6-37. Power Spectral Density Plot (802.11b – Ch. 1)



Plot 6-38. Power Spectral Density Plot (802.11b – Ch. 6)

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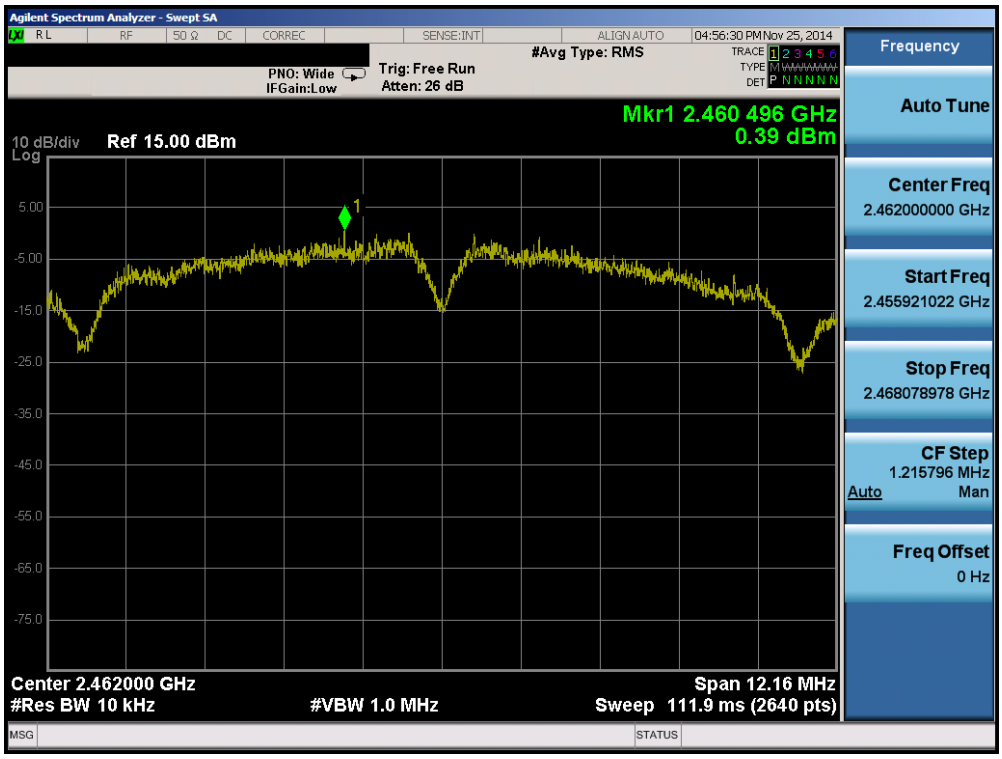
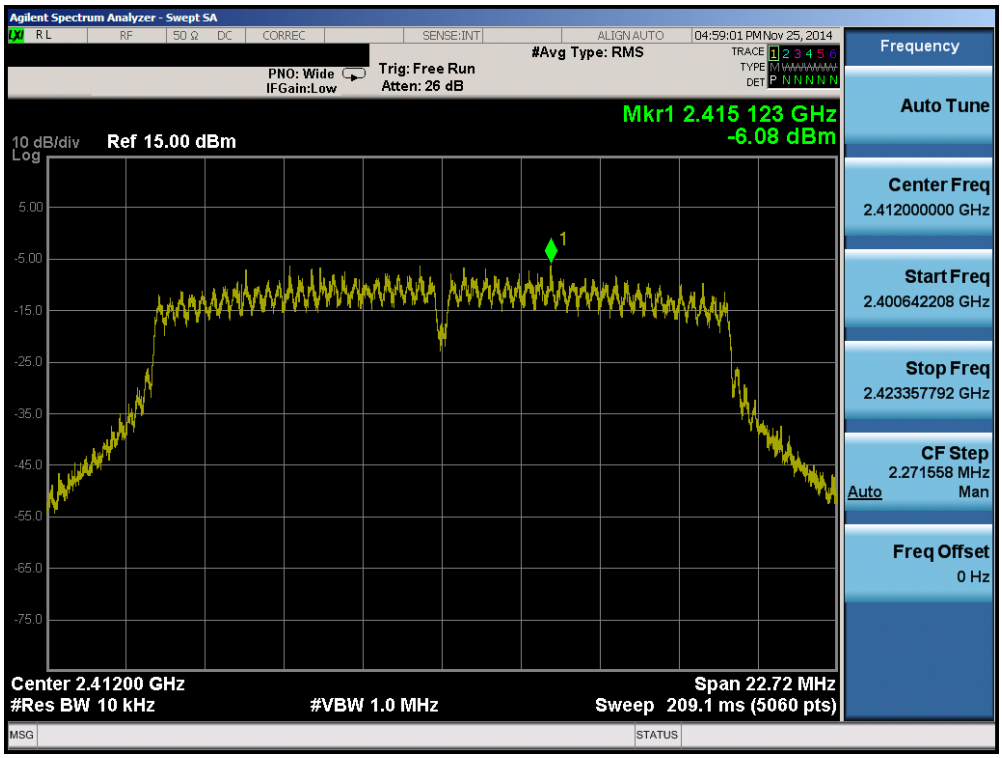


Plot 6-39. Power Spectral Density Plot (802.11b – Ch. 11)



Plot 6-40. Power Spectral Density Plot (802.11g – Ch. 1)

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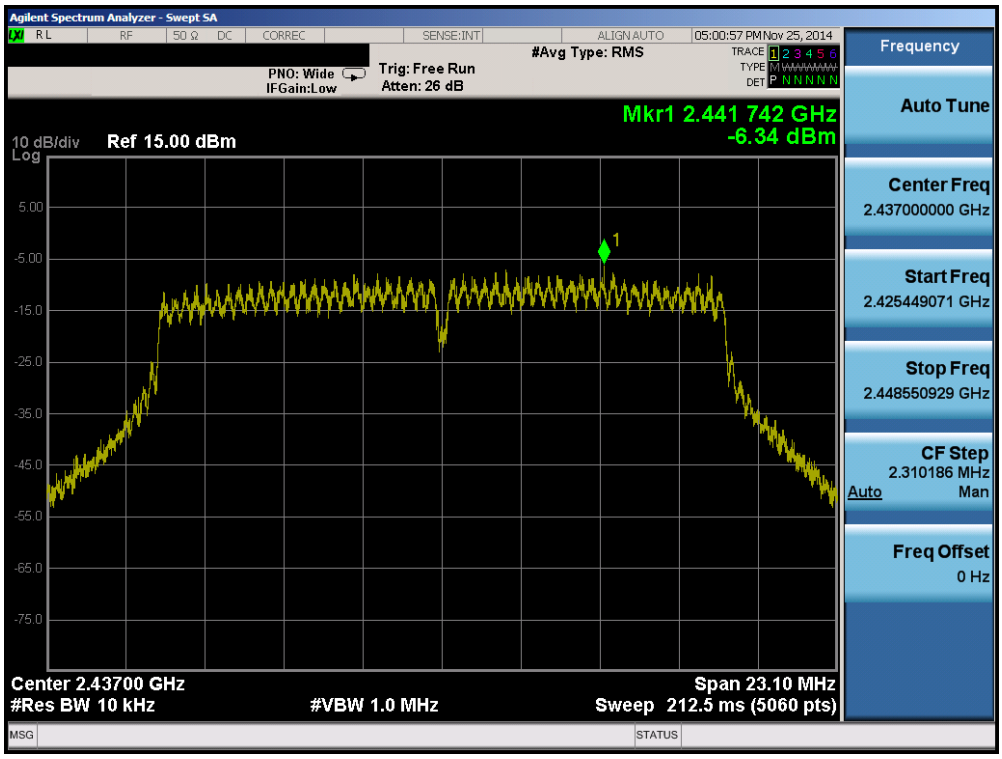
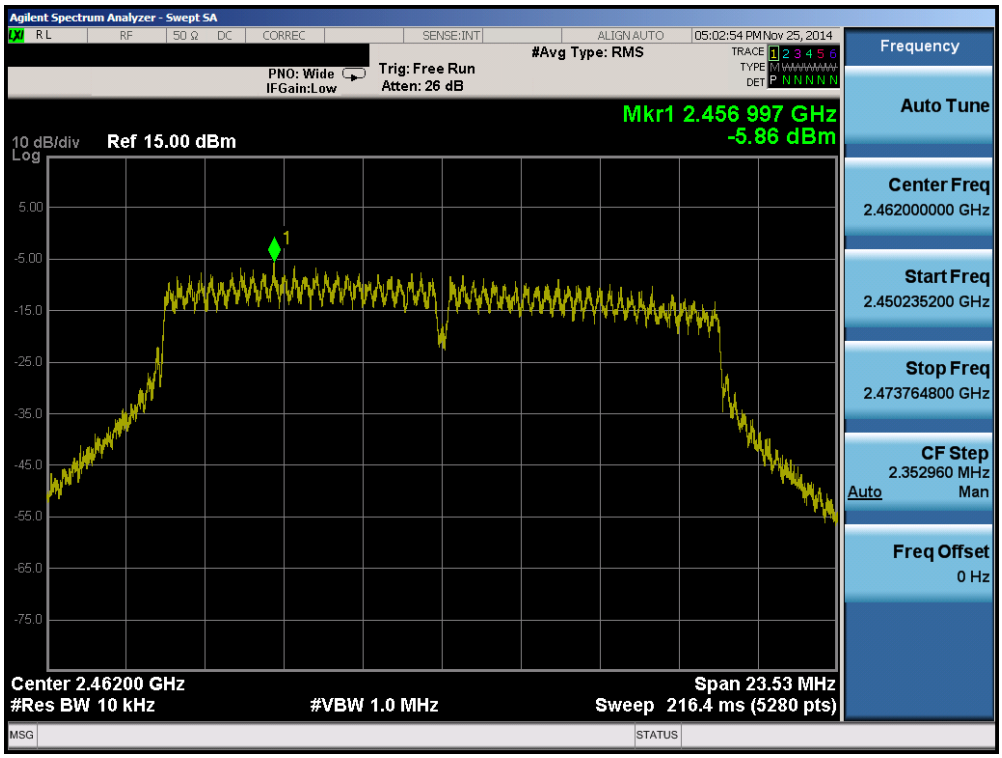


Plot 6-41. Power Spectral Density Plot (802.11g – Ch. 6)



Plot 6-42. Power Spectral Density Plot (802.11g – Ch. 11)

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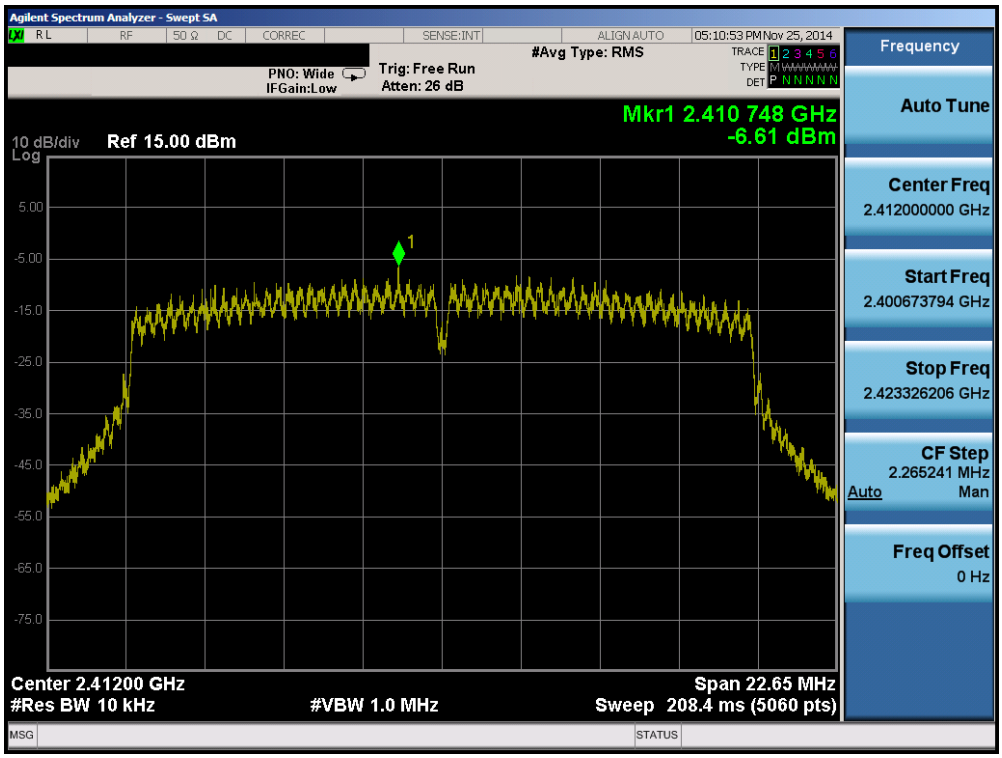
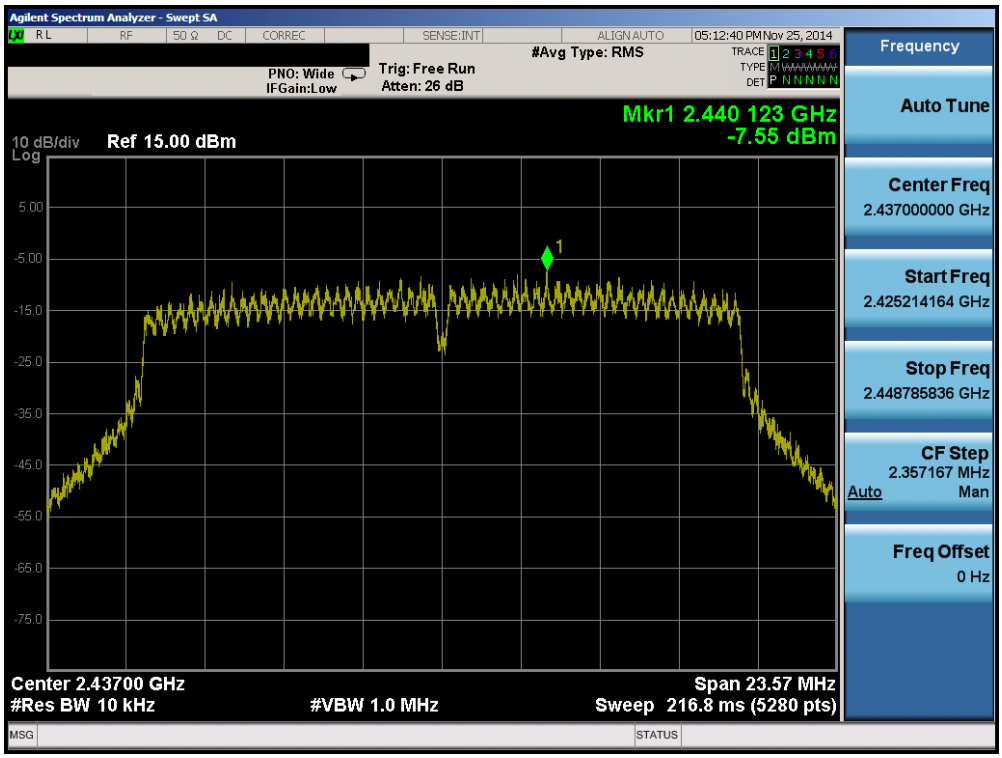


Plot 6-43. Power Spectral Density Plot (802.11n (2.4GHz) – Ch. 1)



Plot 6-44. Power Spectral Density Plot (802.11n (2.4GHz) – Ch. 6)

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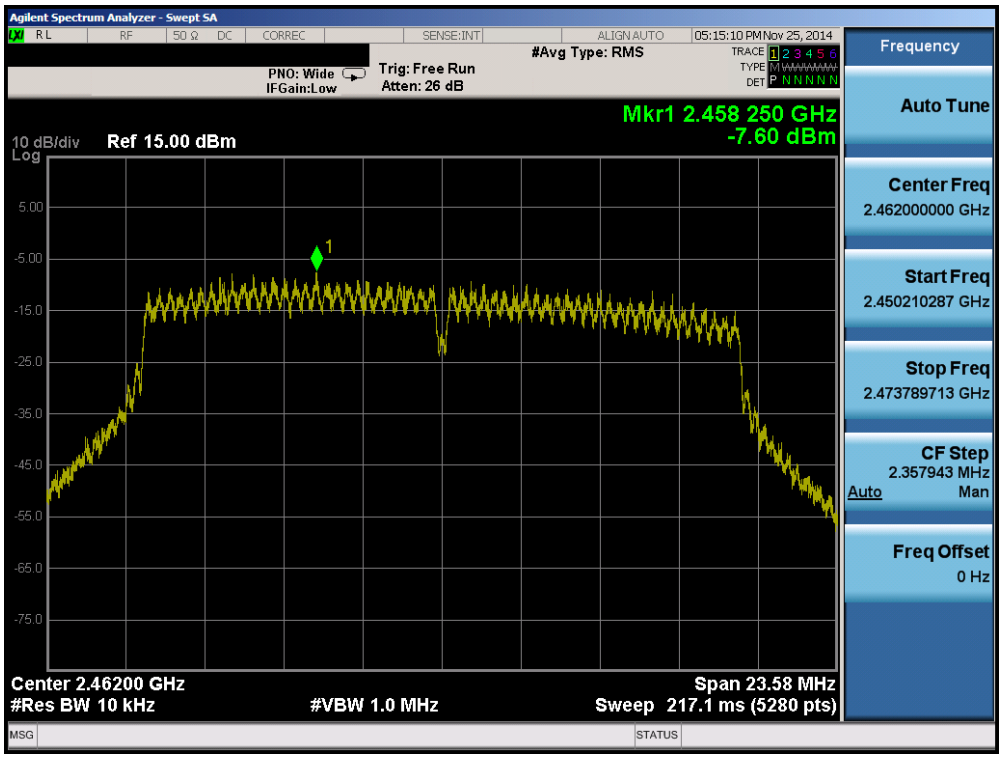
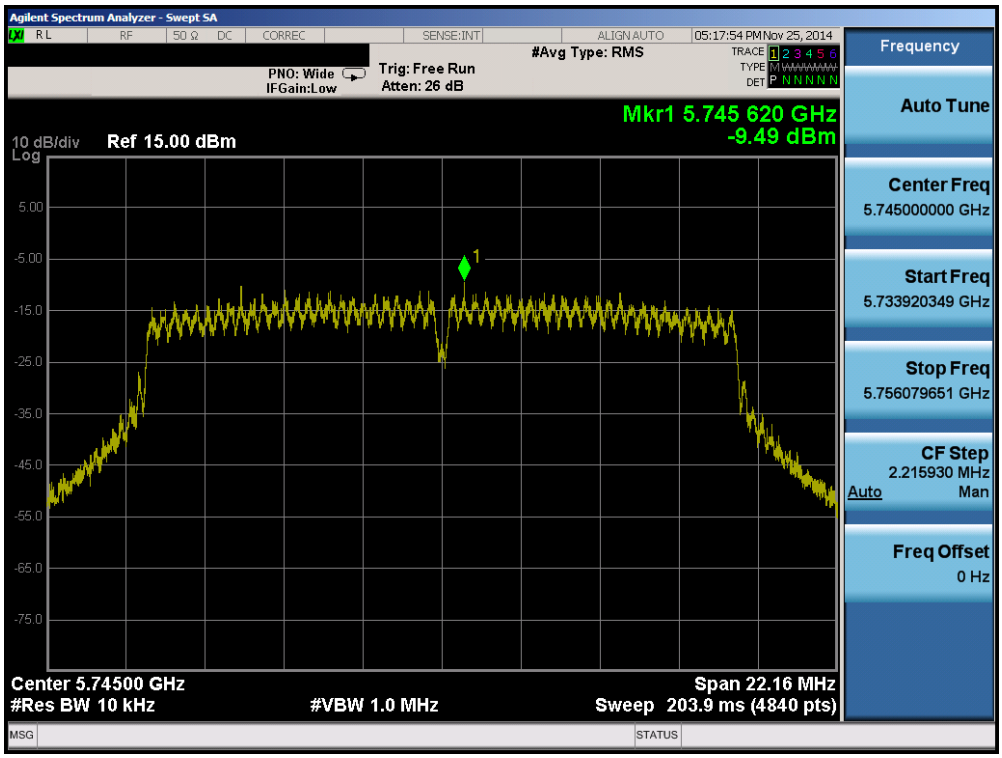


Plot 6-45. Power Spectral Density Plot (802.11n (2.4GHz) – Ch. 11)



Plot 6-46. Power Spectral Density Plot (802.11a – Ch. 149)

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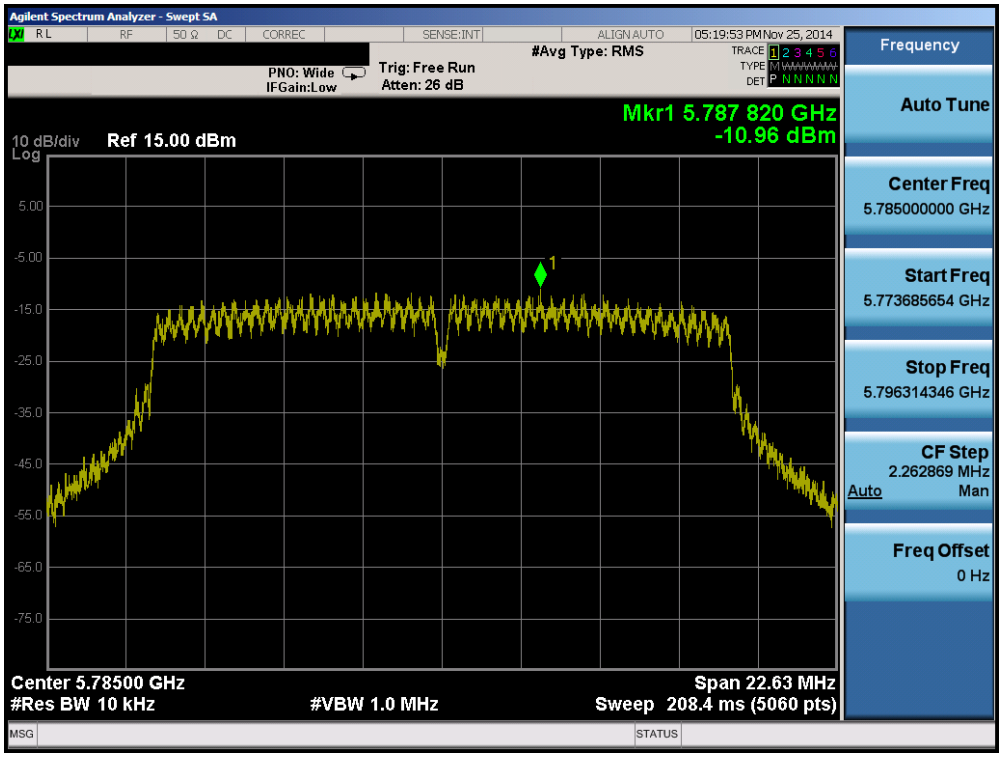
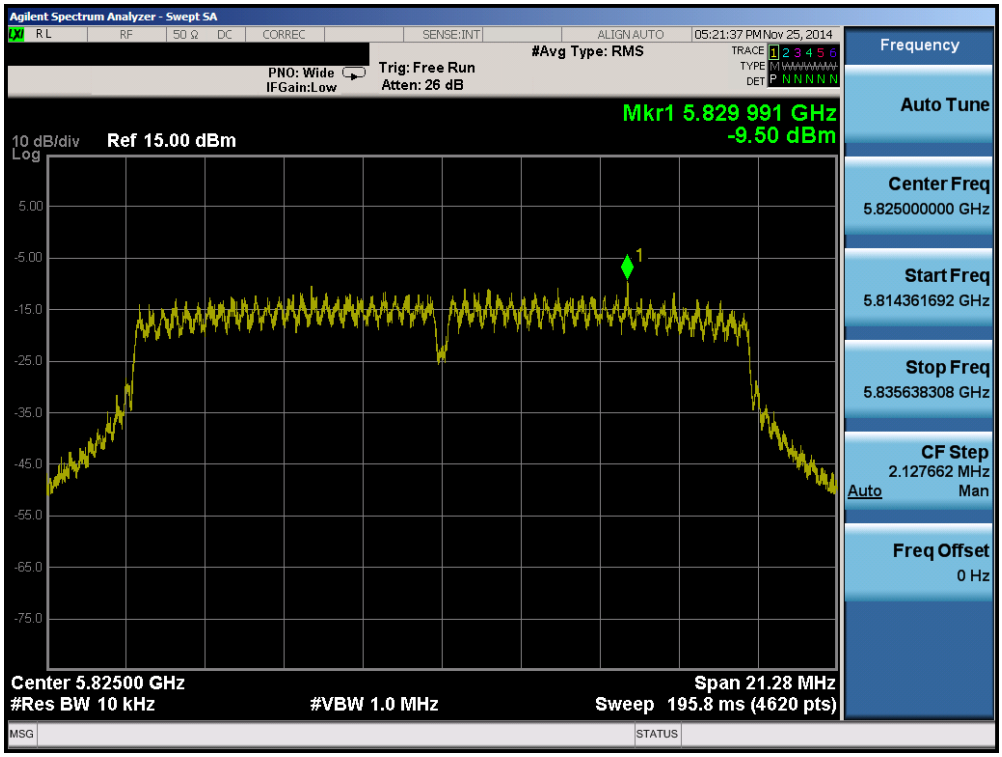


Plot 6-47. Power Spectral Density Plot (802.11a – Ch. 157)



Plot 6-48. Power Spectral Density Plot (802.11a – Ch. 165)

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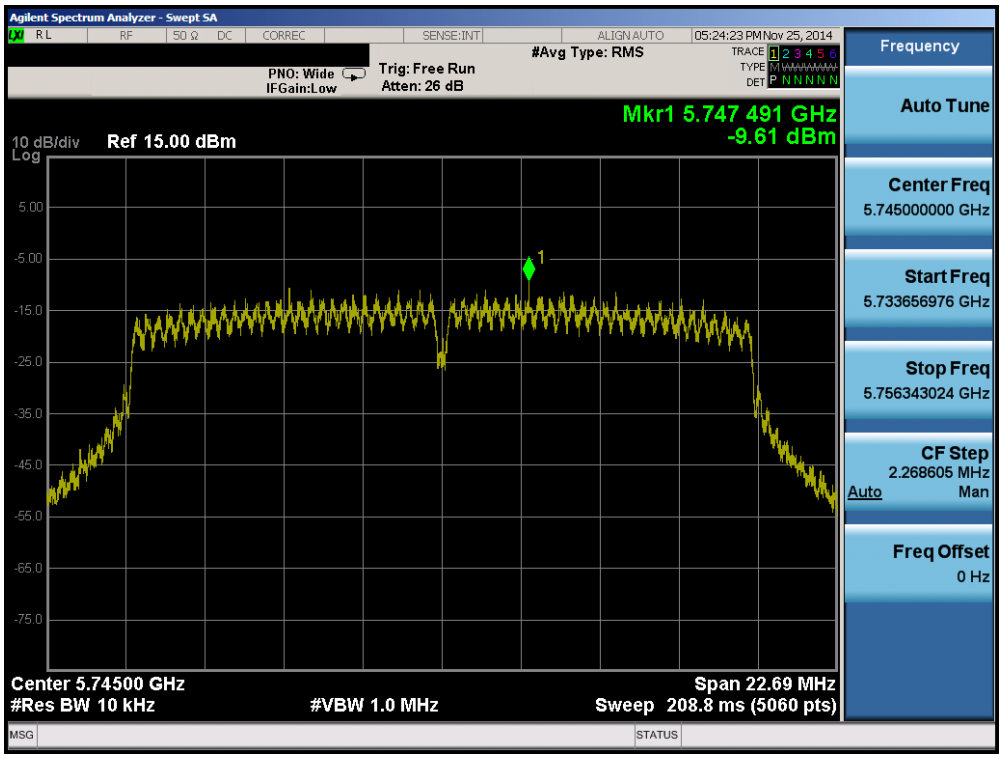
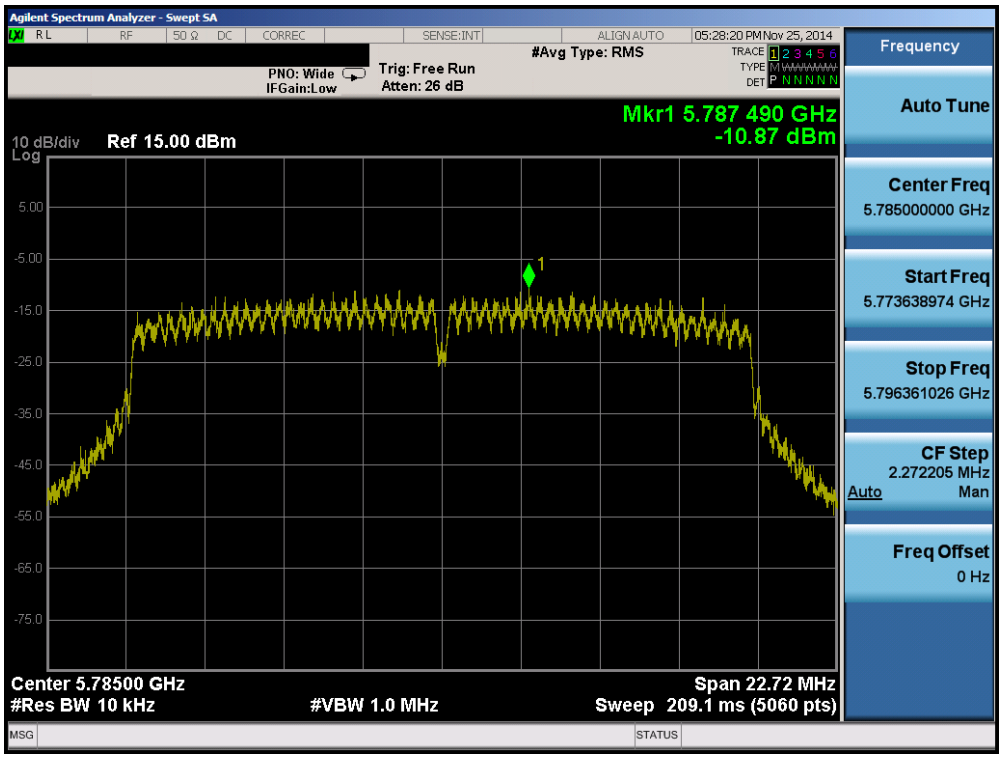


Plot 6-49. Power Spectral Density Plot (20MHz BW 802.11n (5.8GHz) – Ch. 149)



Plot 6-50. Power Spectral Density Plot (20MHz BW 802.11n (5.8GHz) – Ch. 157)

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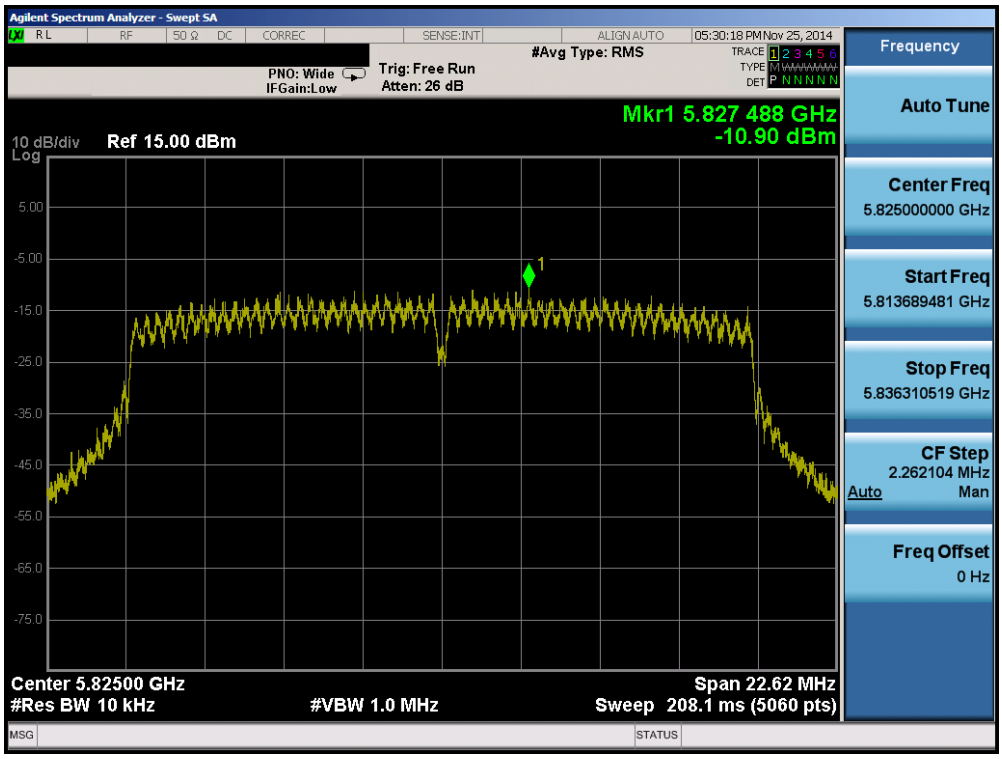
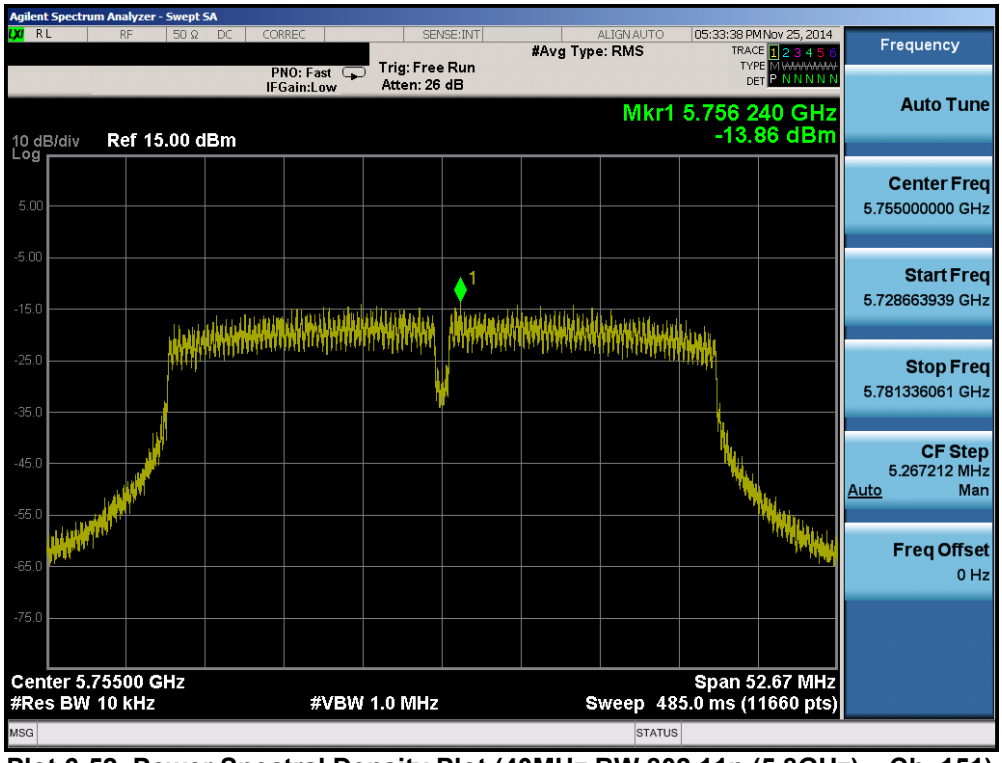


Plot 6-51. Power Spectral Density Plot (20MHz BW 802.11n (5.8GHz) – Ch. 165)



Plot 6-52. Power Spectral Density Plot (40MHz BW 802.11n (5.8GHz) – Ch. 151)

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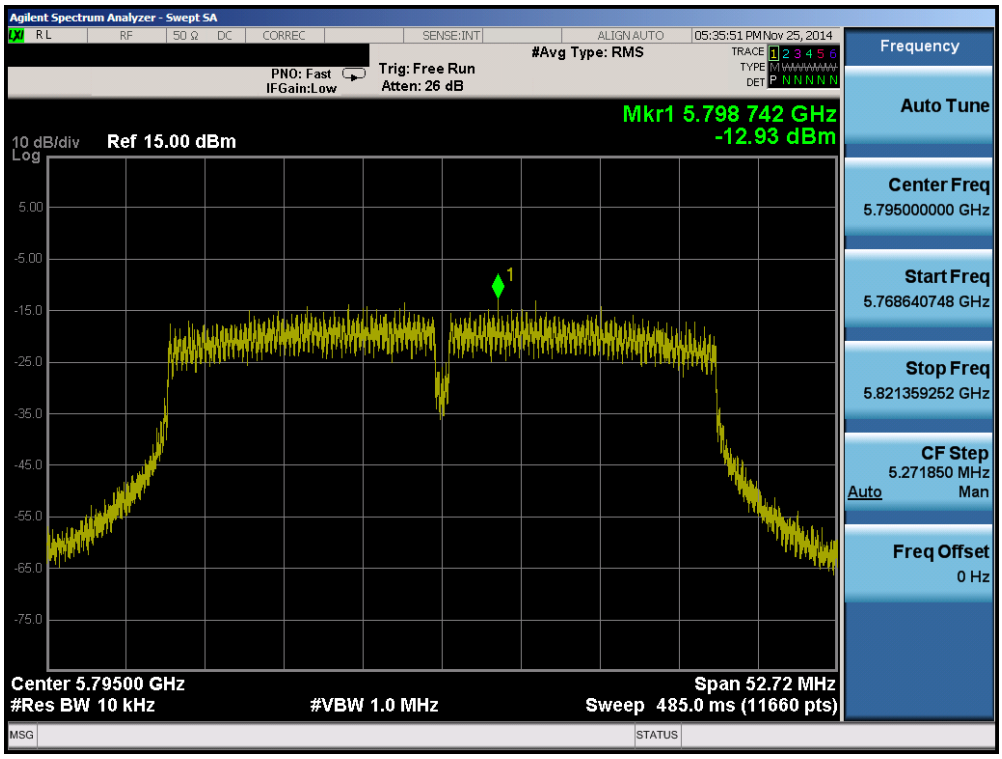
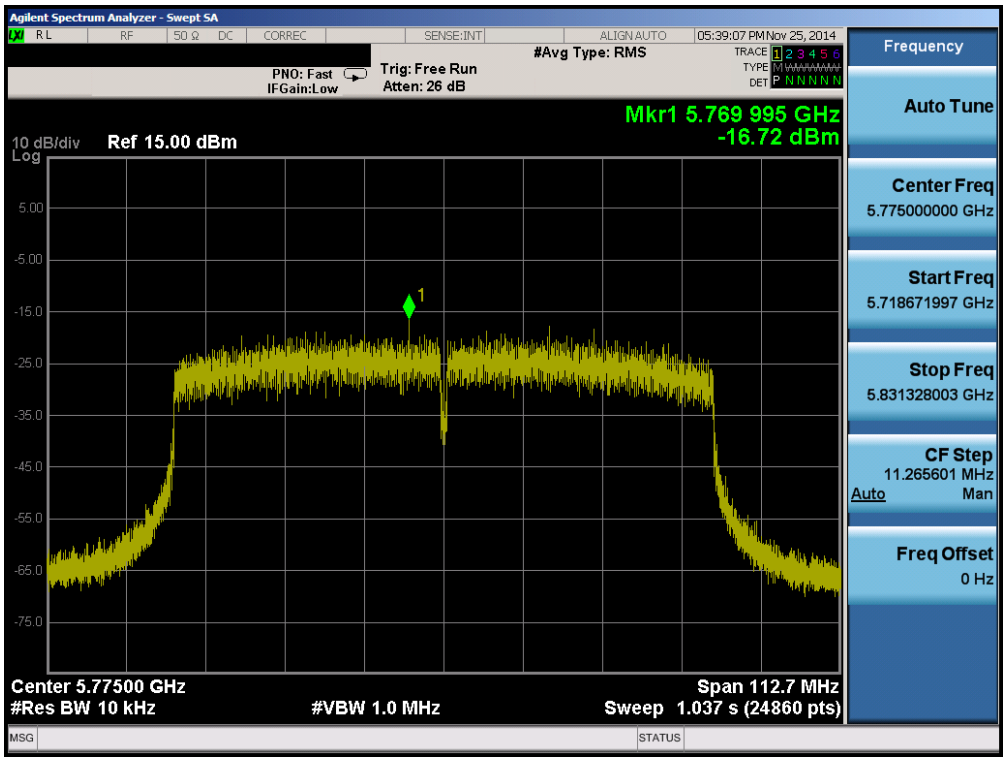


Plot 6-53. Power Spectral Density Plot (40MHz BW 802.11n (5.8GHz) – Ch. 159)



Plot 6-54. Power Spectral Density Plot (80MHz BW 802.11ac (5.8GHz) – Ch. 155)

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Antenna-2 Power Spectral Density Measurements

Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]	Pass / Fail
2412	1	b	1	0.56	8.00	-7.44	Pass
2437	6	b	1	0.16	8.00	-7.84	Pass
2462	11	b	1	-0.41	8.00	-8.41	Pass
2412	1	g	6	-6.81	8.00	-14.81	Pass
2437	6	g	6	-7.01	8.00	-15.01	Pass
2462	11	g	6	-6.34	8.00	-14.34	Pass
2412	1	n	6.5/7.2 (MCS0)	-7.83	8.00	-15.83	Pass
2437	6	n	6.5/7.2 (MCS0)	-7.79	8.00	-15.79	Pass
2462	11	n	6.5/7.2 (MCS0)	-7.71	8.00	-15.71	Pass
5745	149	a	6	-8.08	8.00	-16.08	Pass
5785	157	a	6	-8.03	8.00	-16.03	Pass
5825	165	a	6	-9.05	8.00	-17.05	Pass
5745	149	n (20MHz)	6.5/7.2 (MCS0)	-8.85	8.00	-16.85	Pass
5785	157	n (20MHz)	6.5/7.2 (MCS0)	-9.12	8.00	-17.12	Pass
5825	165	n (20MHz)	6.5/7.2 (MCS0)	-9.00	8.00	-17.00	Pass
5755	151	n (40MHz)	13.5/15 (MCS0)	-12.28	8.00	-20.28	Pass
5795	159	n (40MHz)	13.5/15 (MCS0)	-16.05	8.00	-24.05	Pass
5775	155	ac (80MHz)	29.3/32.5 (MCS0)	-16.83	8.00	-24.83	Pass

Table 6-29. Conducted Power Density Measurements

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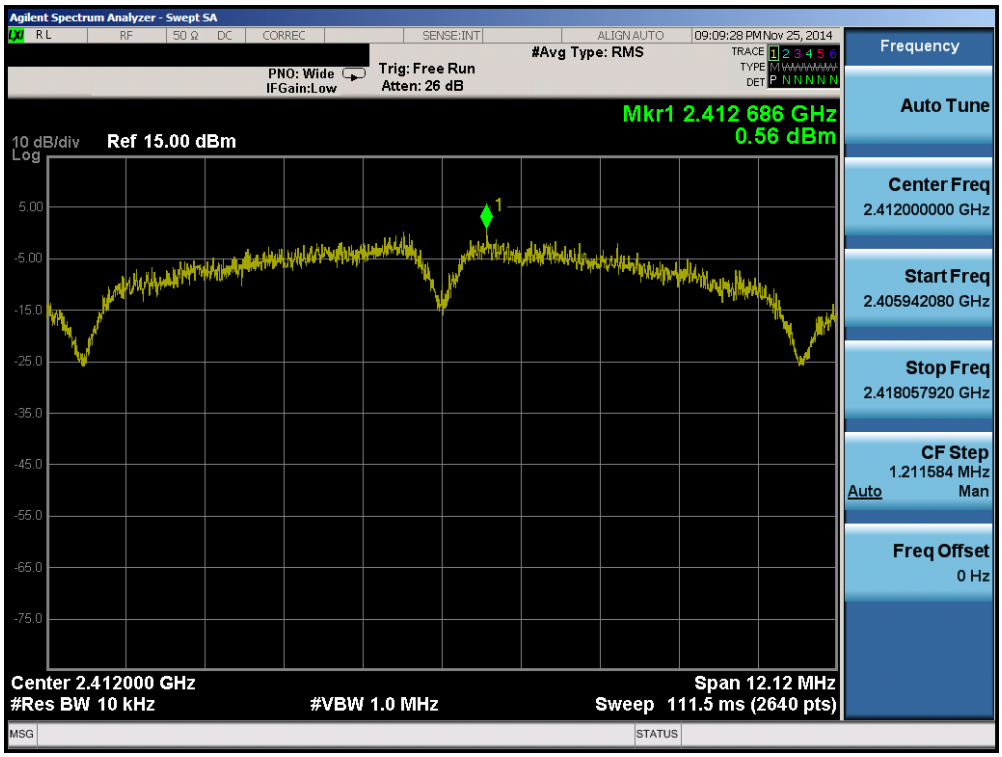
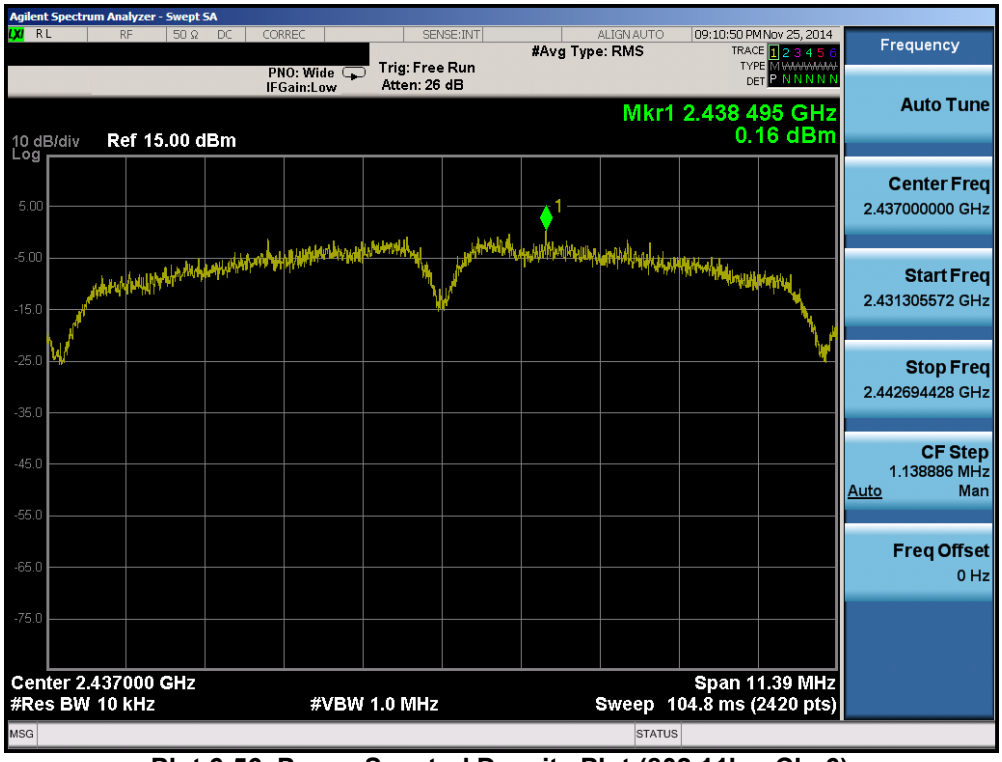


Plot 6-55. Power Spectral Density Plot (802.11b – Ch. 1)



Plot 6-56. Power Spectral Density Plot (802.11b – Ch. 6)

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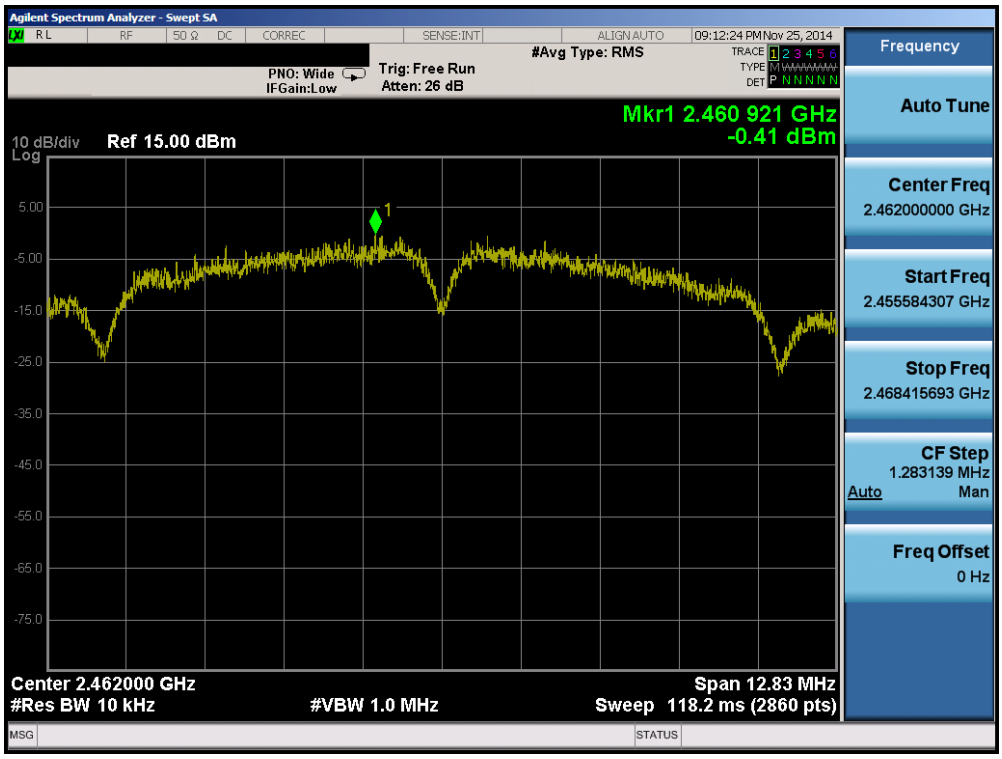
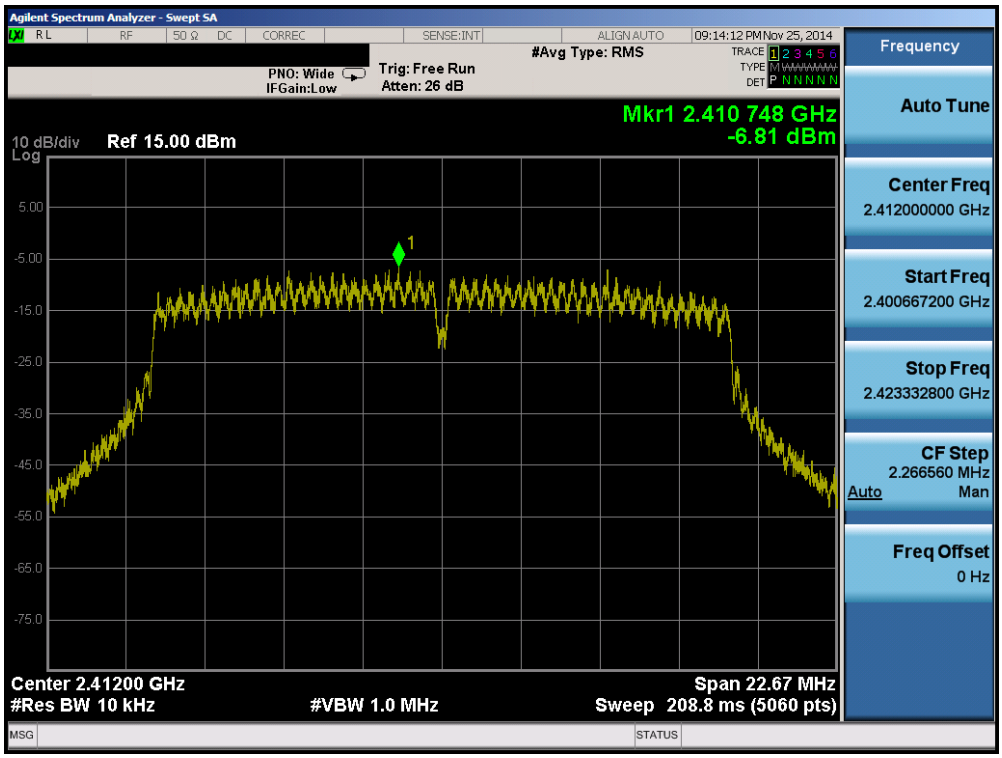


Plot 6-57. Power Spectral Density Plot (802.11b – Ch. 11)



Plot 6-58. Power Spectral Density Plot (802.11g – Ch. 1)

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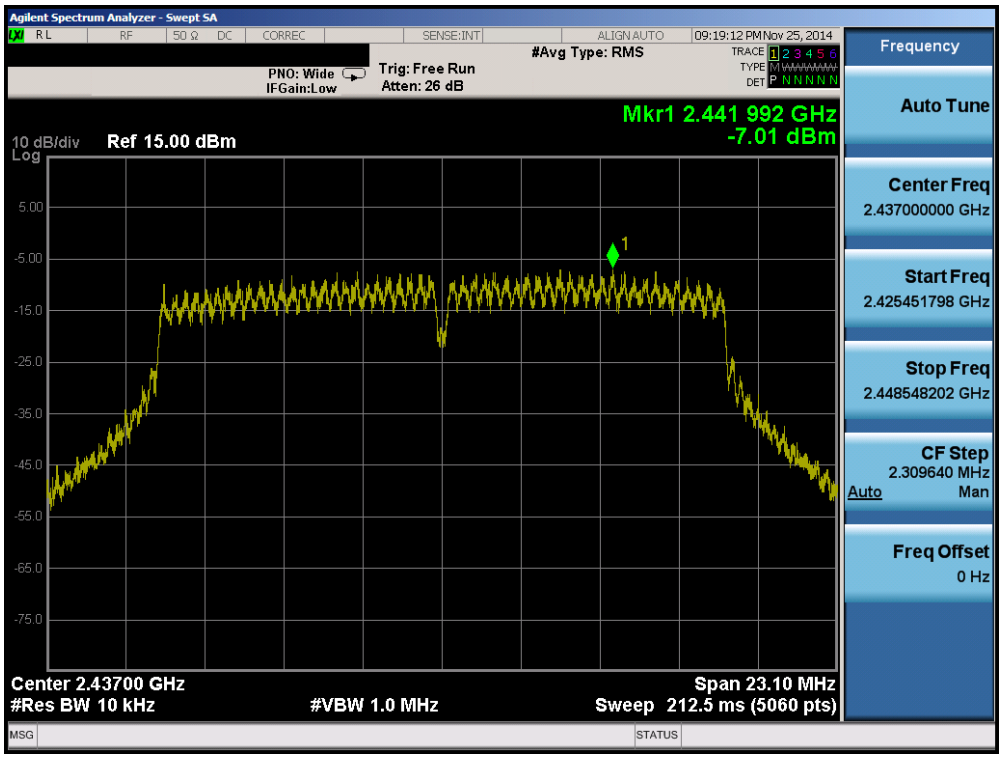
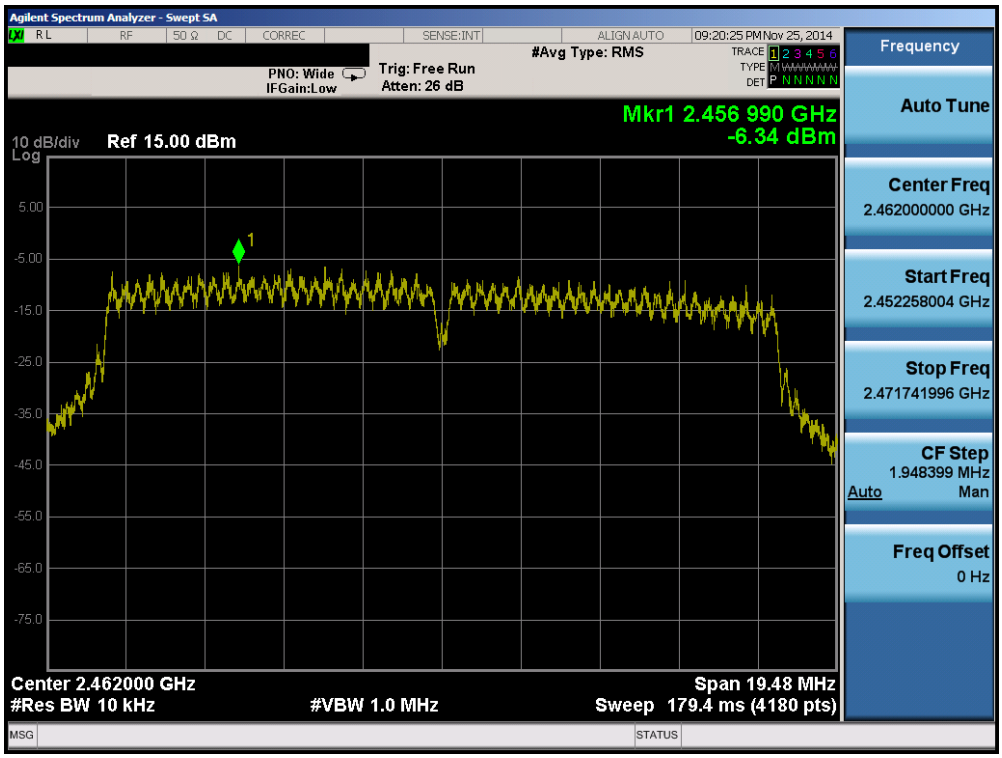


Plot 6-59. Power Spectral Density Plot (802.11g – Ch. 6)



Plot 6-60. Power Spectral Density Plot (802.11g – Ch. 11)

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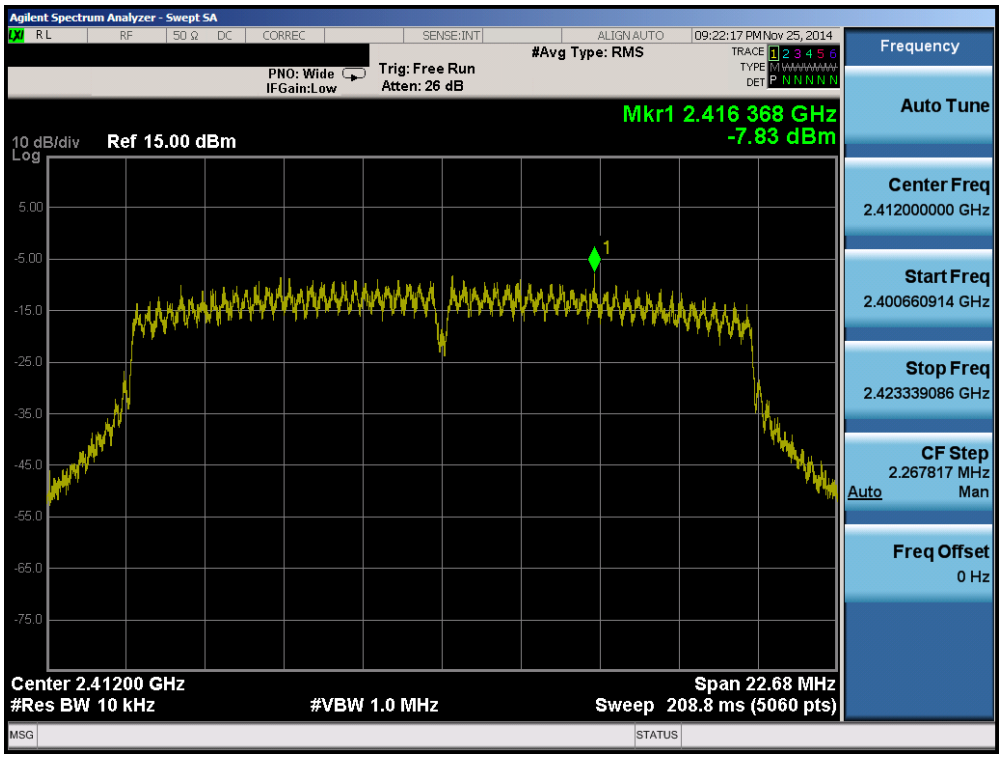
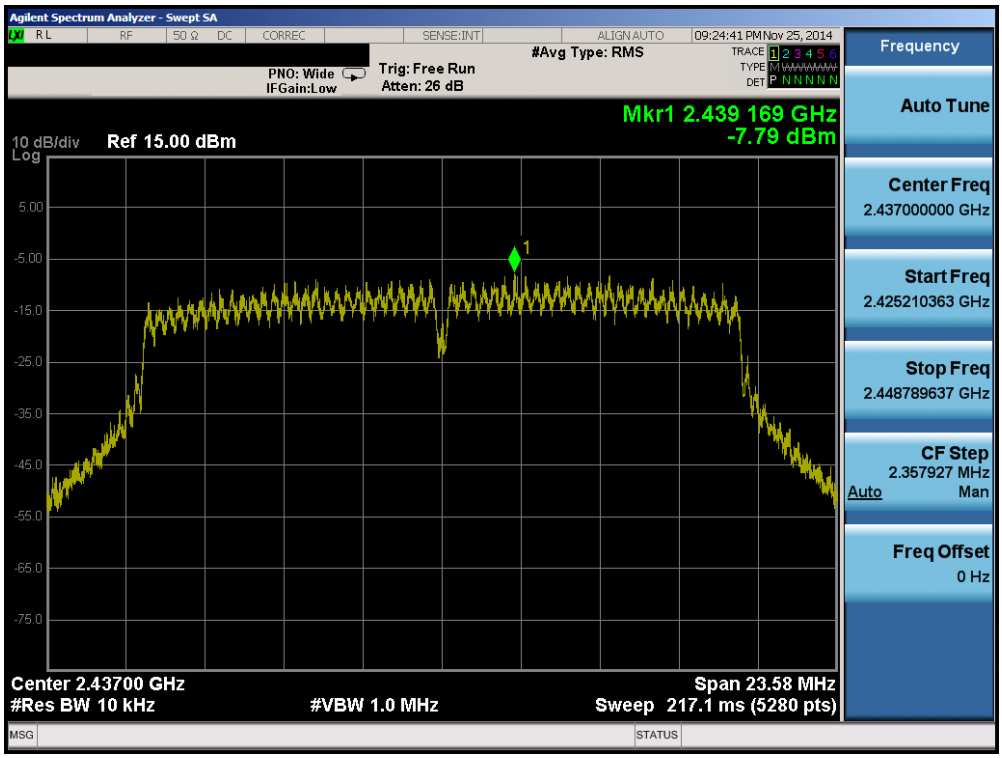


Plot 6-61. Power Spectral Density Plot (802.11n (2.4GHz) – Ch. 1)



Plot 6-62. Power Spectral Density Plot (802.11n (2.4GHz) – Ch. 6)

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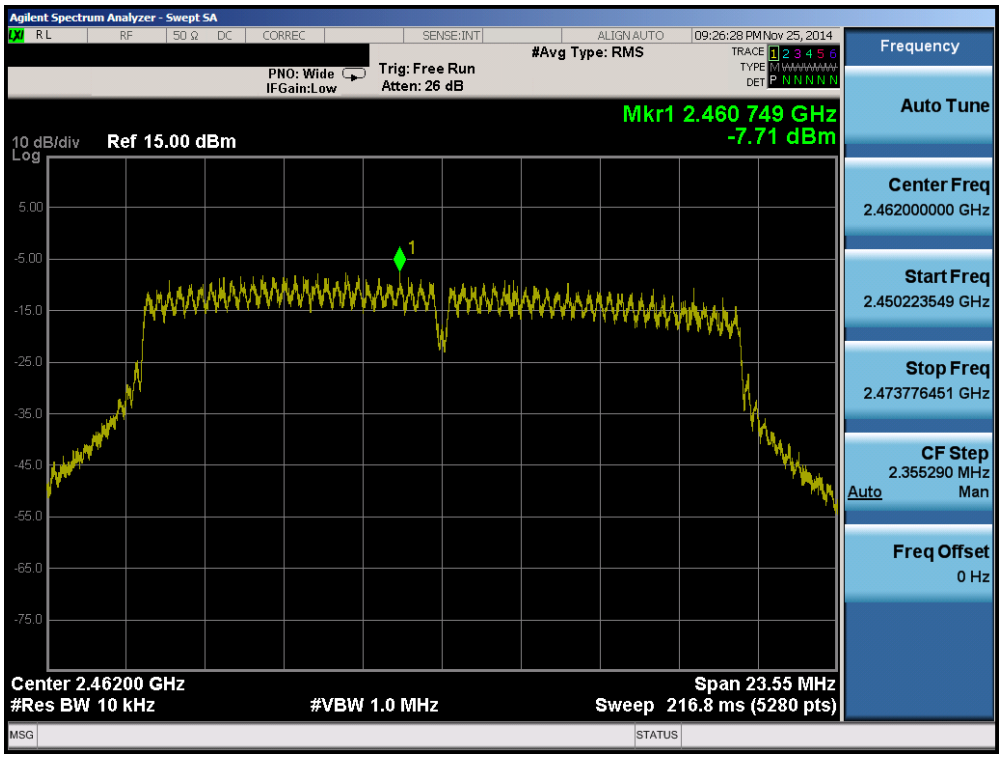
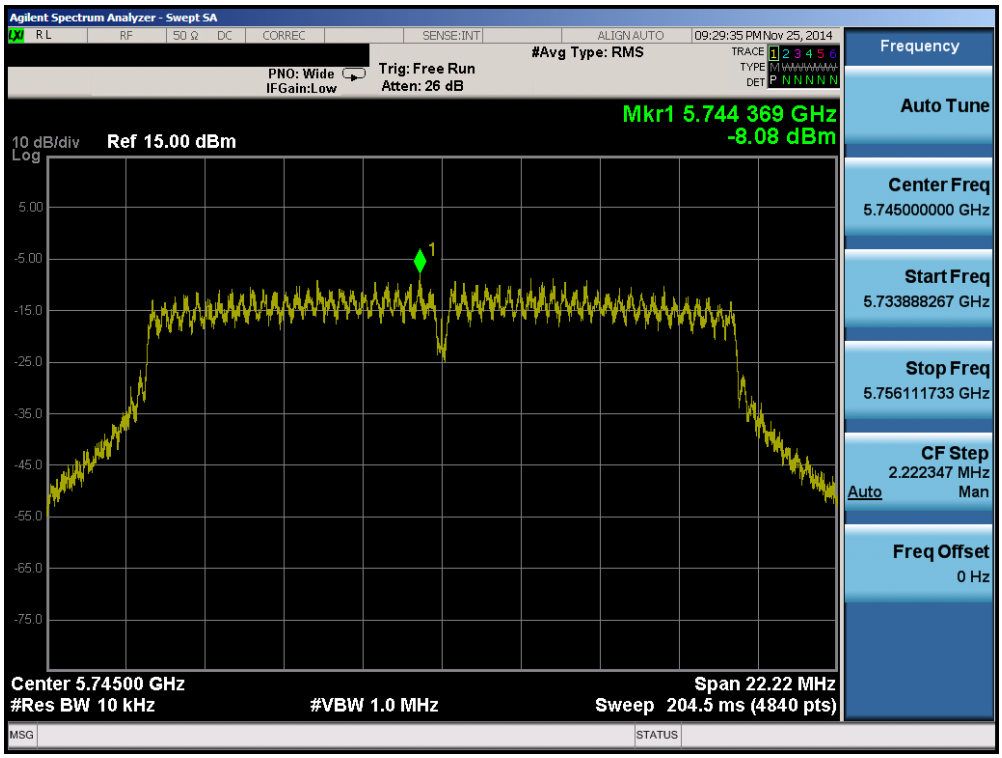


Plot 6-63. Power Spectral Density Plot (802.11n (2.4GHz) – Ch. 11)



Plot 6-64. Power Spectral Density Plot (802.11a – Ch. 149)

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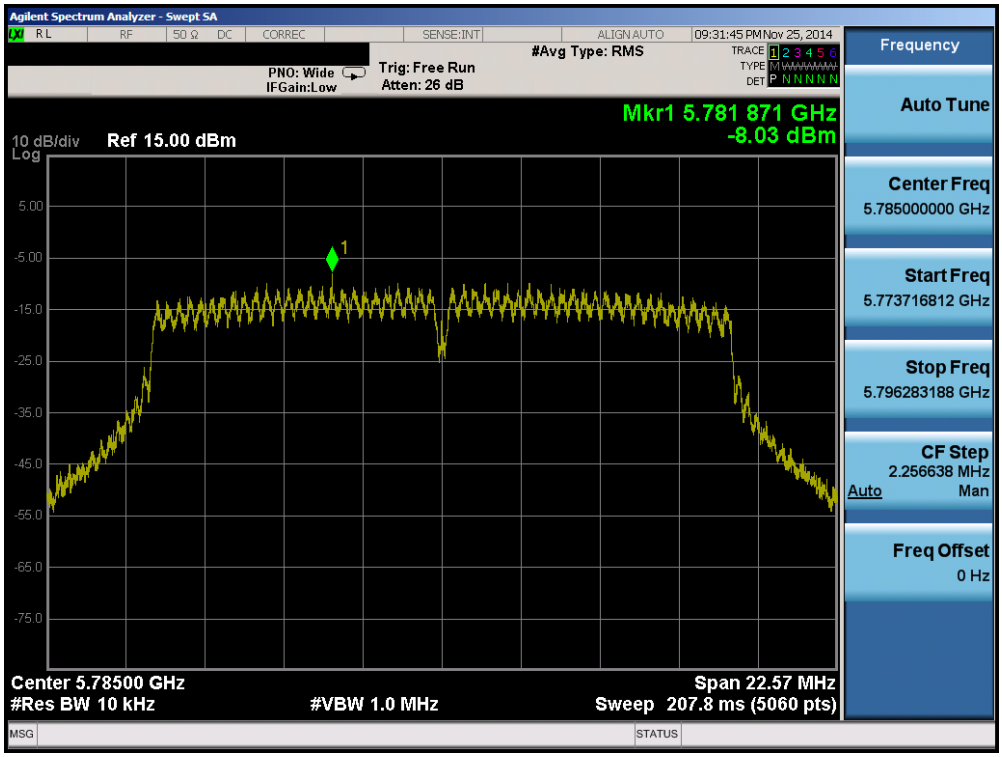
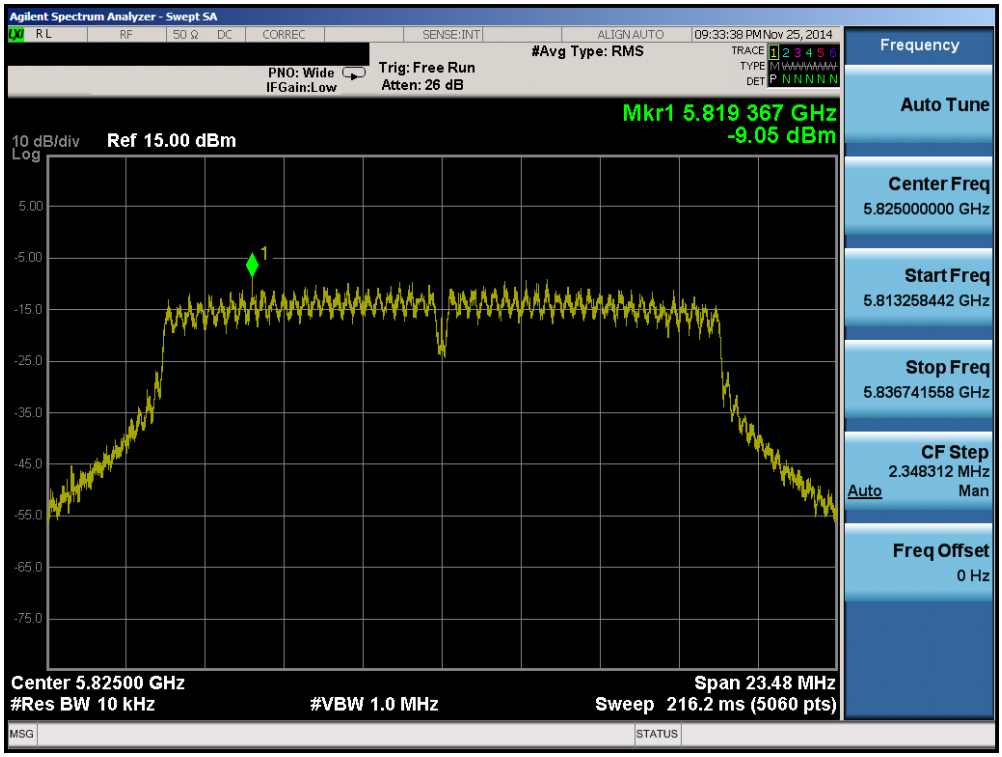


Plot 6-65. Power Spectral Density Plot (802.11a – Ch. 157)



Plot 6-66. Power Spectral Density Plot (802.11a – Ch. 165)

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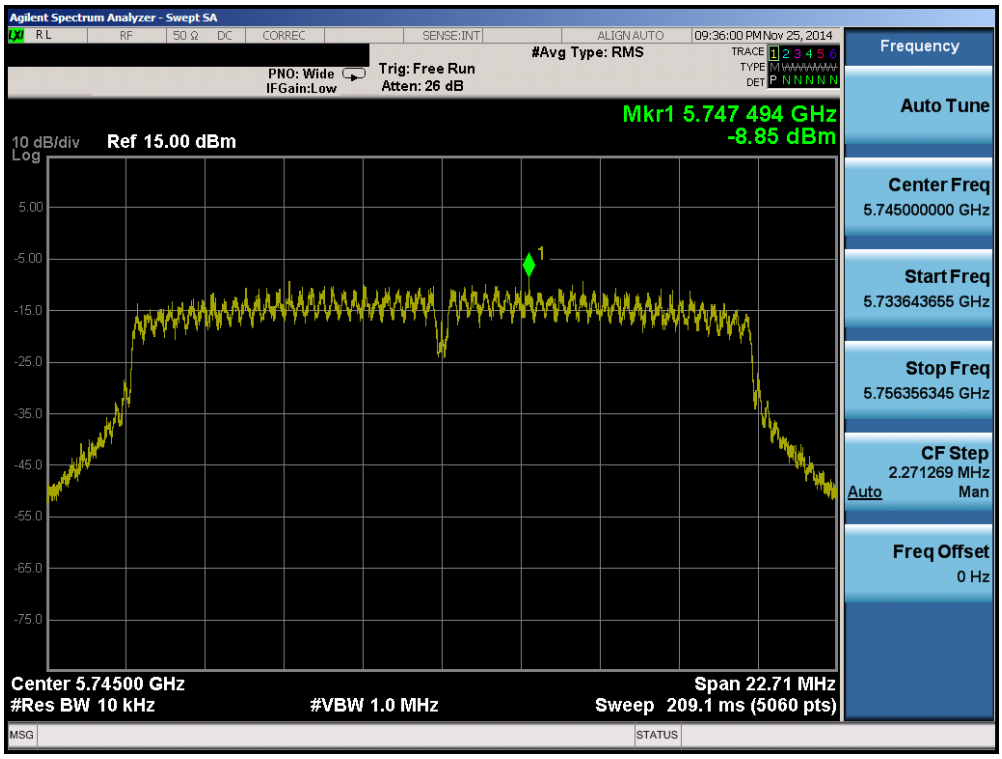
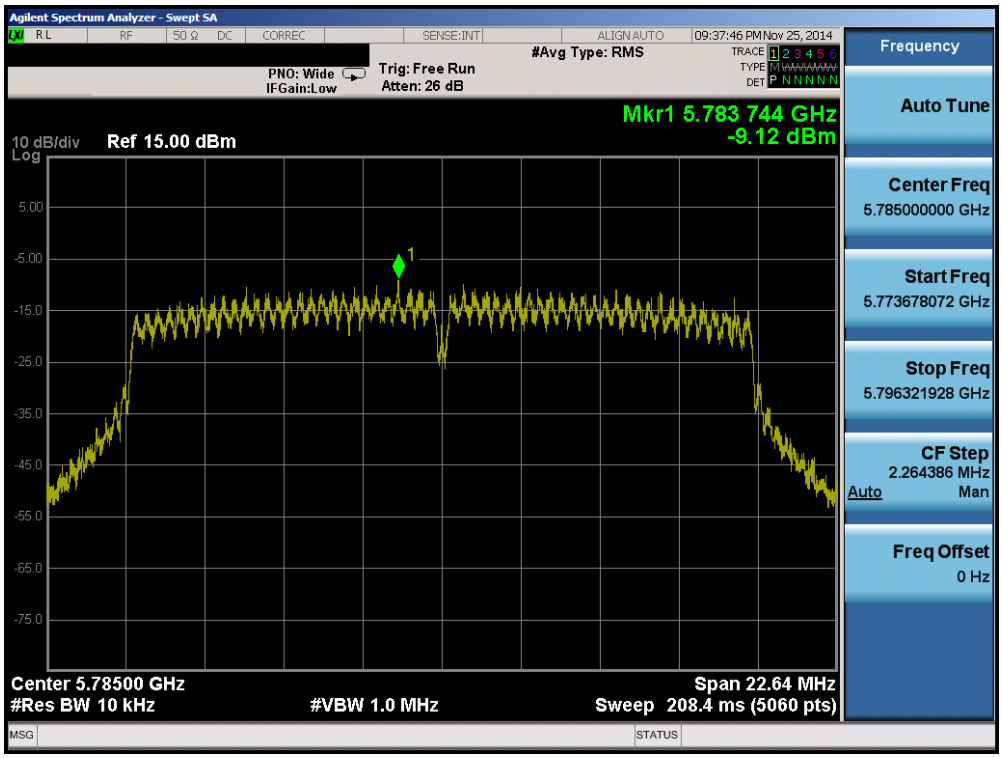


Plot 6-67. Power Spectral Density Plot (20MHz BW 802.11n (5.8GHz) – Ch. 149)



Plot 6-68. Power Spectral Density Plot (20MHz BW 802.11n (5.8GHz) – Ch. 157)

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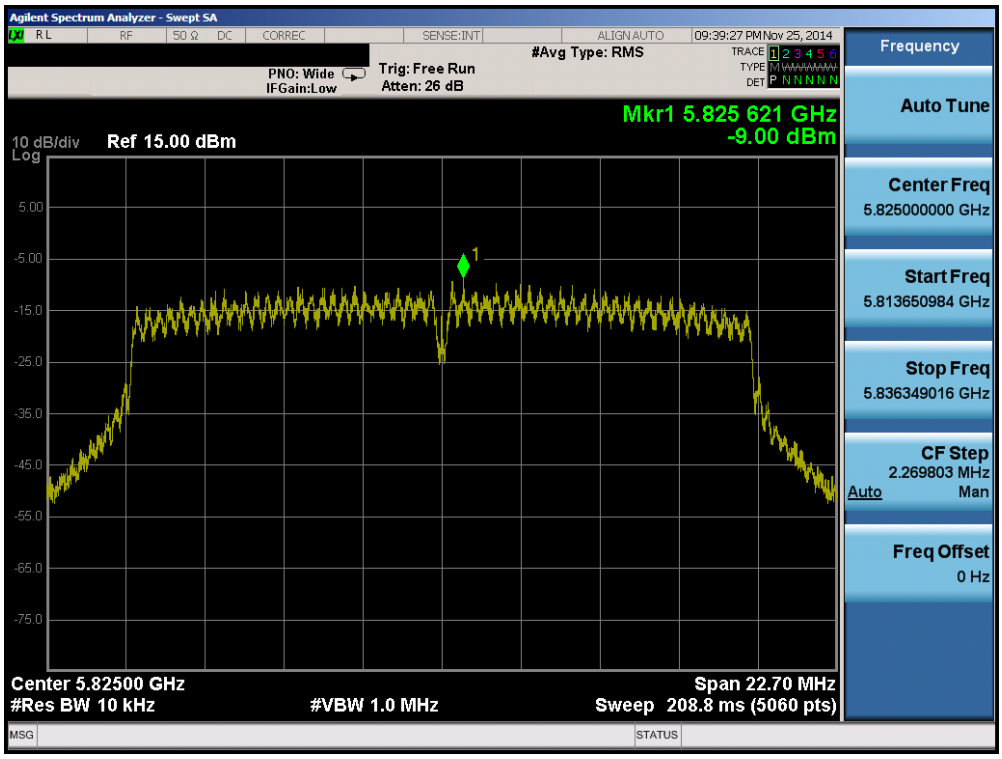
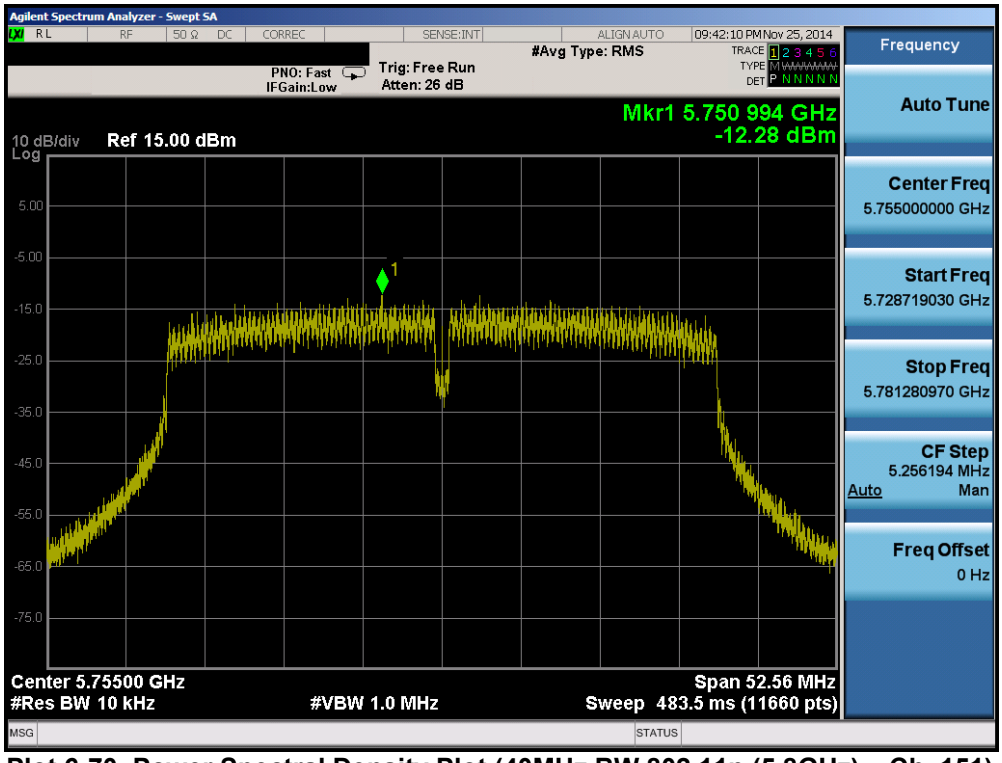


Plot 6-69. Power Spectral Density Plot (20MHz BW 802.11n (5.8GHz) – Ch. 165)



Plot 6-70. Power Spectral Density Plot (40MHz BW 802.11n (5.8GHz) – Ch. 151)

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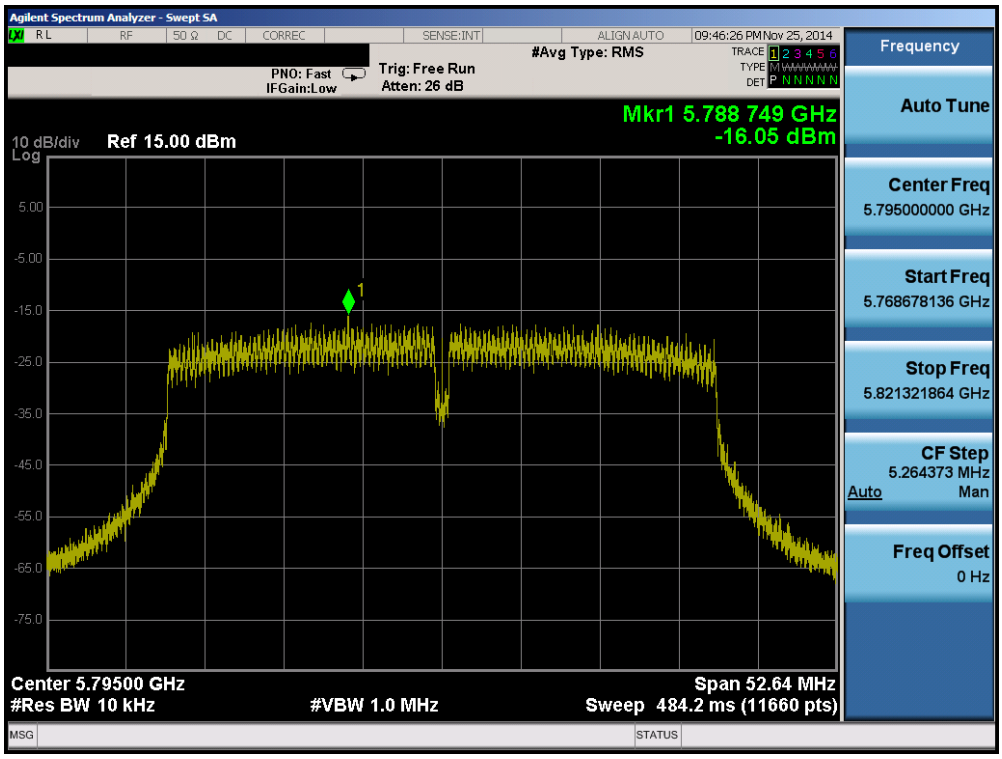
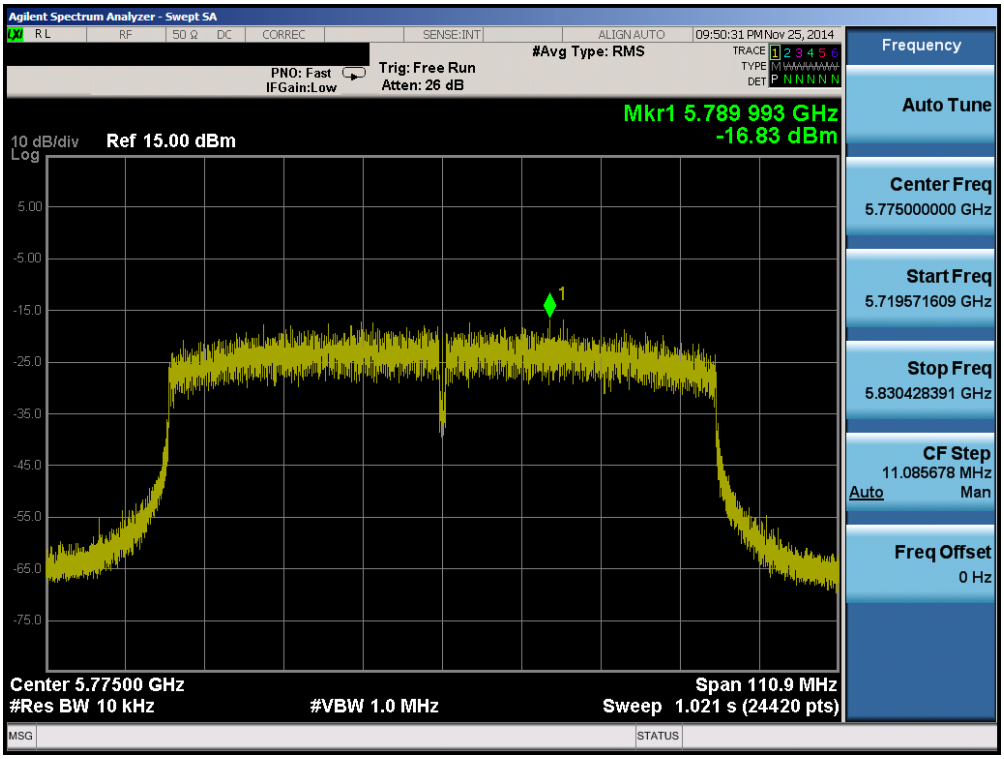


Plot 6-71. Power Spectral Density Plot (40MHz BW 802.11n (5.8GHz) – Ch. 159)



Plot 6-72. Power Spectral Density Plot (80MHz BW 802.11ac (5.8GHz) – Ch. 155)

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MIMO Power Spectral Density Measurements

Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	ANT 1 Power Spectral Density [dBm]	ANT 2 Power Spectral Density [dBm]	Summed MIMO Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]	Pass / Fail
2412	1	n	6.5/7.2 (MCS0)	-6.61	-7.83	-4.17	8.00	-12.17	Pass
2437	6	n	6.5/7.2 (MCS0)	-7.55	-7.79	-4.65	8.00	-12.65	Pass
2462	11	n	6.5/7.2 (MCS0)	-7.60	-7.71	-4.64	8.00	-12.64	Pass
5745	149	n (20MHz)	6.5/7.2 (MCS0)	-9.61	-8.85	-6.20	8.00	-14.20	Pass
5785	157	n (20MHz)	6.5/7.2 (MCS0)	-10.87	-9.12	-6.89	8.00	-14.89	Pass
5825	165	n (20MHz)	6.5/7.2 (MCS0)	-10.90	-9.00	-6.84	8.00	-14.84	Pass
5755	151	n (40MHz)	13.5/15 (MCS0)	-13.86	-12.28	-9.99	8.00	-17.99	Pass
5795	159	n (40MHz)	13.5/15 (MCS0)	-12.93	-16.05	-11.21	8.00	-19.21	Pass
5775	155	ac (80MHz)	29.3/32.5 (MCS0)	-16.72	-16.83	-13.77	8.00	-21.77	Pass

Table 6-30.MIMO Conducted Power Density Measurements

Note:

Per KDB 662911 Section E)2), the power spectral density at Antenna 1 and Antenna 2 were first measured separately as shown in the section above. The measured values were then summed in linear power units then converted back to dBm.

Sample MIMO Calculation:

At 2412MHz the average conducted power spectral density was measured to be -6.61 dBm for Antenna-1 and -7.83 dBm for Antenna-2.

Antenna 1 + Antenna 2 = MIMO

(-6.61 dBm + -7.83 dBm) = (0.22 mW + 0.16 mW) = 0.38 mW = -4.17 dBm

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6.5 Conducted Emissions at the Band Edge

§15.247(d)

Test Overview and Limit

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle (>98%), at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. For the following out of band conducted spurious emissions plots at the band edge, the EUT was set at a data rate of 1Mbps for "b" mode, 6 Mbps for "g" mode, 6 Mbps for "a" mode, 6.5/7.2Mbps for 20MHz BW "n" mode, 13.5/15Mbps for 40MHz "n", and 29.3/32.5Mbps for 80MHz "ac" mode as these settings produced the worst-case emissions.

The limit for out-of-band spurious emissions at the band edge is 30dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth per the PSD procedure (Section 9.1).

Test Procedure Used

KDB 558074 v03r02 – Section 11.3

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW = 100kHz
4. VBW = 1MHz
5. Detector = Peak
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = max hold
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

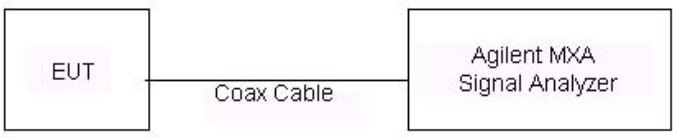

Figure 6-4. Test Instrument & Measurement Setup

Test Notes

None

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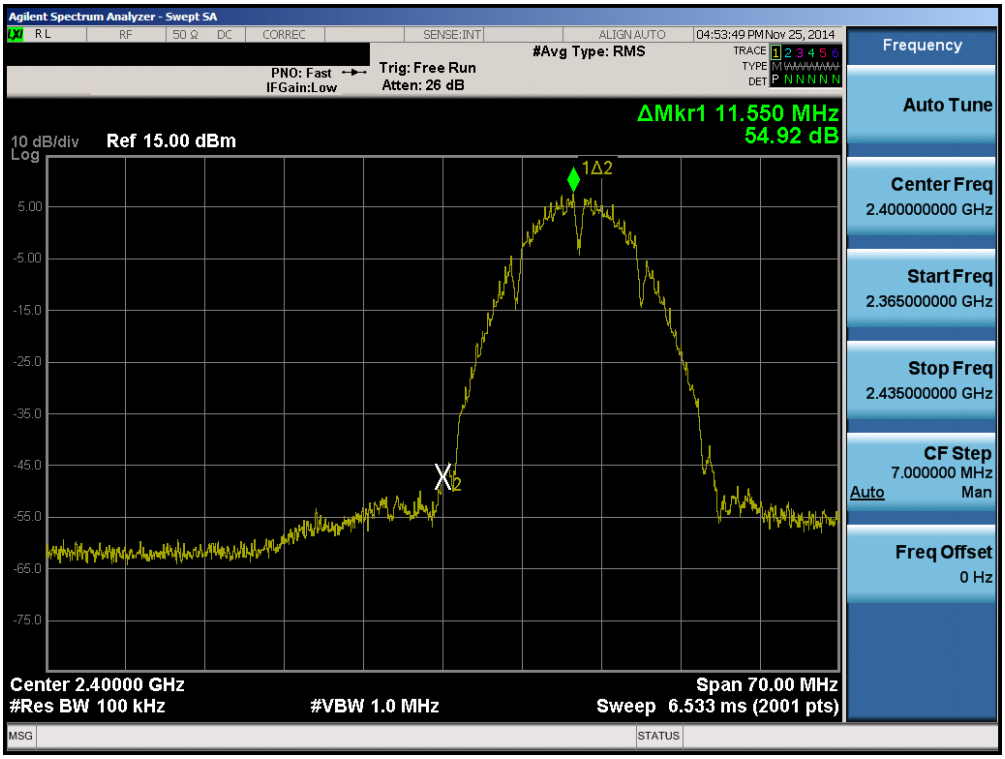
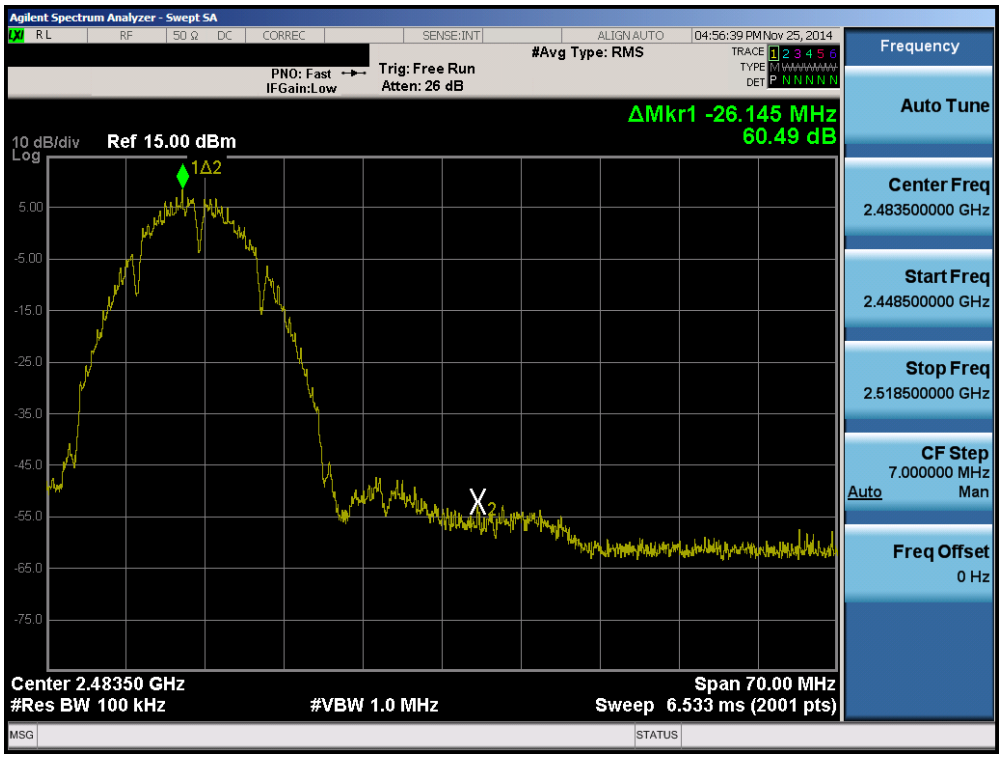
Antenna-1 Conducted Emissions at the Band Edge



Plot 6-73. Band Edge Plot (802.11b – Ch. 1)



Plot 6-74. Band Edge Plot (802.11b – Ch. 11)

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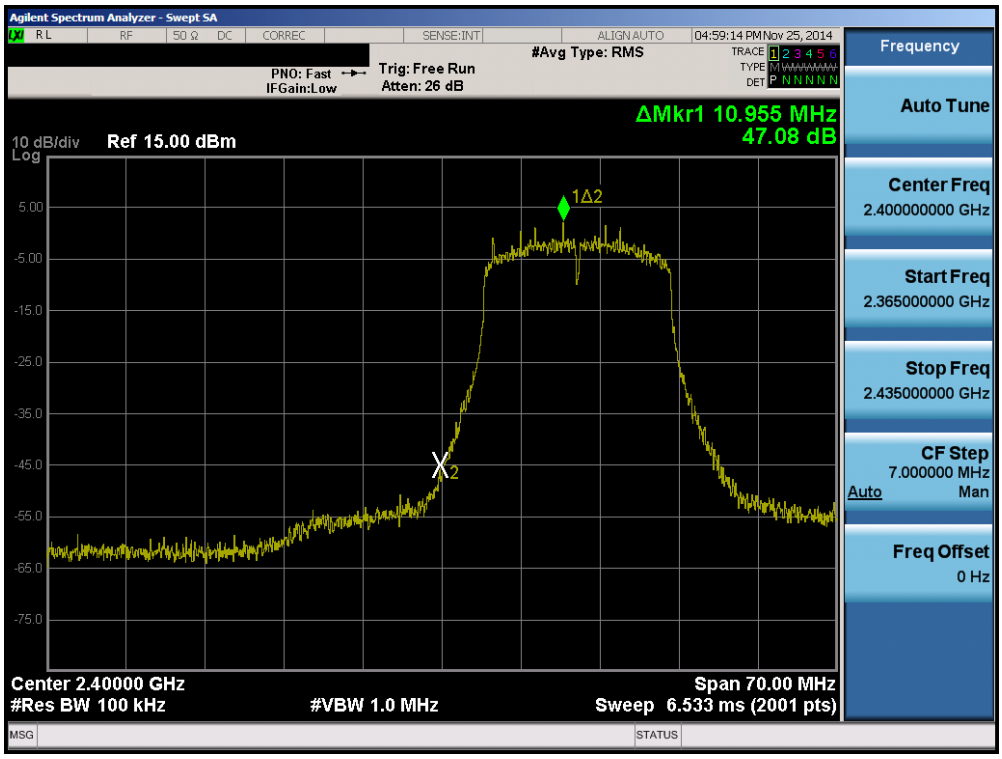
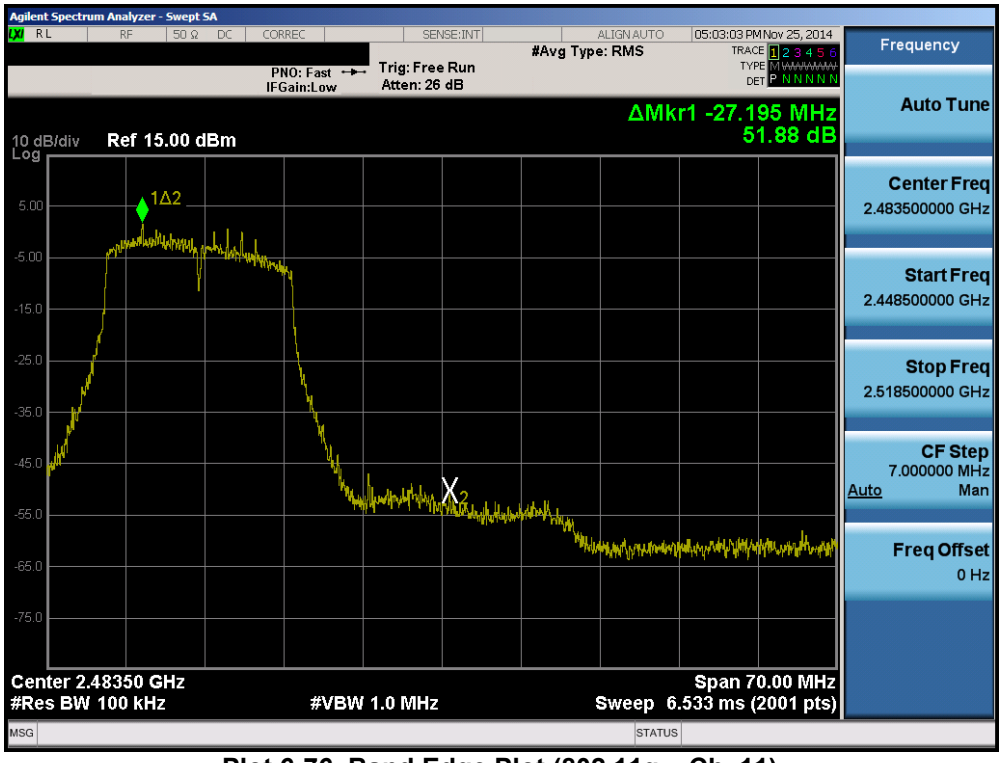


Plot 6-75. Band Edge Plot (802.11g– Ch. 1)



Plot 6-76. Band Edge Plot (802.11g – Ch. 11)

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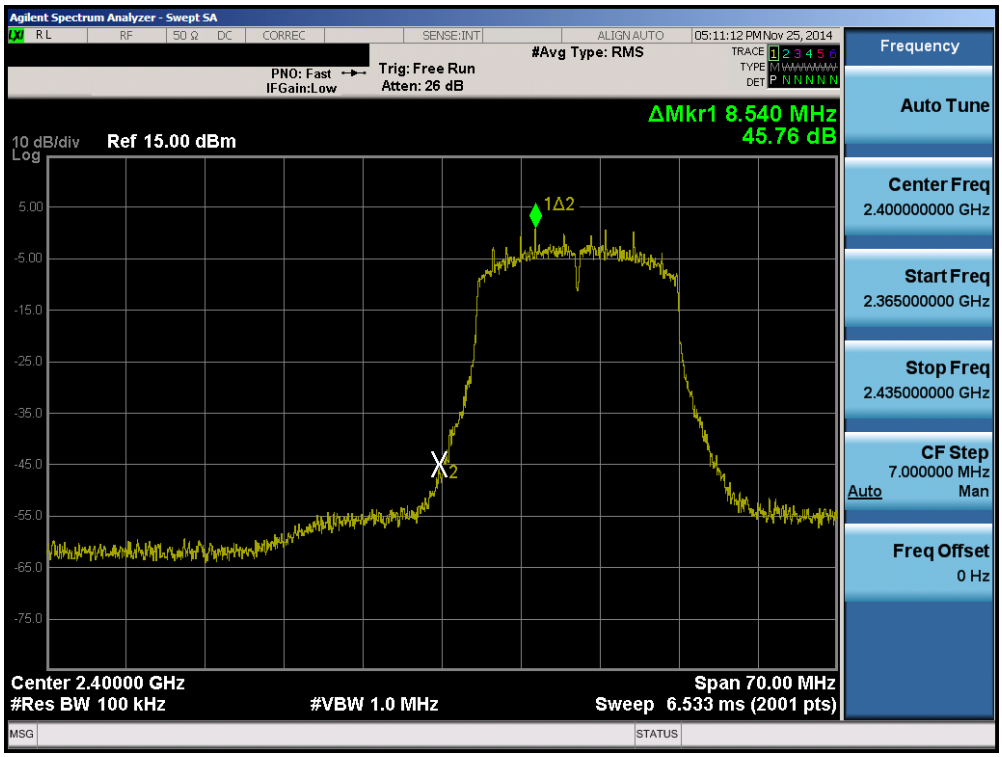
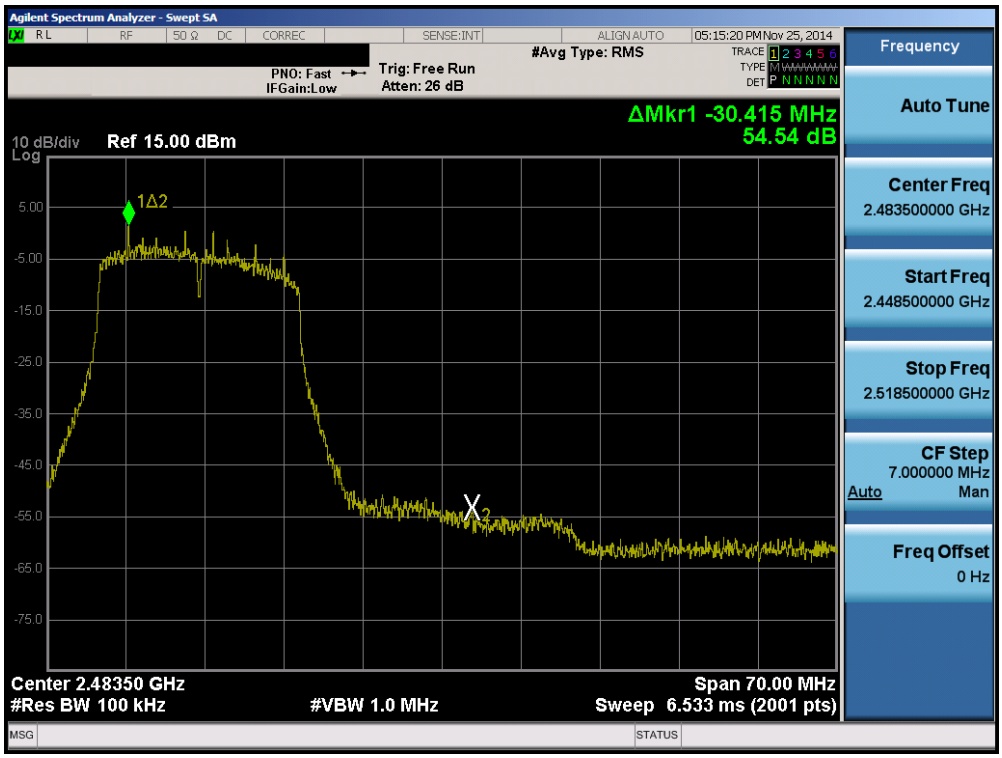


Plot 6-77. Band Edge Plot (802.11n (2.4GHz) – Ch. 1)



Plot 6-78. Band Edge Plot (802.11n (2.4GHz) – Ch. 11)

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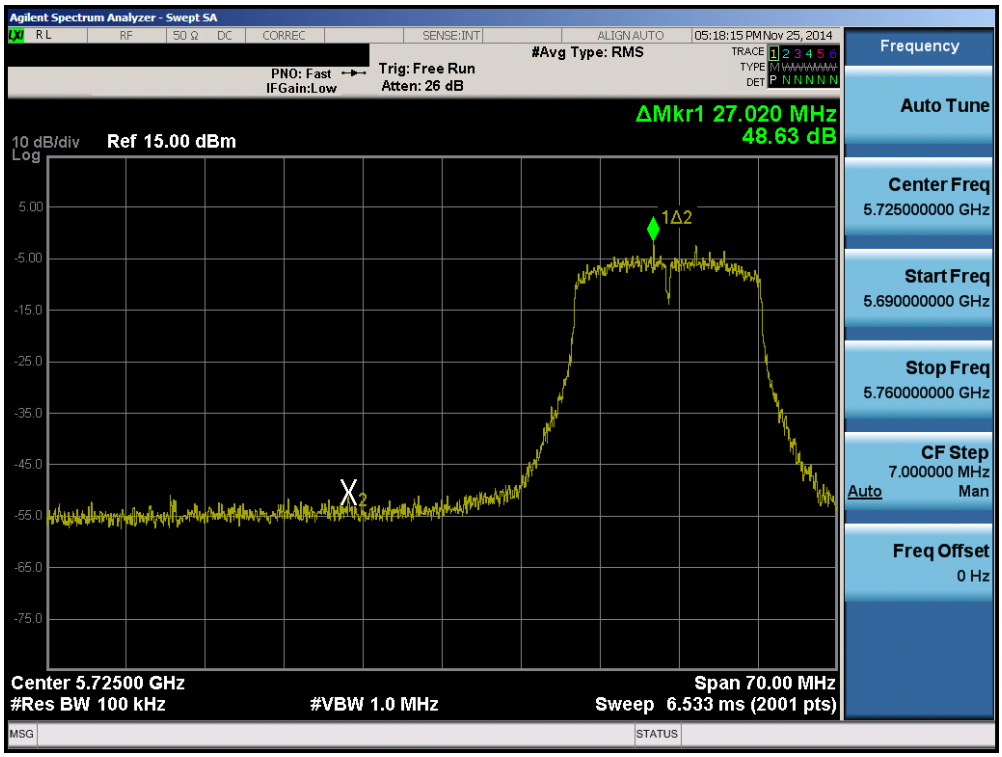
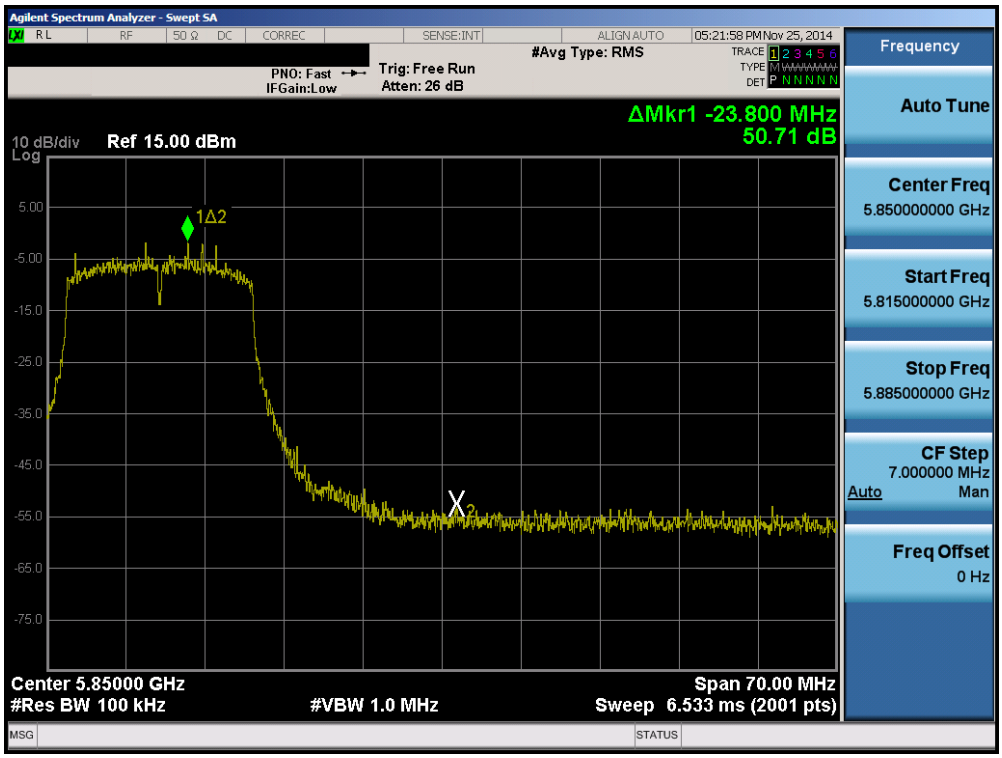


Plot 6-79. Band Edge Plot (802.11a – Ch. 149)



Plot 6-80. Band Edge Plot (802.11a – Ch. 165)

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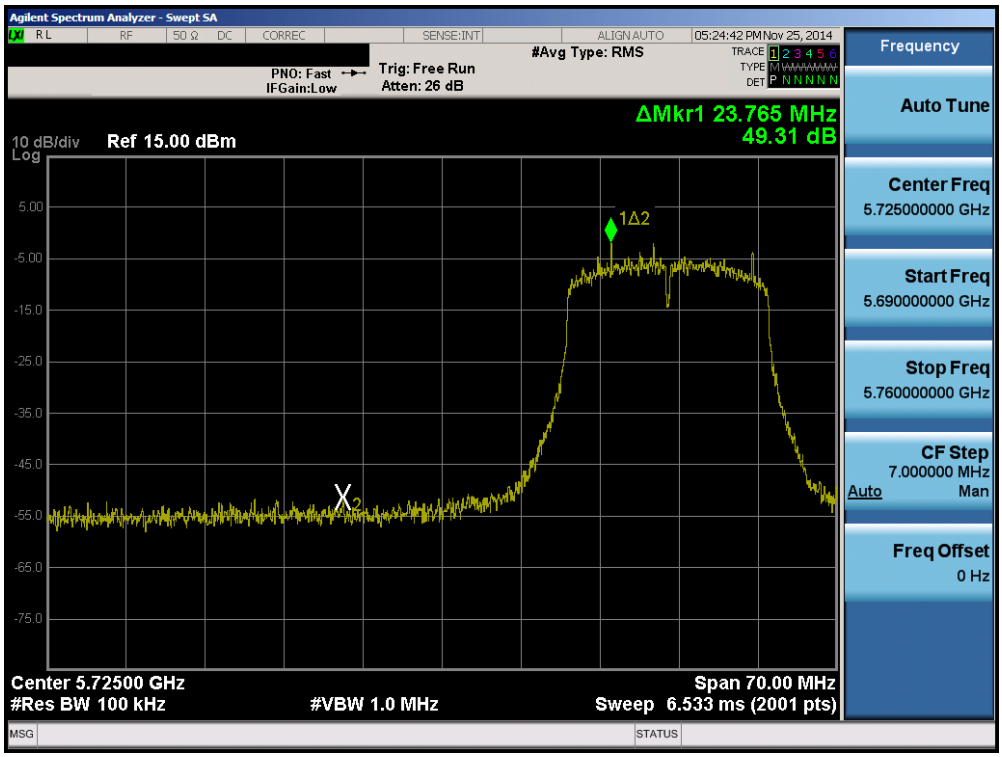
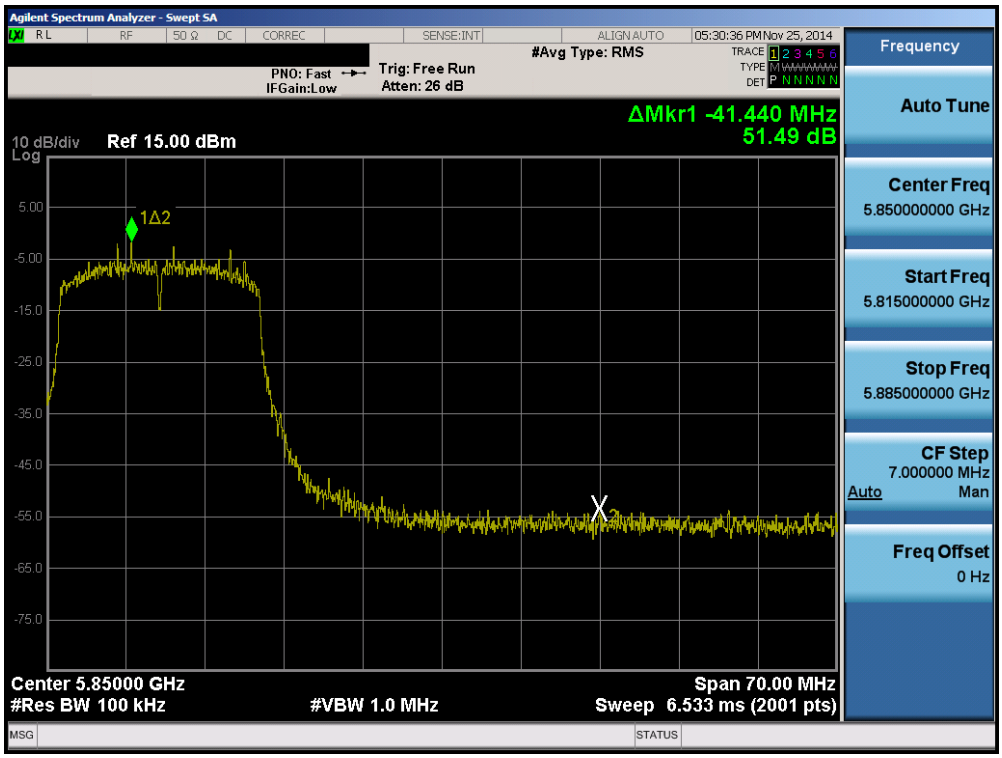


Plot 6-81. Band Edge Plot (20MHz BW 802.11n (5.8GHz) – Ch. 149)



Plot 6-82. Band Edge Plot (20MHz BW 802.11n (5.8GHz) – Ch. 165)

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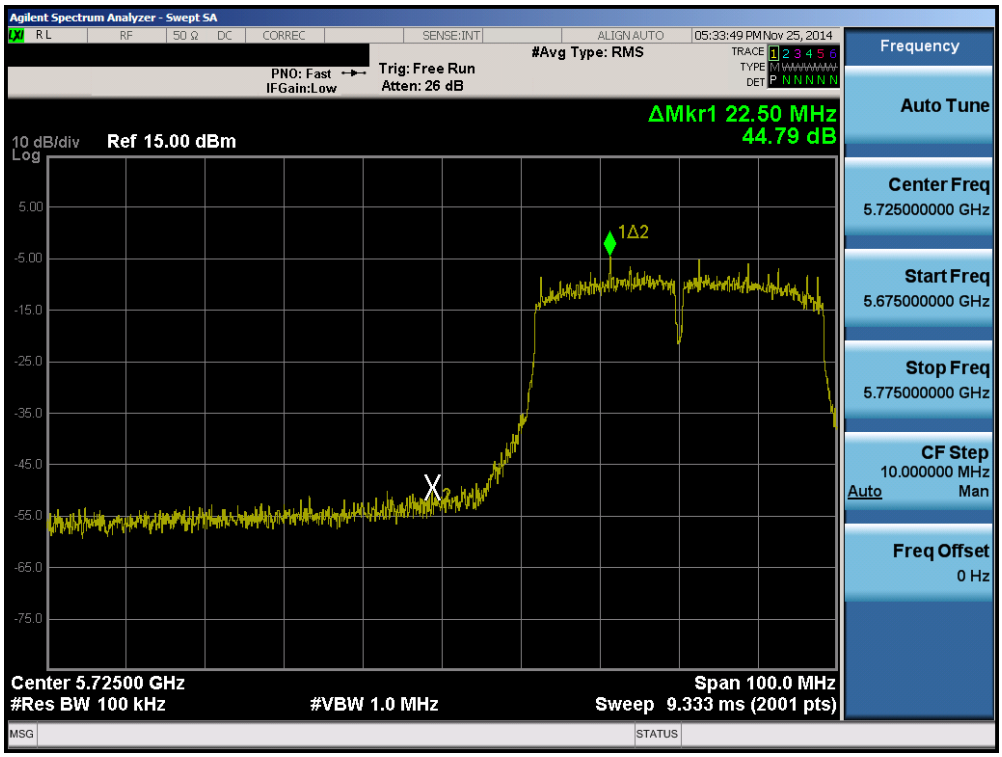
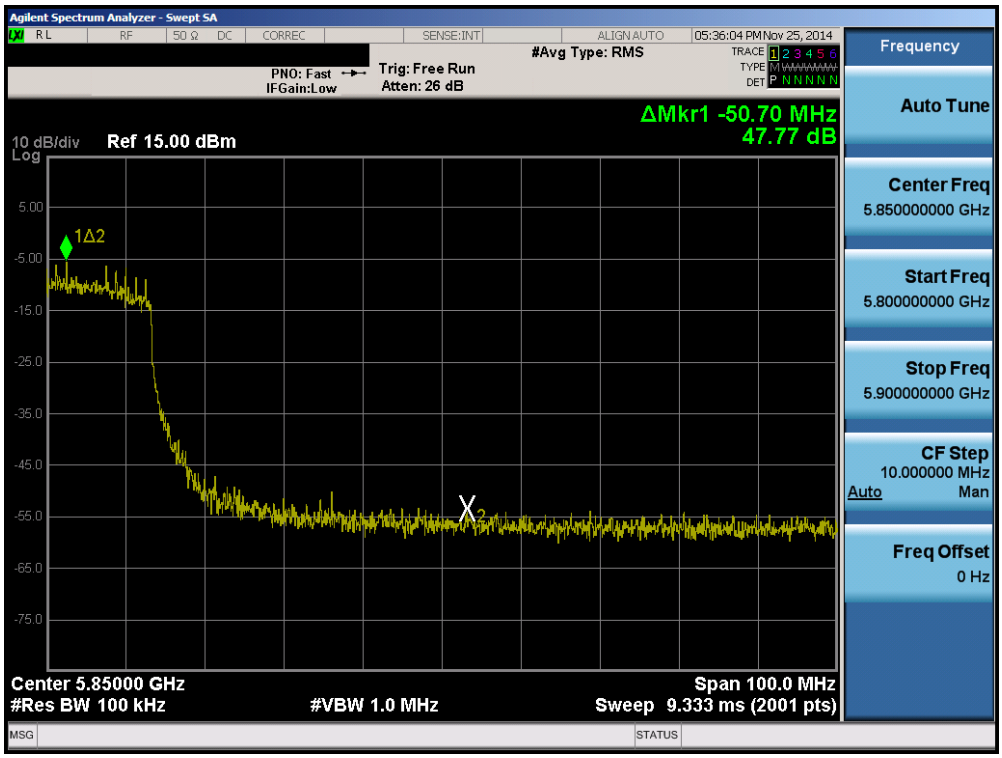


Plot 6-83. Band Edge Plot (40MHz BW 802.11n (5.8GHz) – Ch. 151)



Plot 6-84. Band Edge Plot (40MHz BW 802.11n (5.8GHz) – Ch. 163)

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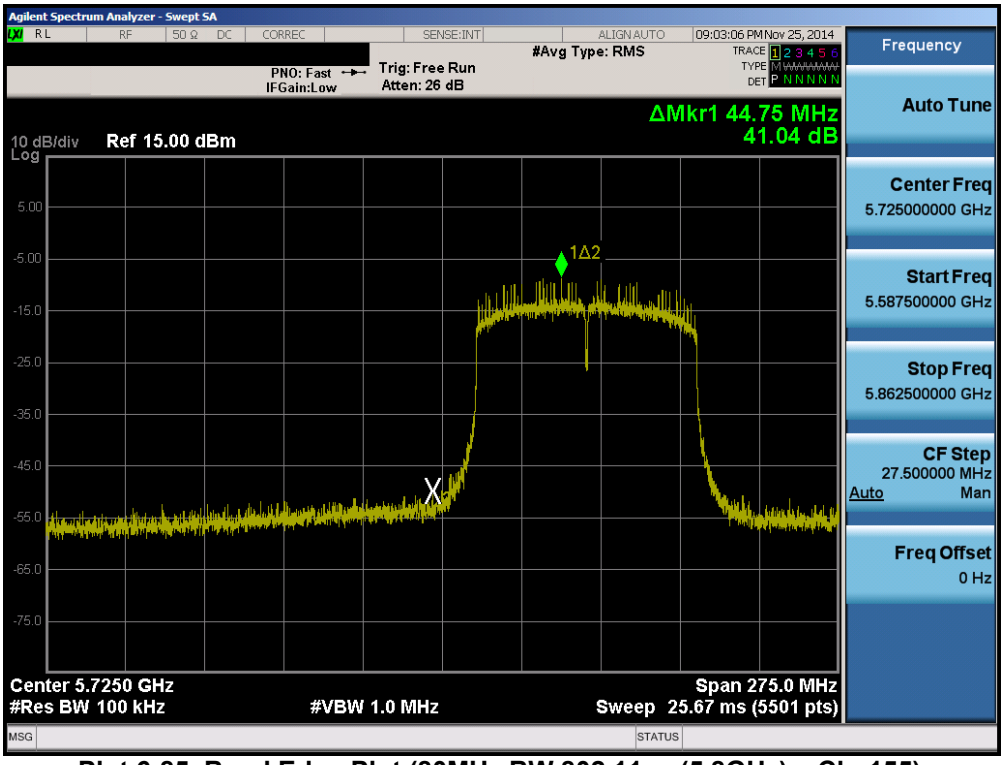
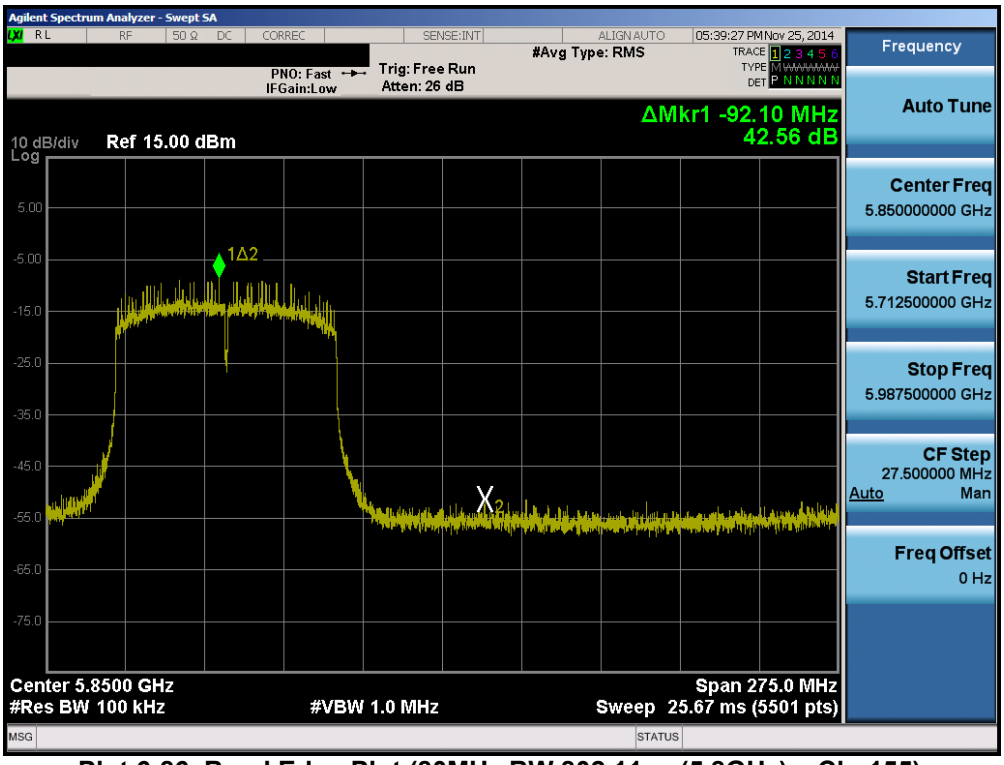


Plot 6-85. Band Edge Plot (80MHz BW 802.11ac (5.8GHz) – Ch. 155)



Plot 6-86. Band Edge Plot (80MHz BW 802.11ac (5.8GHz) – Ch. 155)

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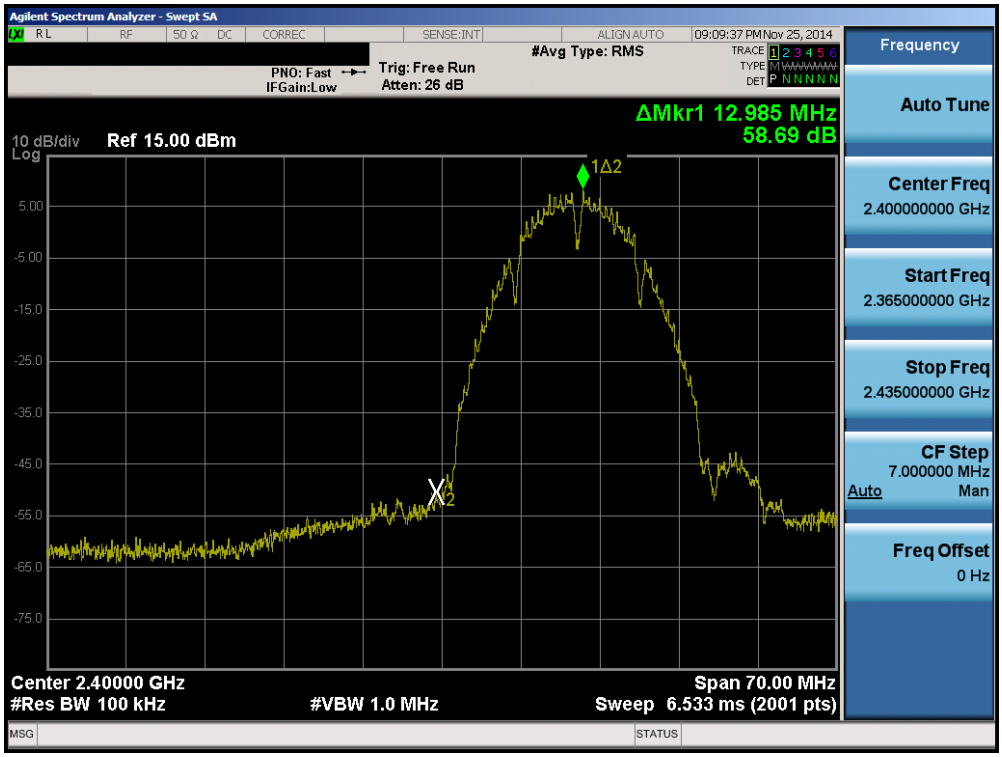
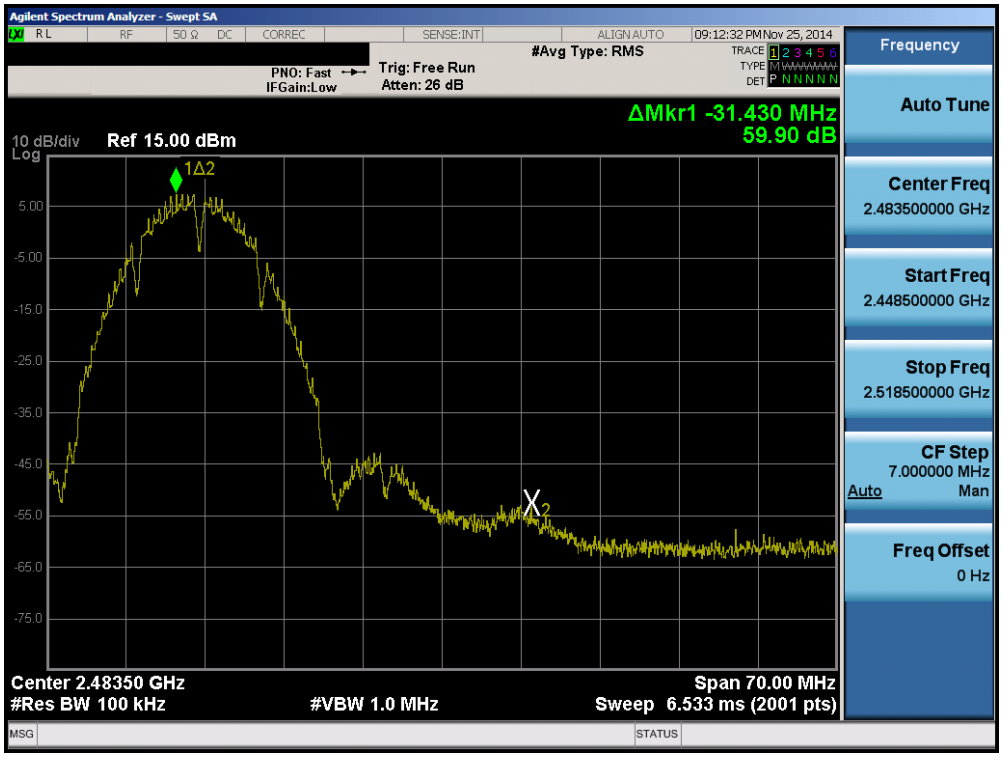
Antenna-2 Conducted Emissions at the Band Edge



Plot 6-87. Band Edge Plot (802.11b – Ch. 1)



Plot 6-88. Band Edge Plot (802.11b – Ch. 11)

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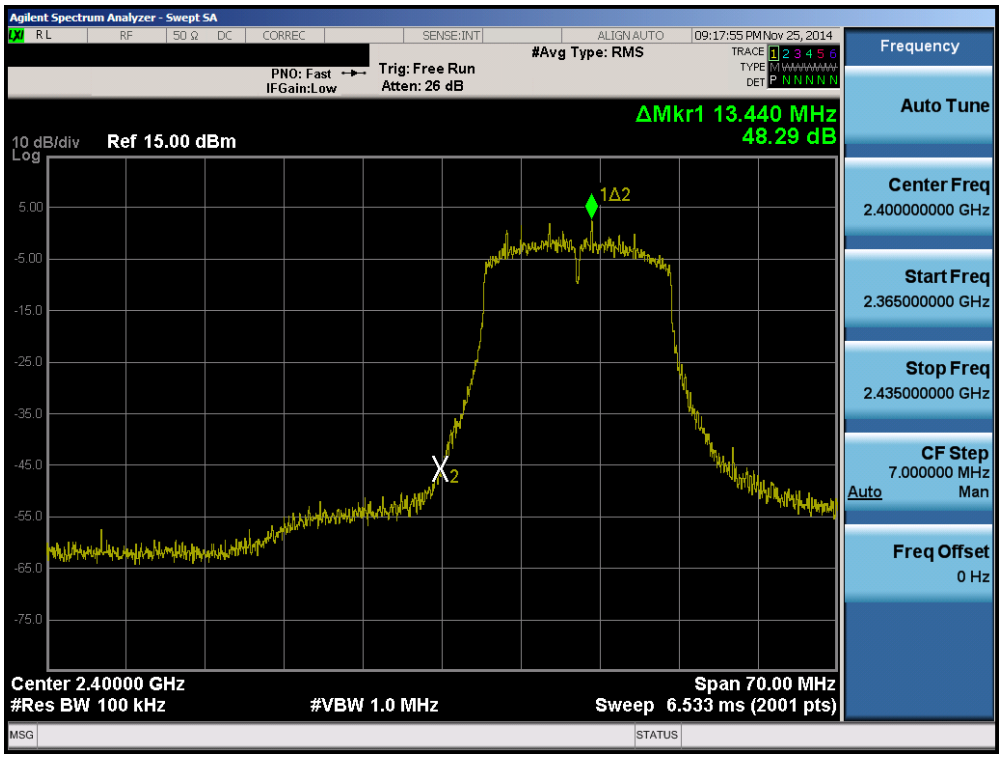
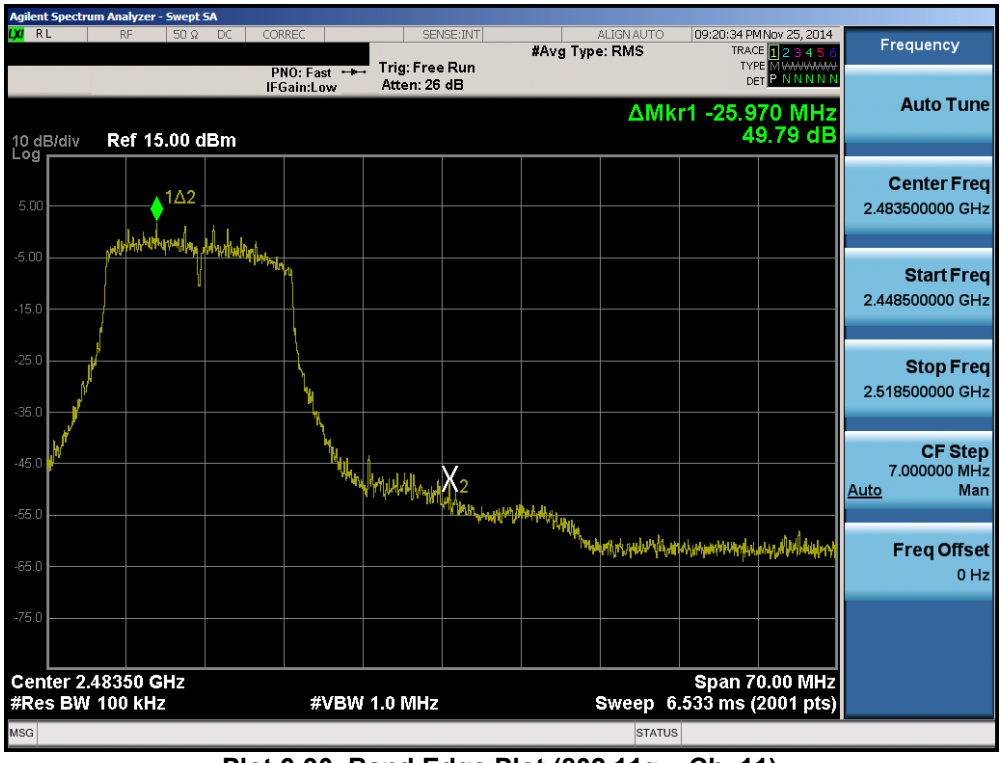


Plot 6-89. Band Edge Plot (802.11g– Ch. 1)



Plot 6-90. Band Edge Plot (802.11g – Ch. 11)

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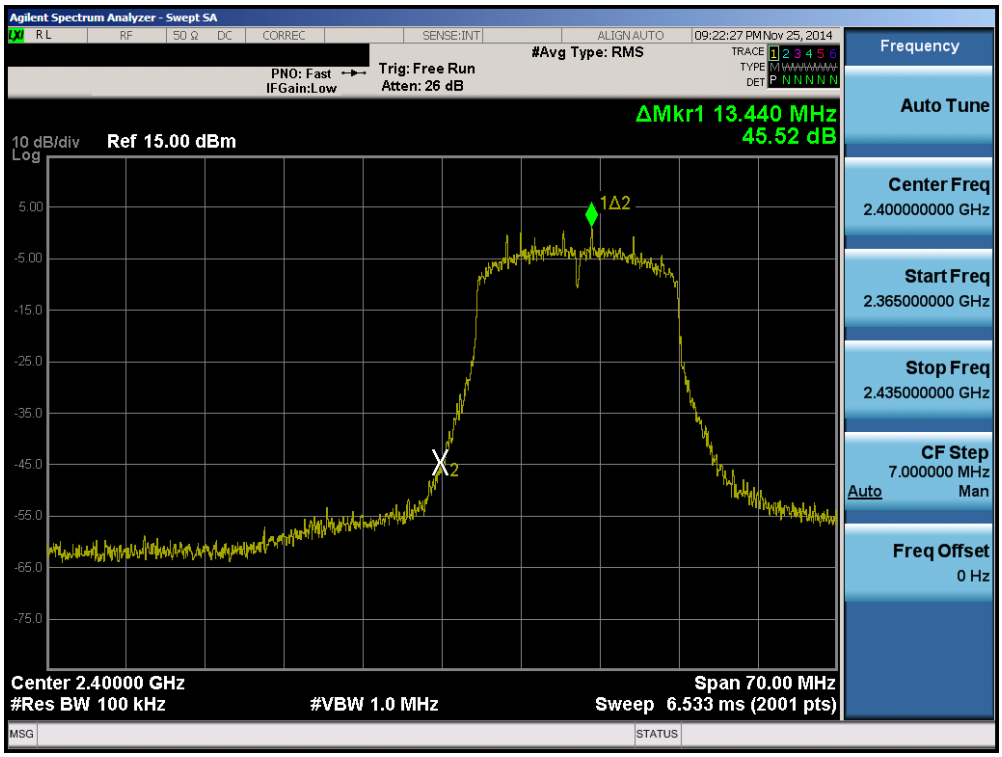
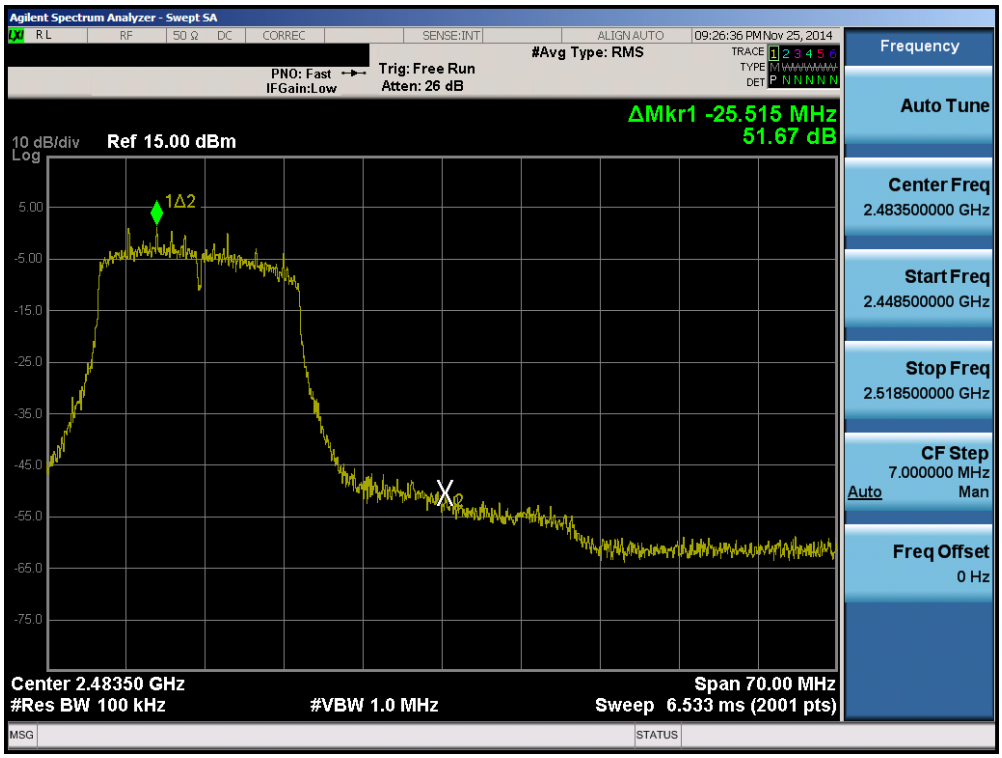


Plot 6-91. Band Edge Plot (802.11n (2.4GHz) – Ch. 1)



Plot 6-92. Band Edge Plot (802.11n (2.4GHz) – Ch. 11)

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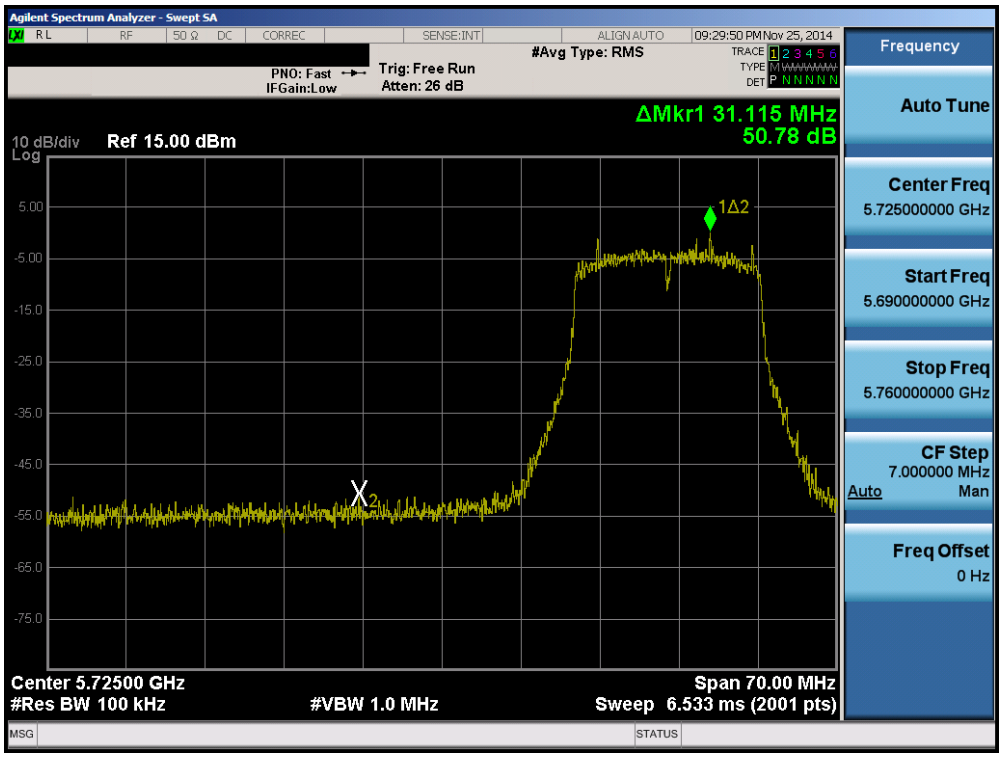
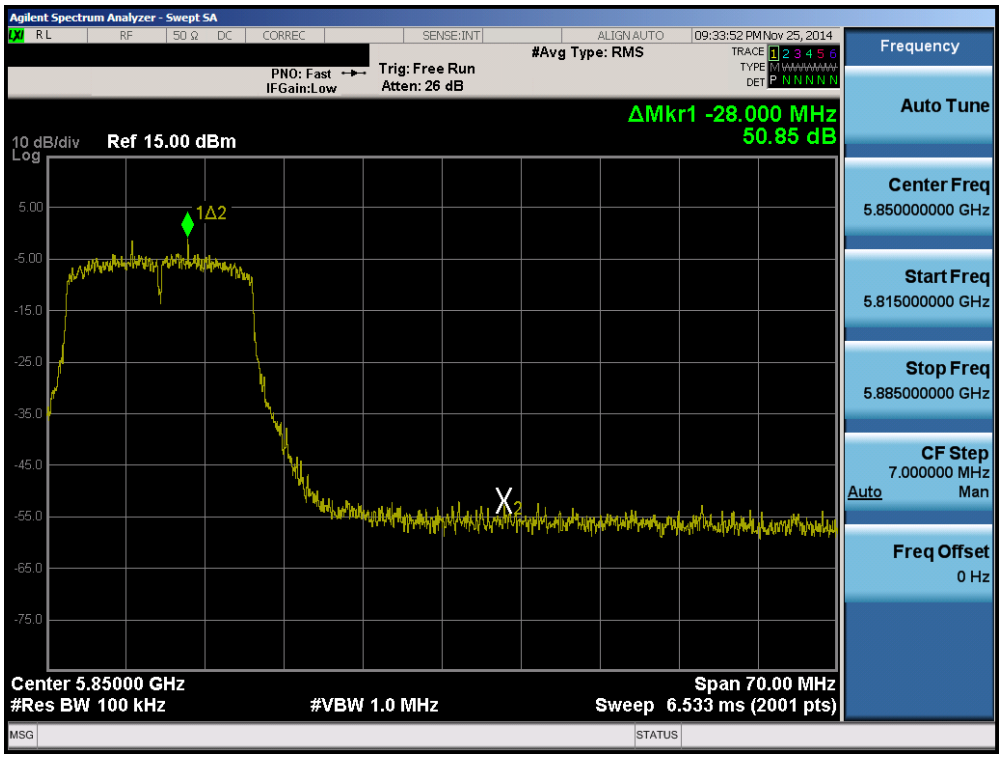


Plot 6-93. Band Edge Plot (802.11a – Ch. 149)



Plot 6-94. Band Edge Plot (802.11a – Ch. 165)

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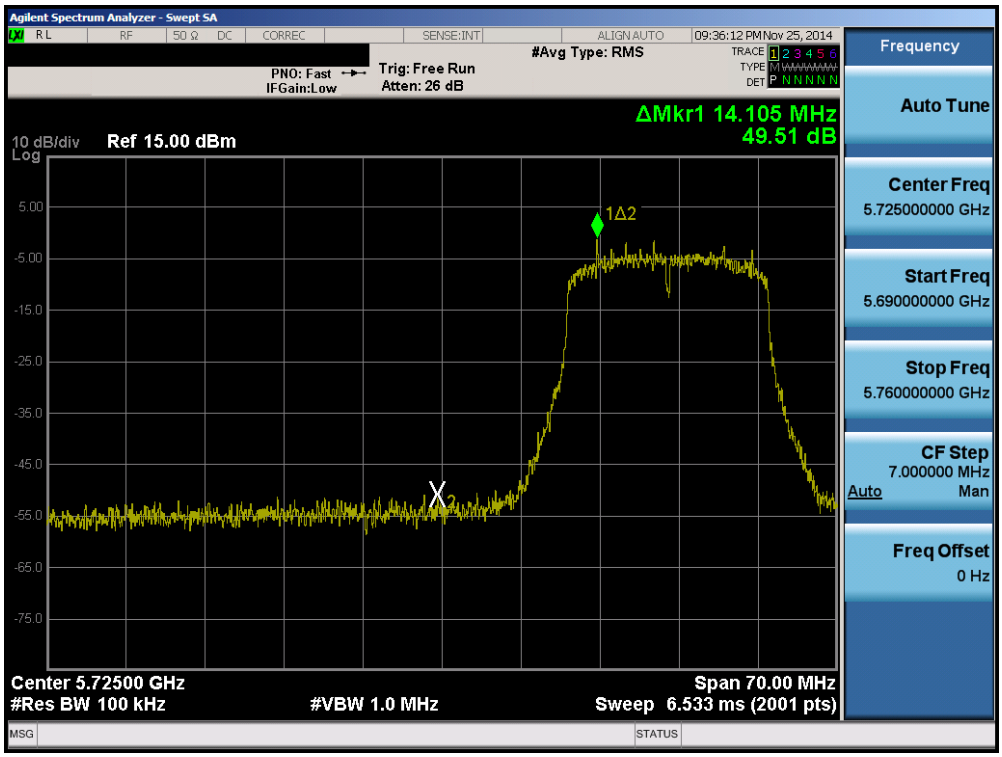
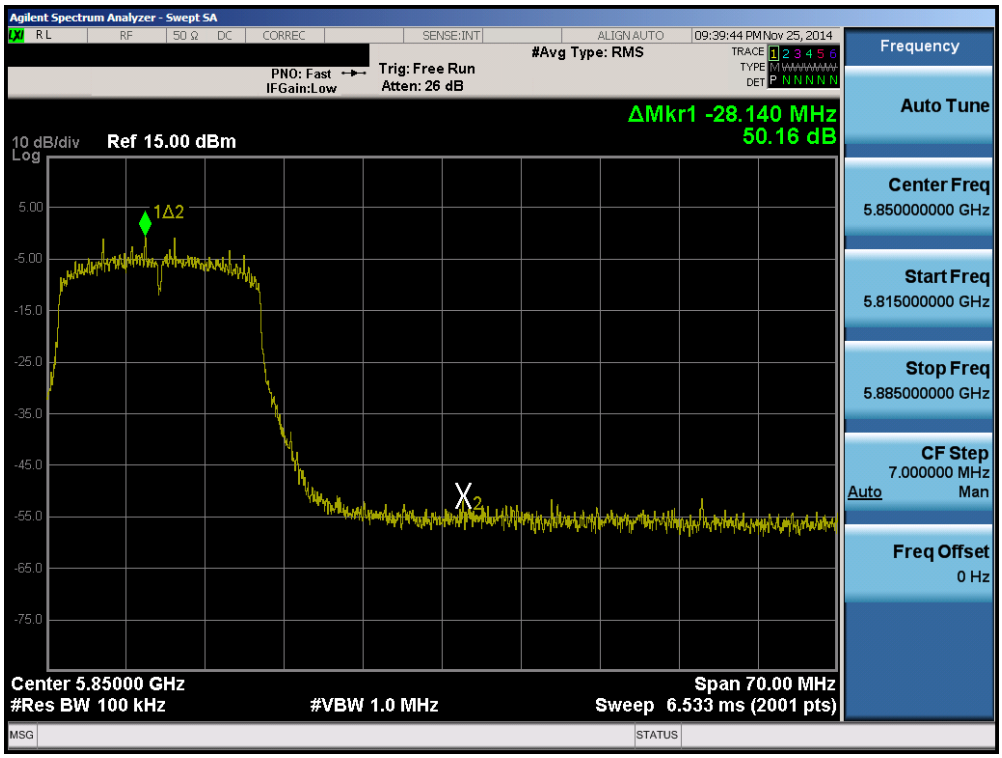


Plot 6-95. Band Edge Plot (20MHz BW 802.11n (5.8GHz) – Ch. 149)



Plot 6-96. Band Edge Plot (20MHz BW 802.11n (5.8GHz) – Ch. 165)

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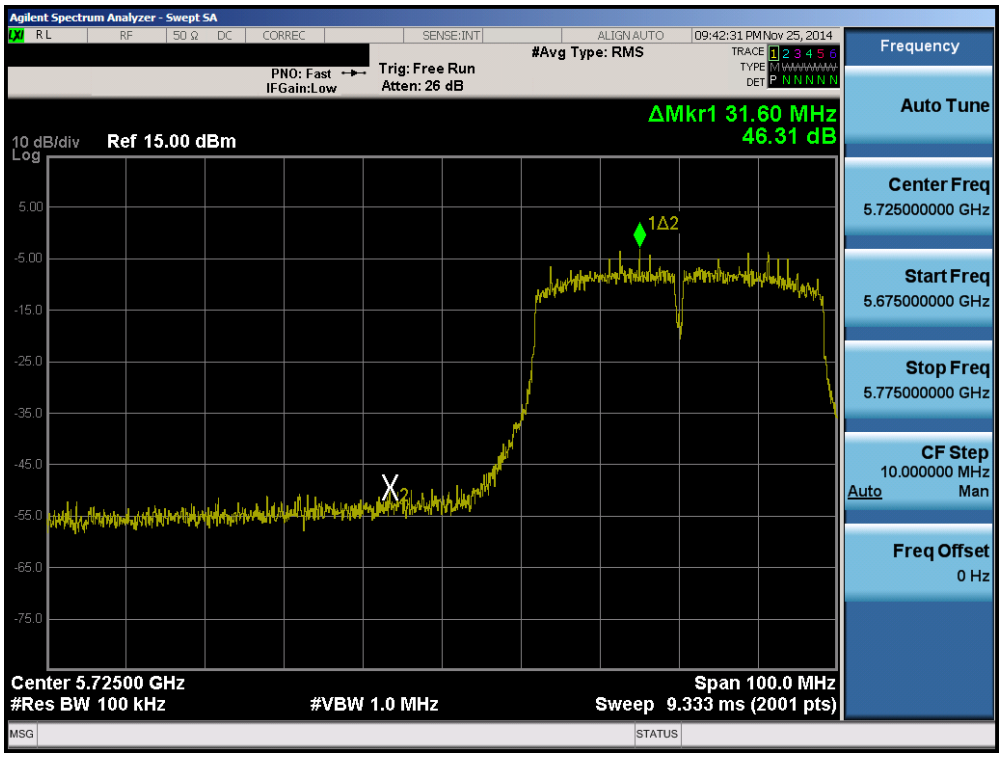
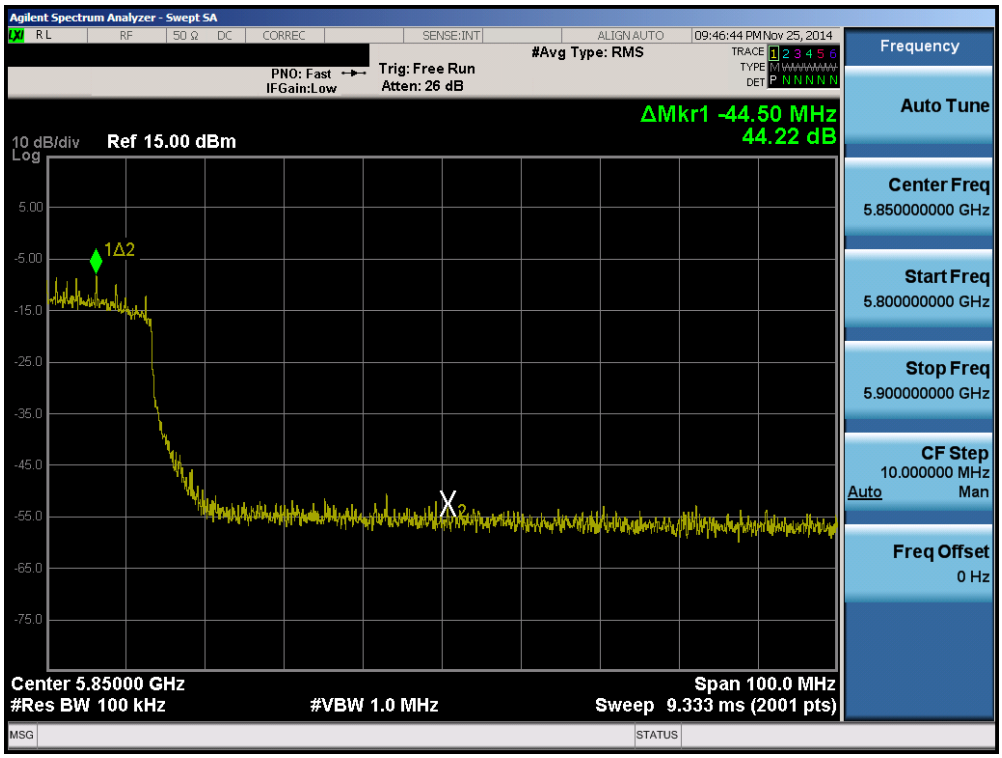


Plot 6-97. Band Edge Plot (40MHz BW 802.11n (5.8GHz) – Ch. 151)



Plot 6-98. Band Edge Plot (40MHz BW 802.11n (5.8GHz) – Ch. 163)

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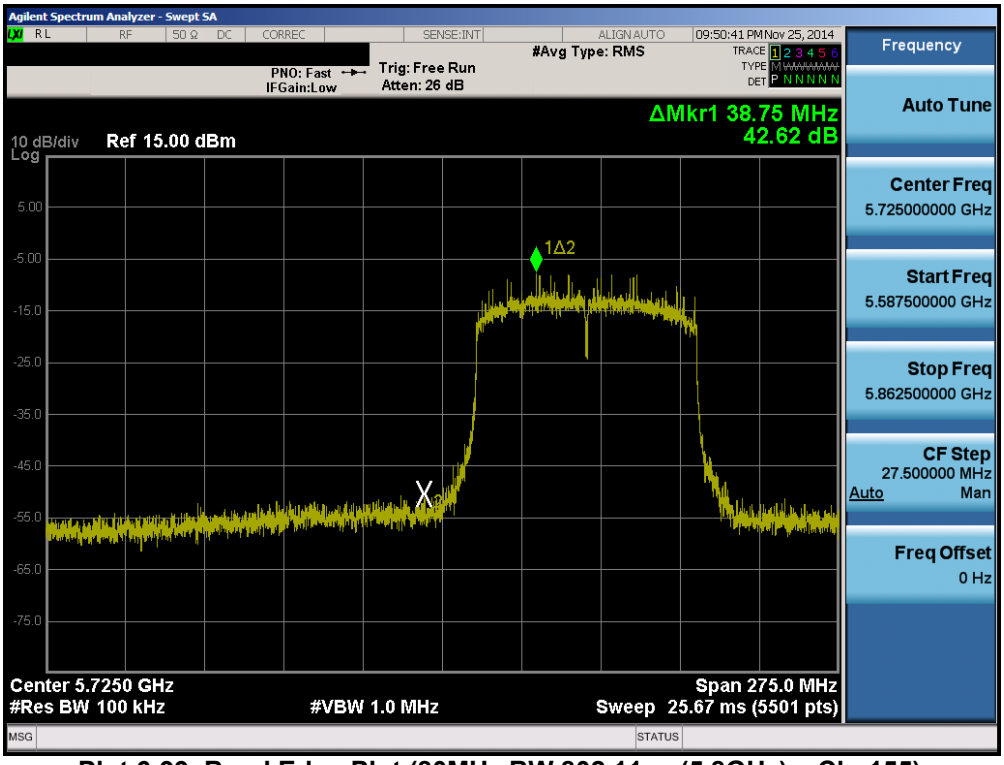
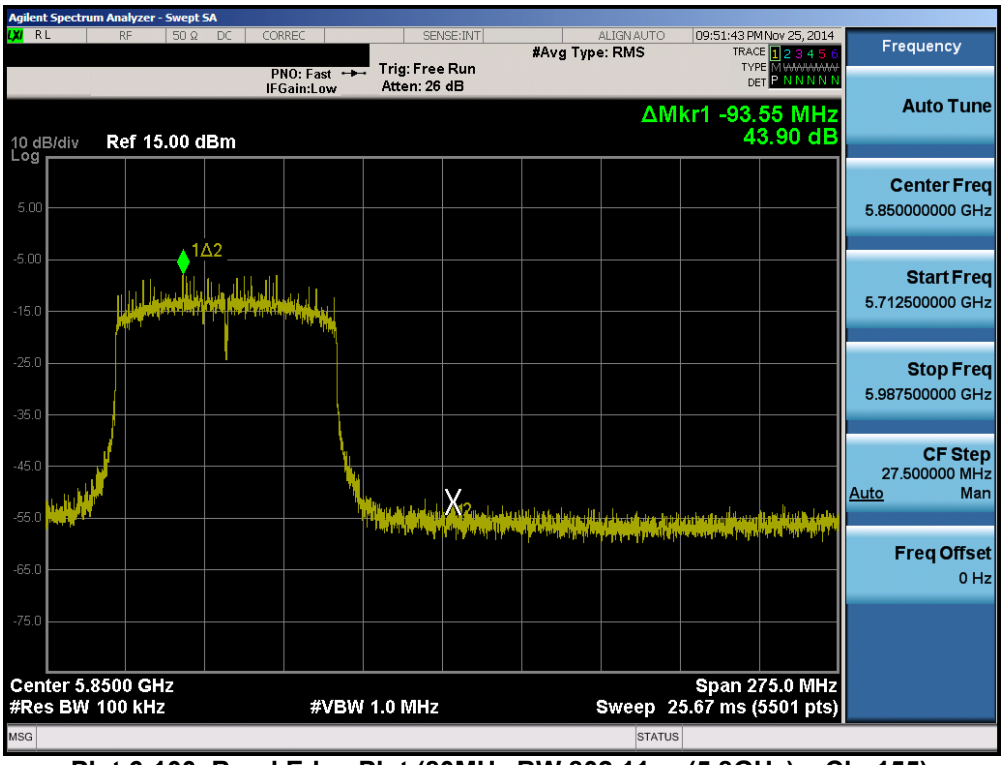


Plot 6-99. Band Edge Plot (80MHz BW 802.11ac (5.8GHz) – Ch. 155)



Plot 6-100. Band Edge Plot (80MHz BW 802.11ac (5.8GHz) – Ch. 155)

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6.6 Conducted Spurious Emissions

§15.247(d)

Test Overview and Limit

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle (>98%), at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. For the following out of band conducted spurious emissions plots, the EUT was investigated in all available data rates for "b", "g", "a", "n", and "ac" modes. The worst case spurious emissions for the 2.4GHz band were found while transmitting in "b" mode at 1 Mbps and are shown in the plots below. The worst case spurious emissions for the 5.8GHz band were found while transmitting in "a" mode at 6 Mbps and are shown in the plots below.

The limit for out-of-band spurious emissions at the band edge is 30dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth per the procedure in Section 11.1 of KDB 558074 v03r02.

Test Procedure Used

KDB 558074 v03r02 – Section 11.3
KDB 662911 v02r01 – Section E)3)b)

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 25GHz for 2.4GHz frequencies and 40GHz for 5GHz frequencies (separated into two plots per channel)
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

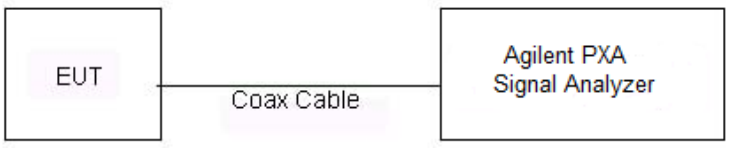

Figure 6-5. Test Instrument & Measurement Setup

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Test Notes

1. RBW was set to 1MHz rather than 100kHz in order to increase the measurement speed.

2. The display line shown in the following plots denotes the limit at 30dB below the fundamental emission level measured in a 100kHz bandwidth. However, since the traces in the following plots are measured with a 1MHz RBW, the display line may not necessarily appear to be 30dB below the level of the fundamental in a 1MHz bandwidth.

3. For plots showing conducted spurious emissions near the limit, the frequencies were investigated with a reduced RBW to ensure that no emissions were present.

4. The conducted spurious emissions were measured to relative limits. Therefore, in accordance with KDB 662911 v02r01 Section E)3)b), it was unnecessary to show compliance through the summation of test results of the individual outputs.

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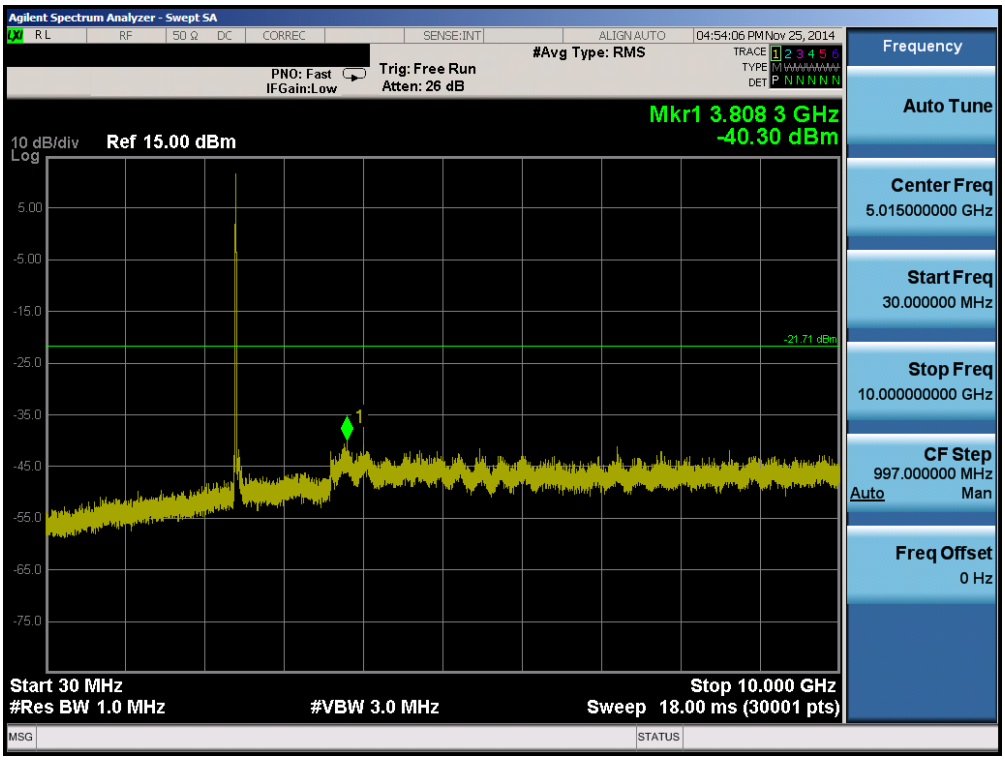
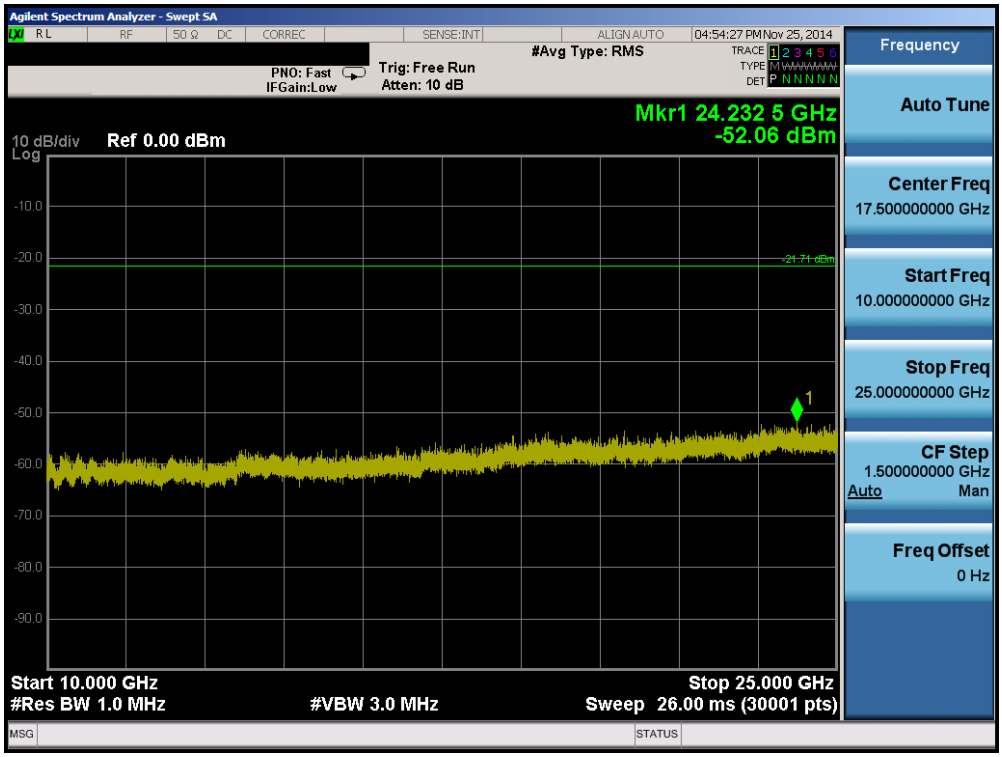
Antenna-1 Conducted Spurious Emissions



Plot 6-101. Conducted Spurious Plot (802.11b – Ch. 1)



Plot 6-102. Conducted Spurious Plot (802.11b – Ch. 1)

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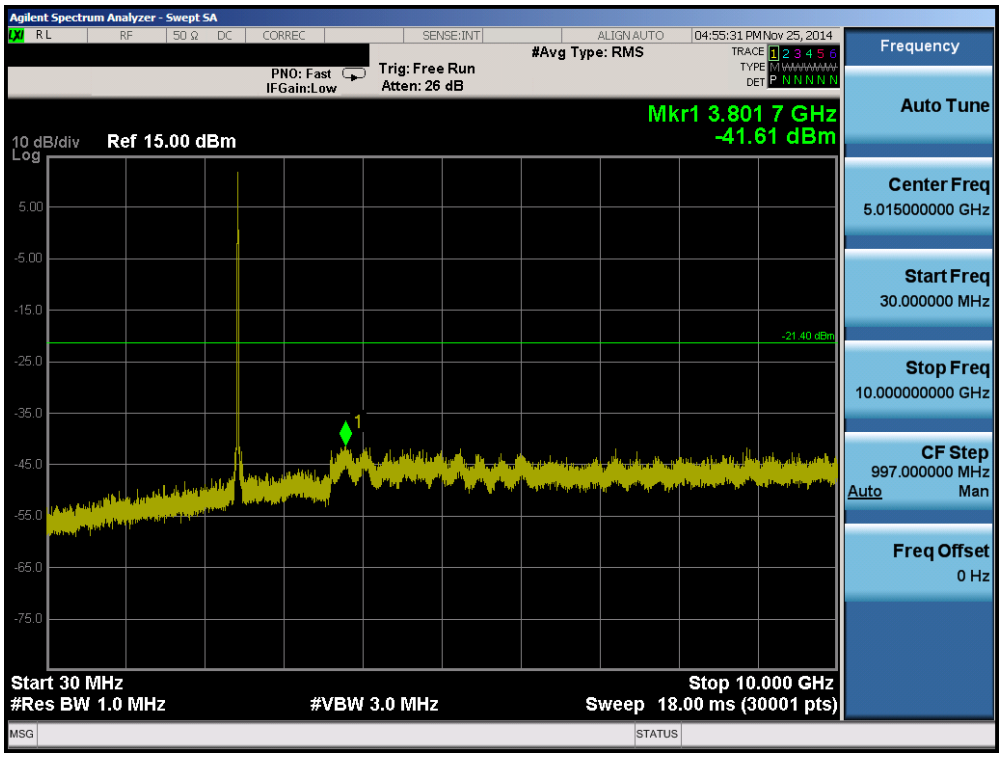
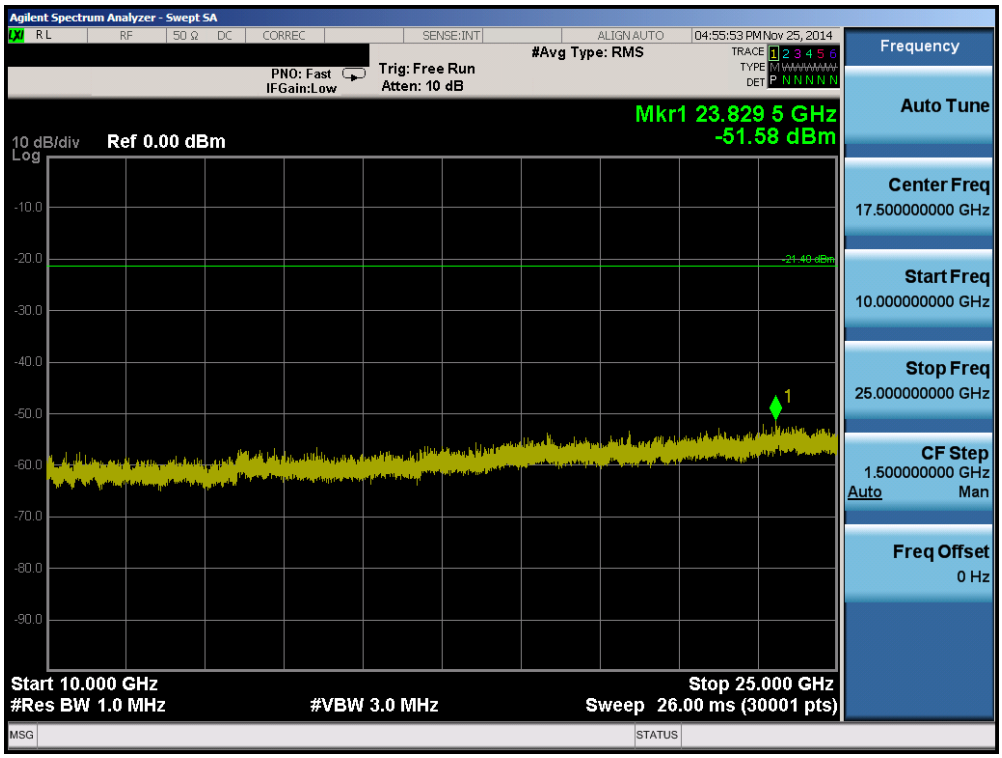


Plot 6-103. Conducted Spurious Plot (802.11b – Ch. 6)



Plot 6-104. Conducted Spurious Plot (802.11b – Ch. 6)

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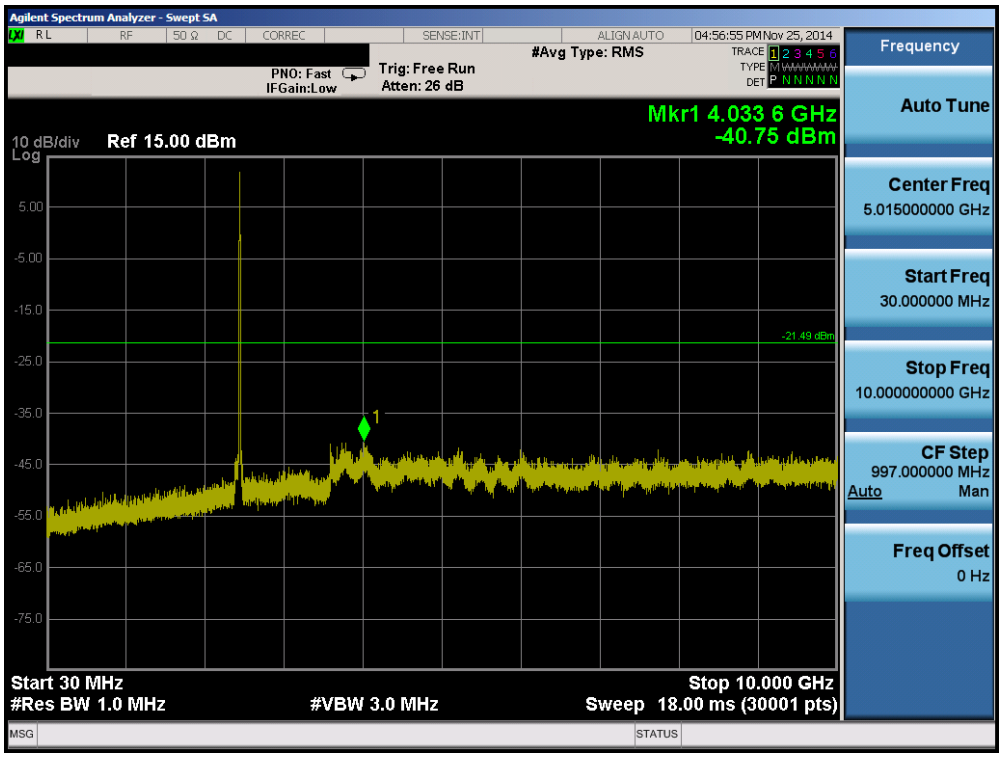
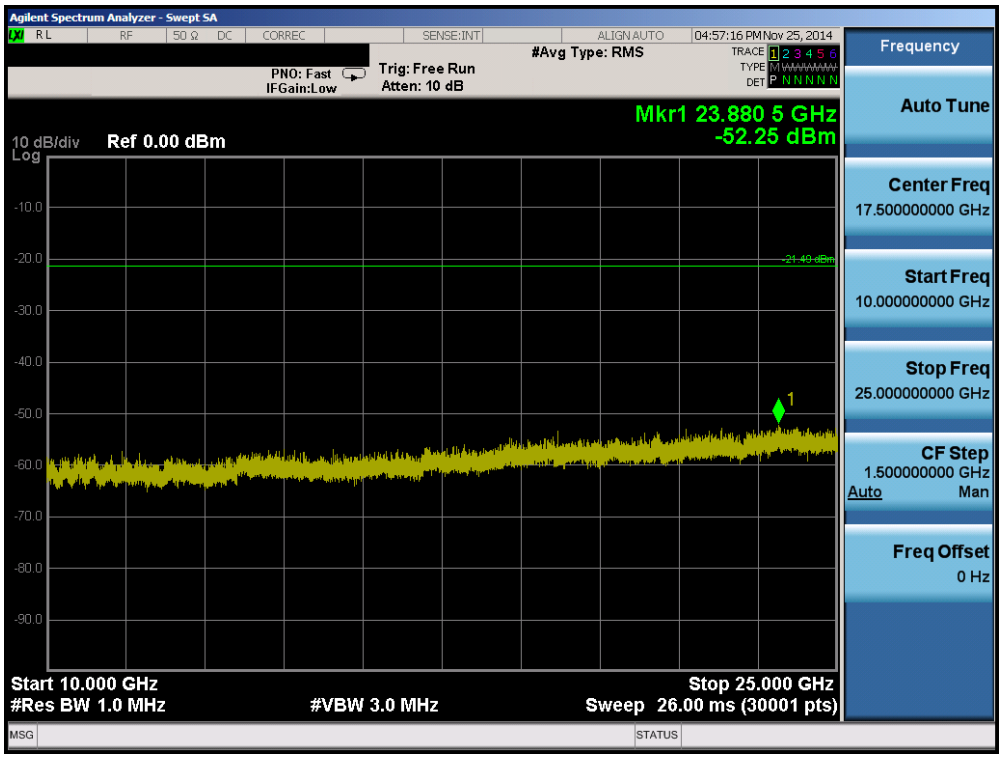


Plot 6-105. Conducted Spurious Plot (802.11b – Ch. 11)



Plot 6-106. Conducted Spurious Plot (802.11b – Ch. 11)

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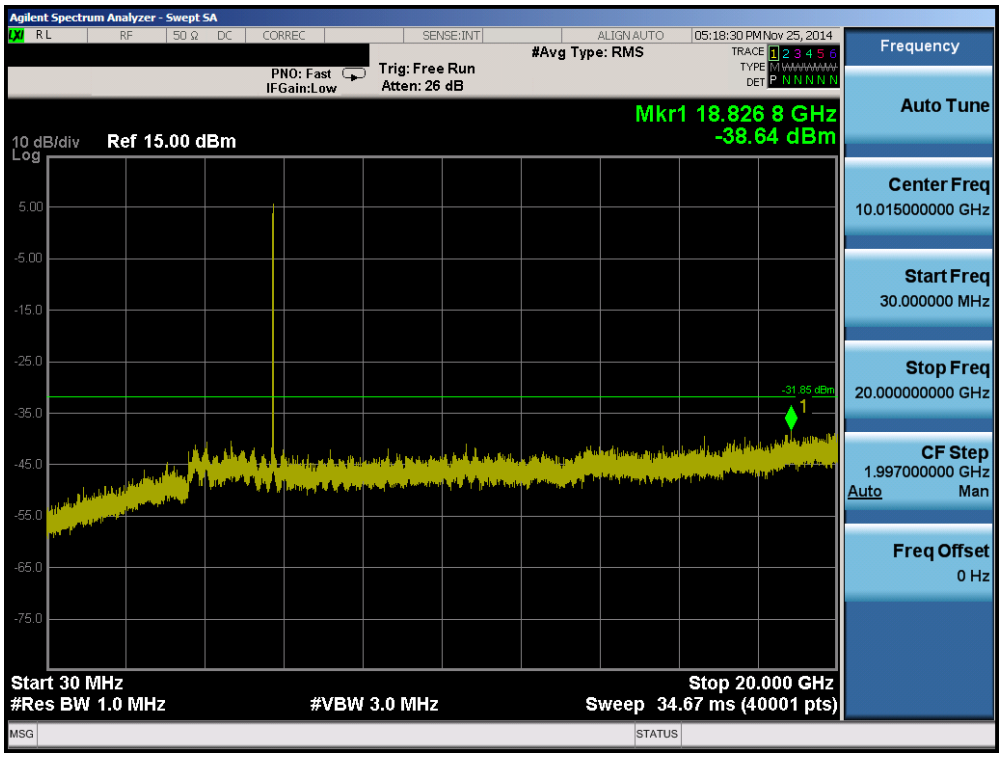
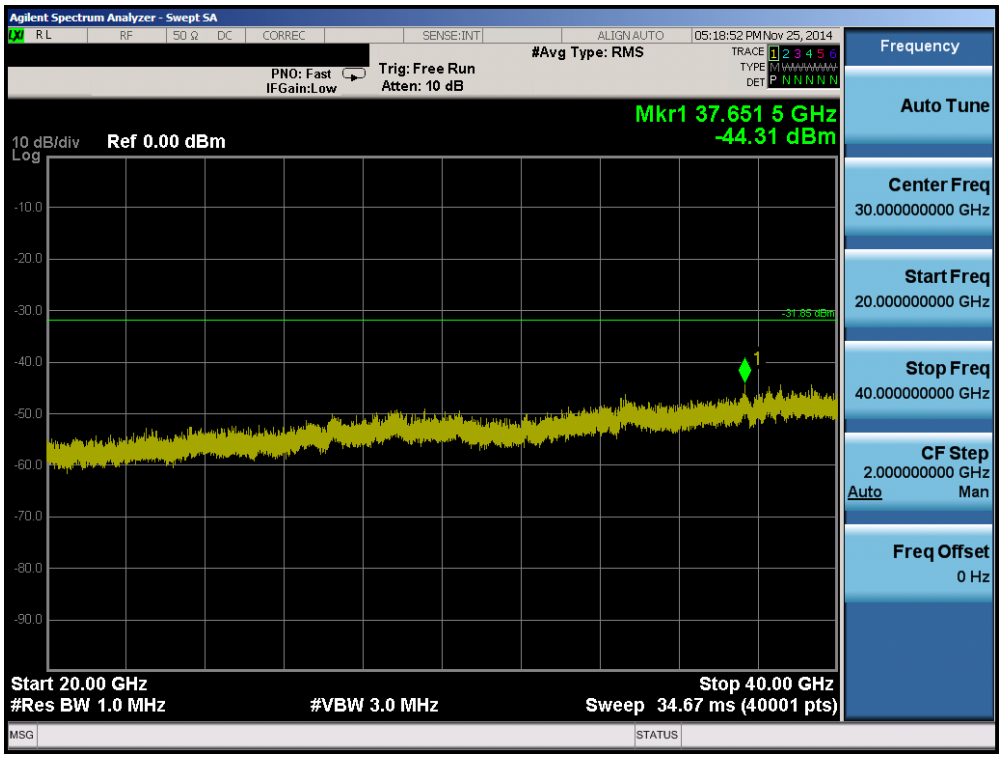


Plot 6-107. Conducted Spurious Plot (802.11a – Ch. 149)



Plot 6-108. Conducted Spurious Plot (802.11a – Ch. 149)

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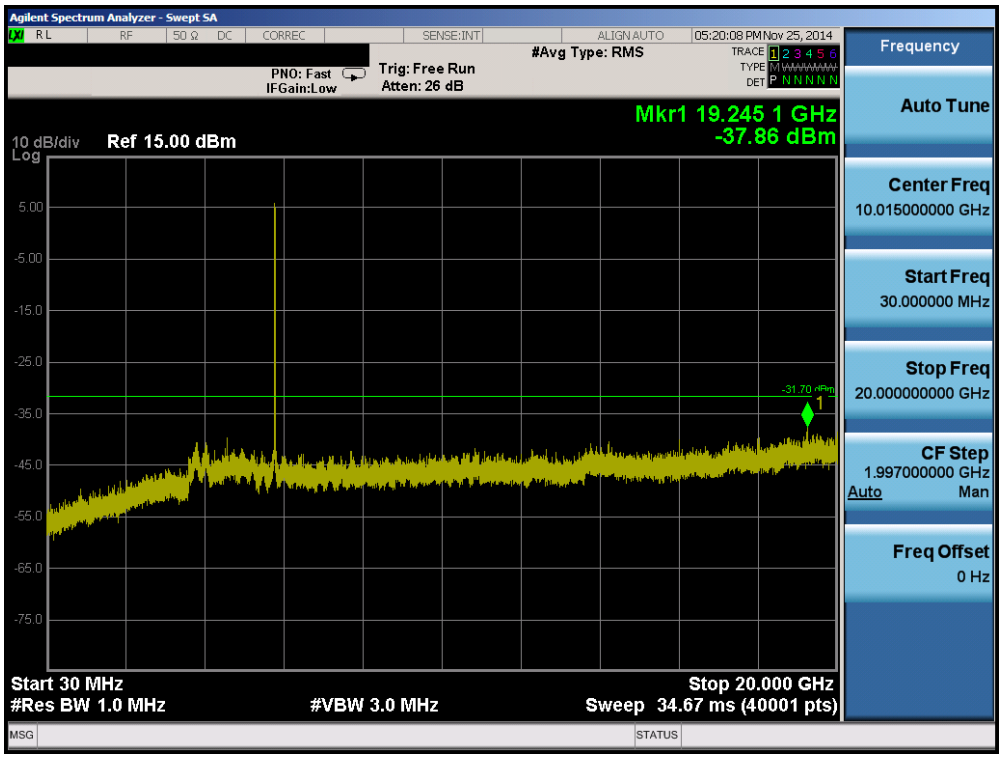
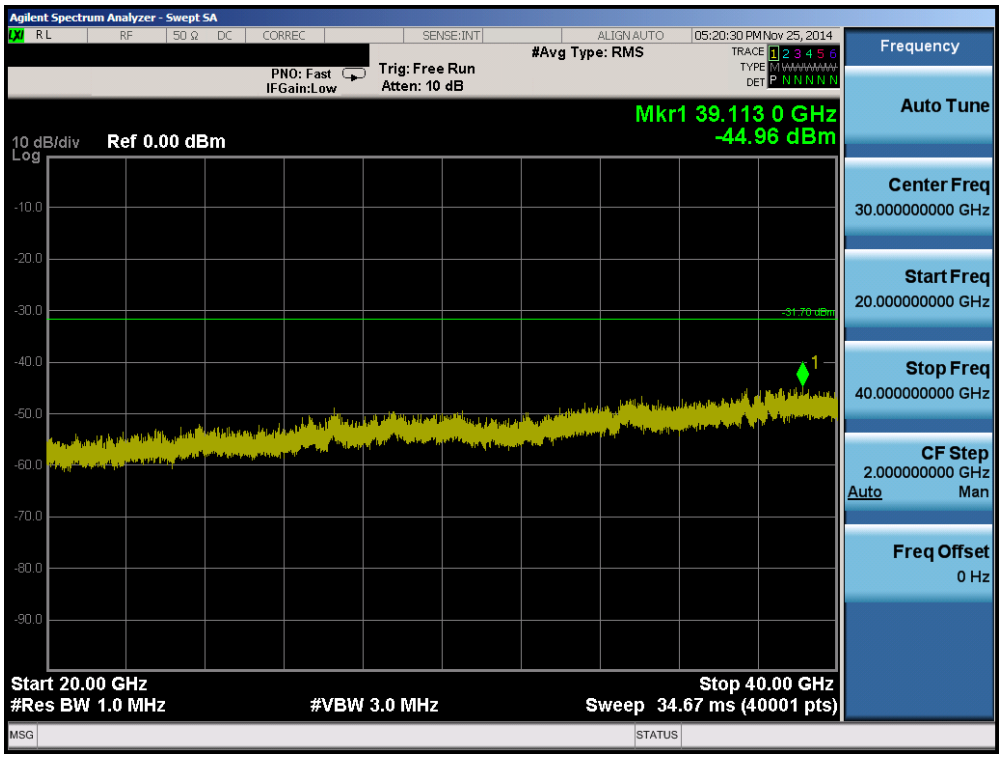


Plot 6-109. Conducted Spurious Plot (802.11a – Ch. 157)



Plot 6-110. Conducted Spurious Plot (802.11a – Ch. 157)

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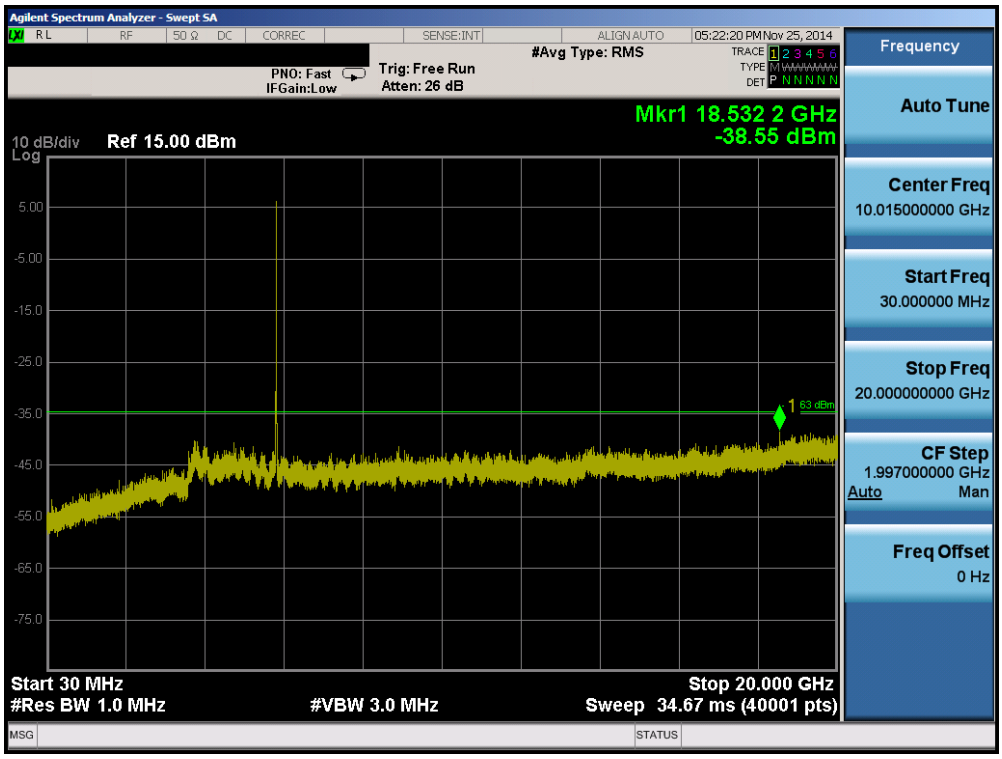
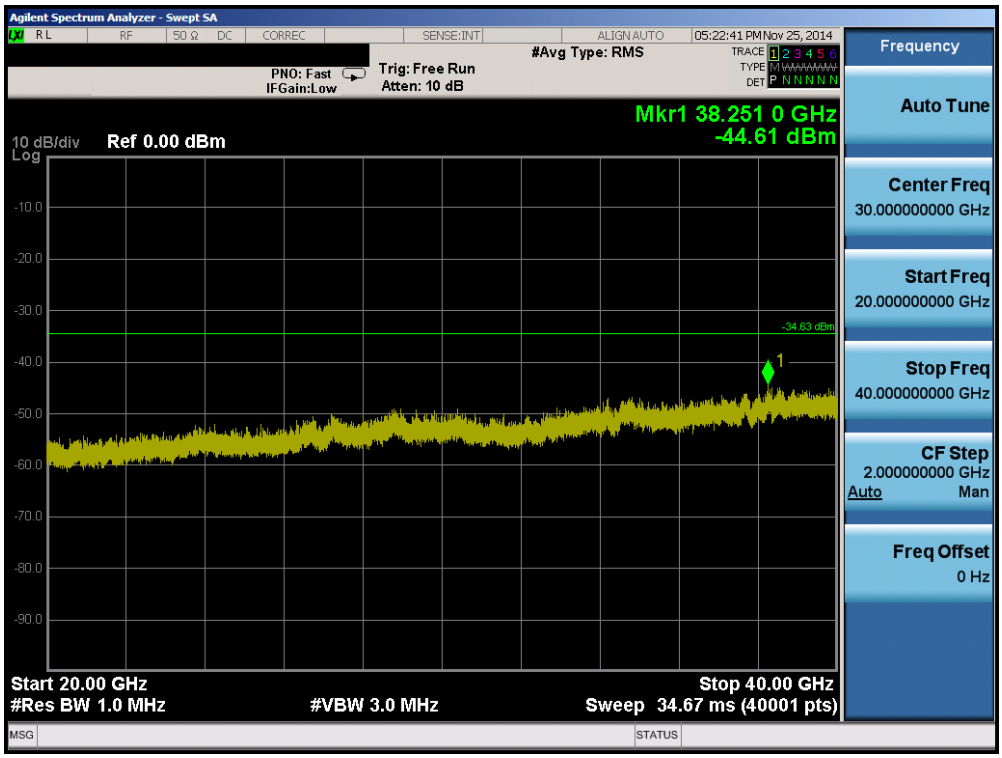


Plot 6-111. Conducted Spurious Plot (802.11a – Ch. 165)



Plot 6-112. Conducted Spurious Plot (802.11a – Ch. 165)

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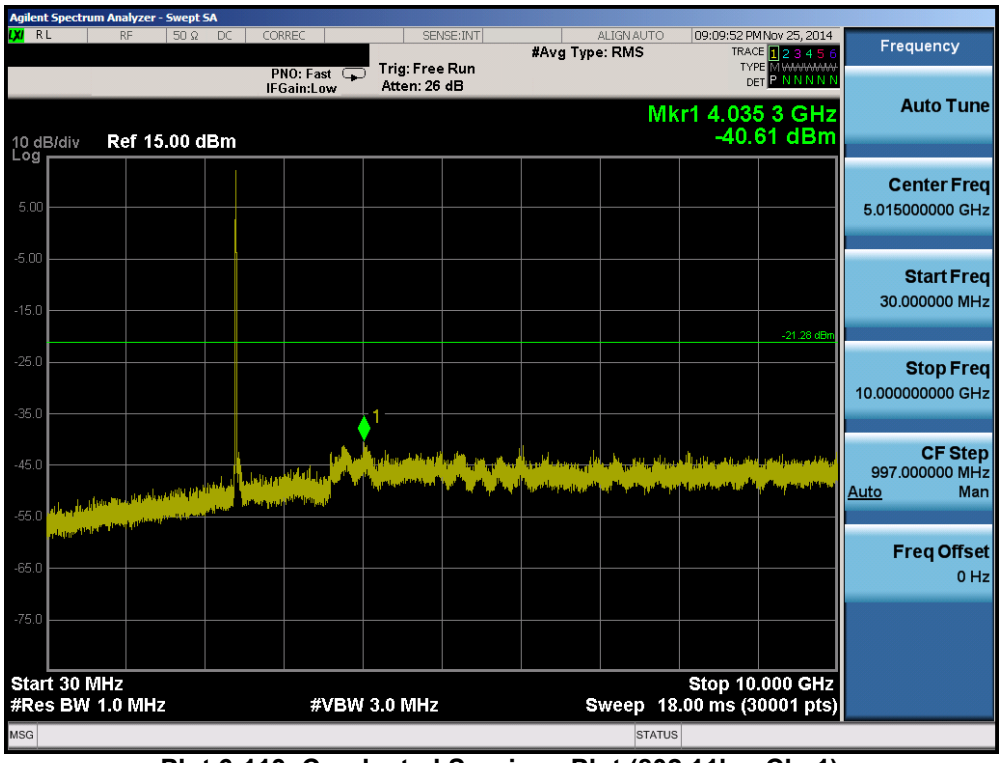
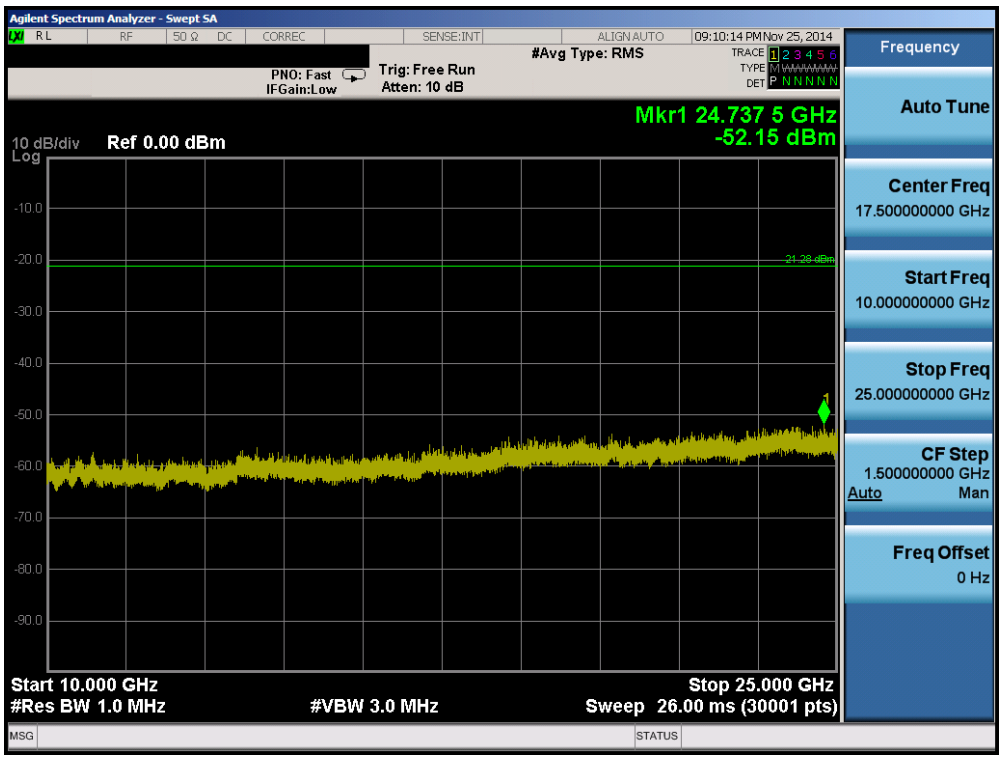
Antenna-2 Conducted Spurious Emissions



Plot 6-113. Conducted Spurious Plot (802.11b – Ch. 1)



Plot 6-114. Conducted Spurious Plot (802.11b – Ch. 1)

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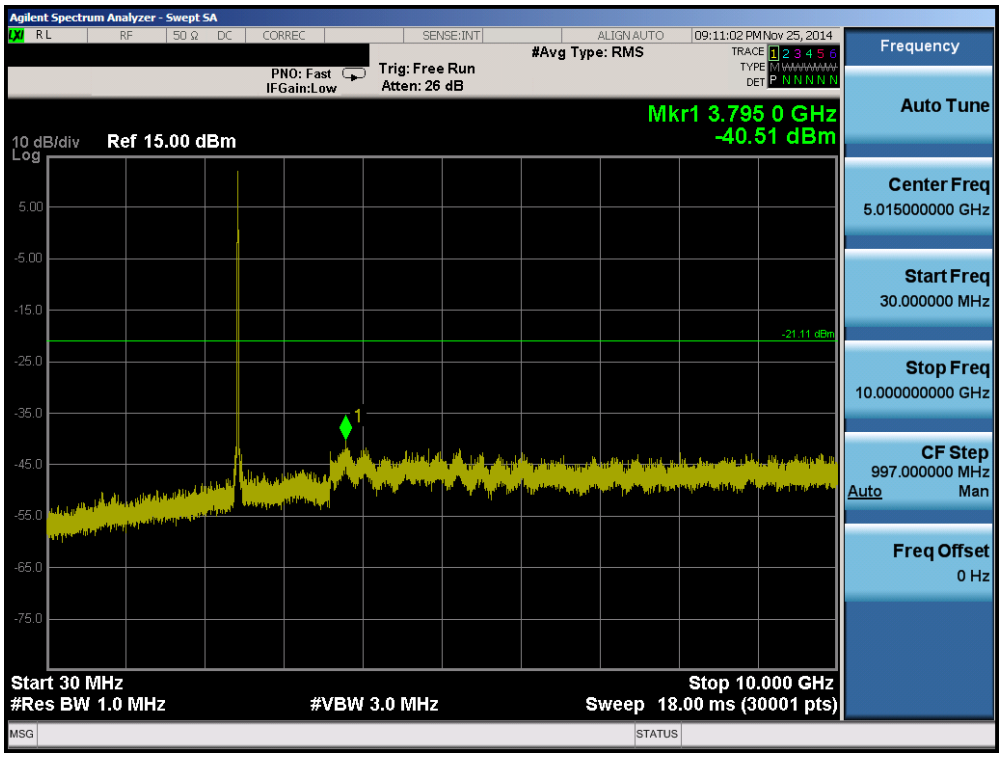
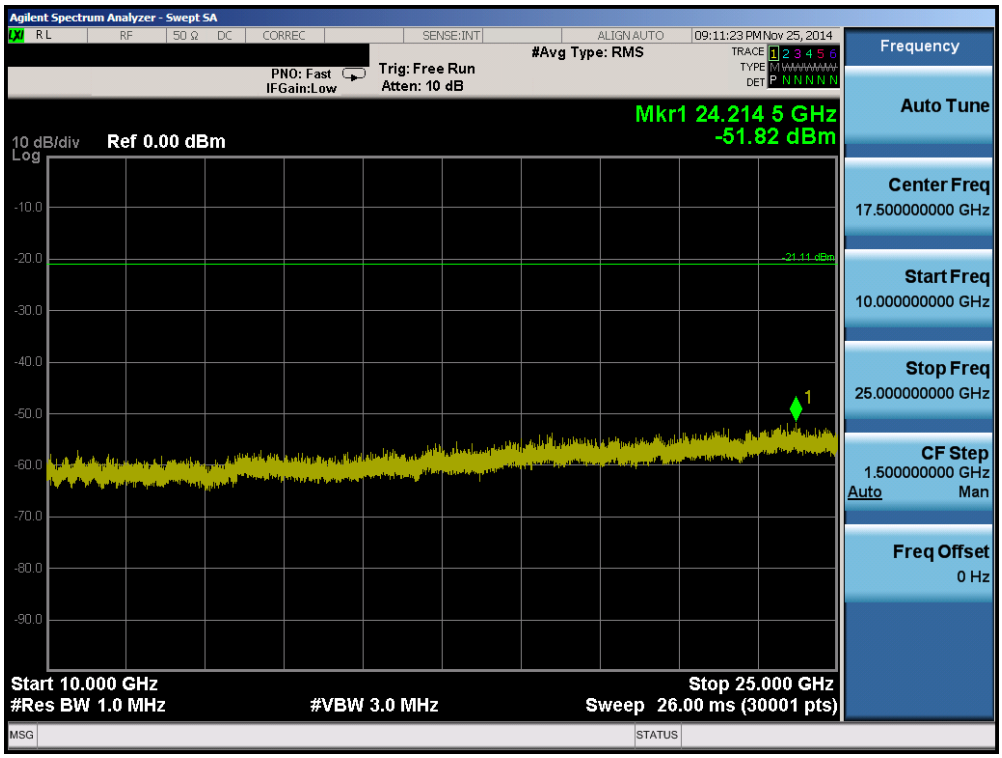


Plot 6-115. Conducted Spurious Plot (802.11b – Ch. 6)



Plot 6-116. Conducted Spurious Plot (802.11b – Ch. 6)

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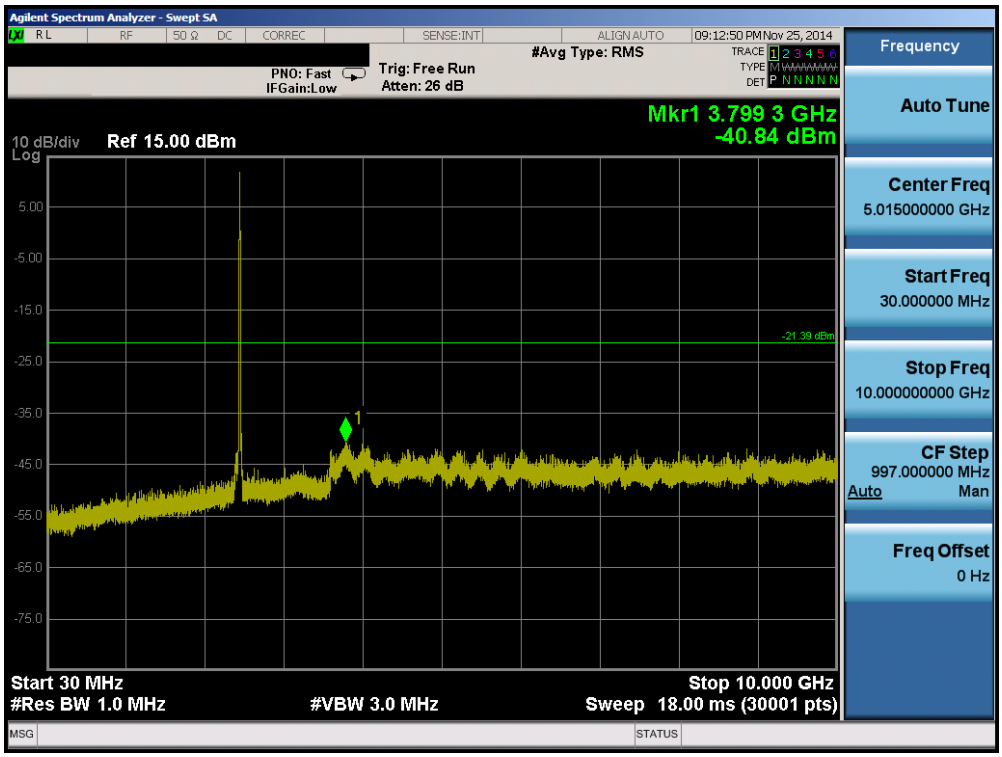
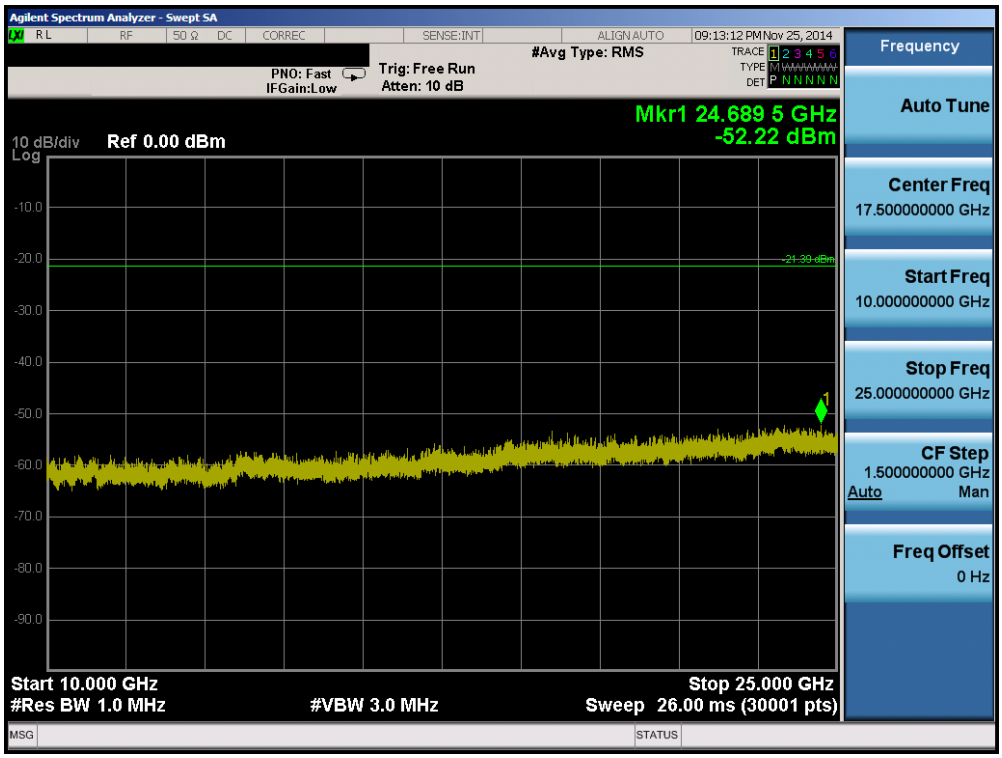


Plot 6-117. Conducted Spurious Plot (802.11b – Ch. 11)



Plot 6-118. Conducted Spurious Plot (802.11b – Ch. 11)

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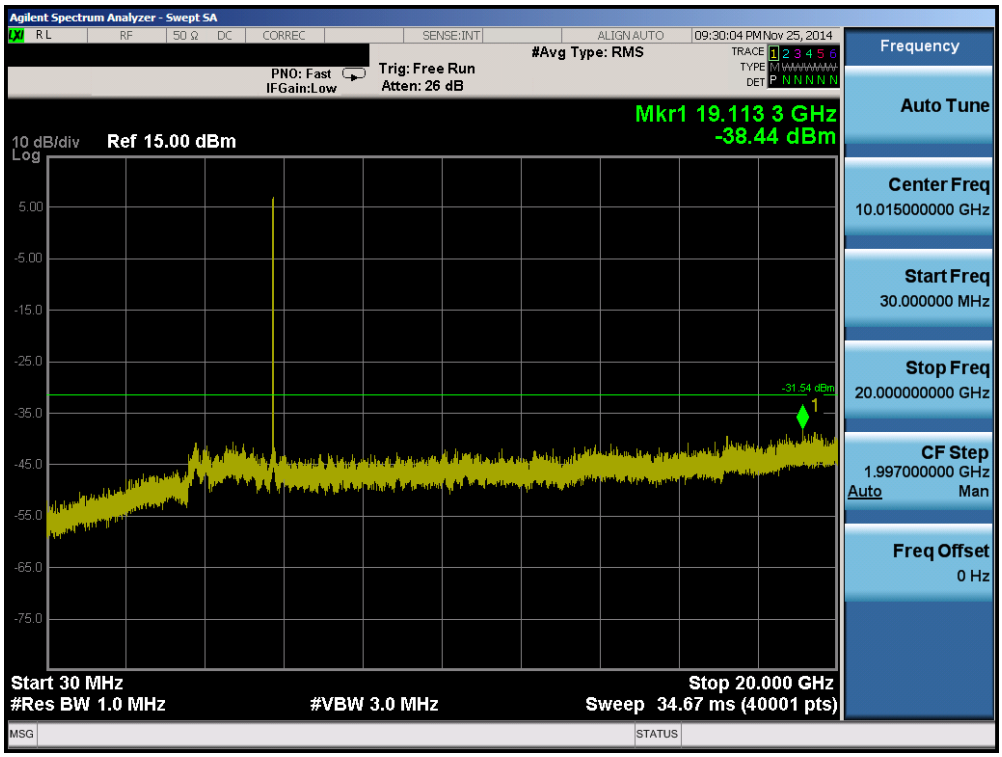
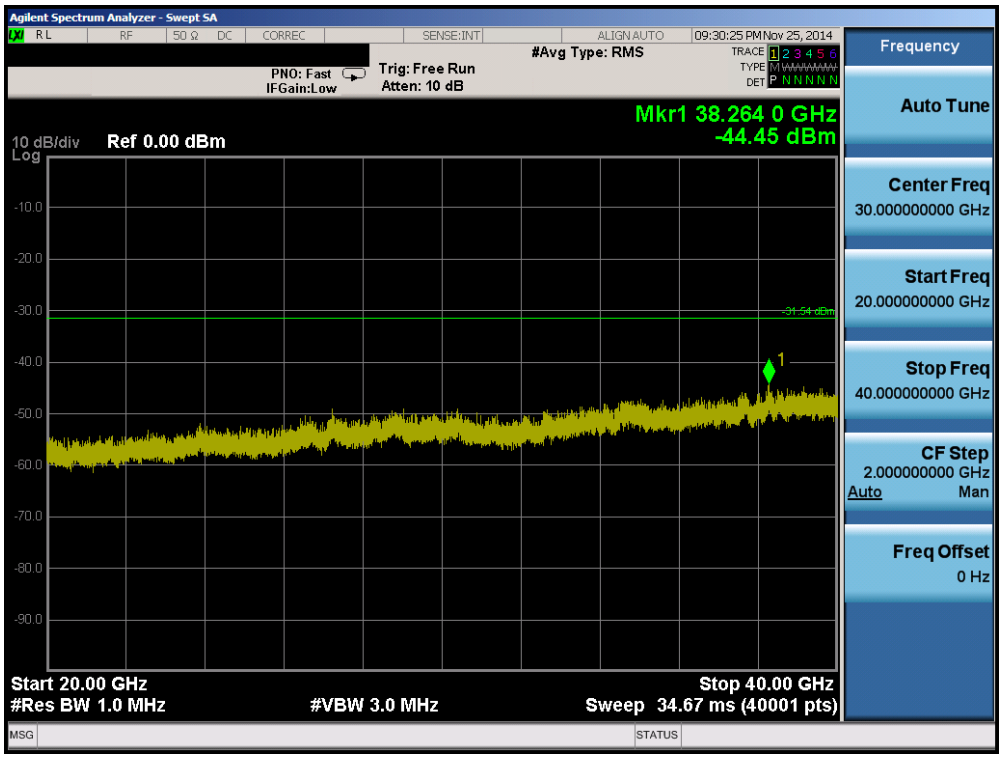


Plot 6-119. Conducted Spurious Plot (802.11a – Ch. 149)



Plot 6-120. Conducted Spurious Plot (802.11a – Ch. 149)

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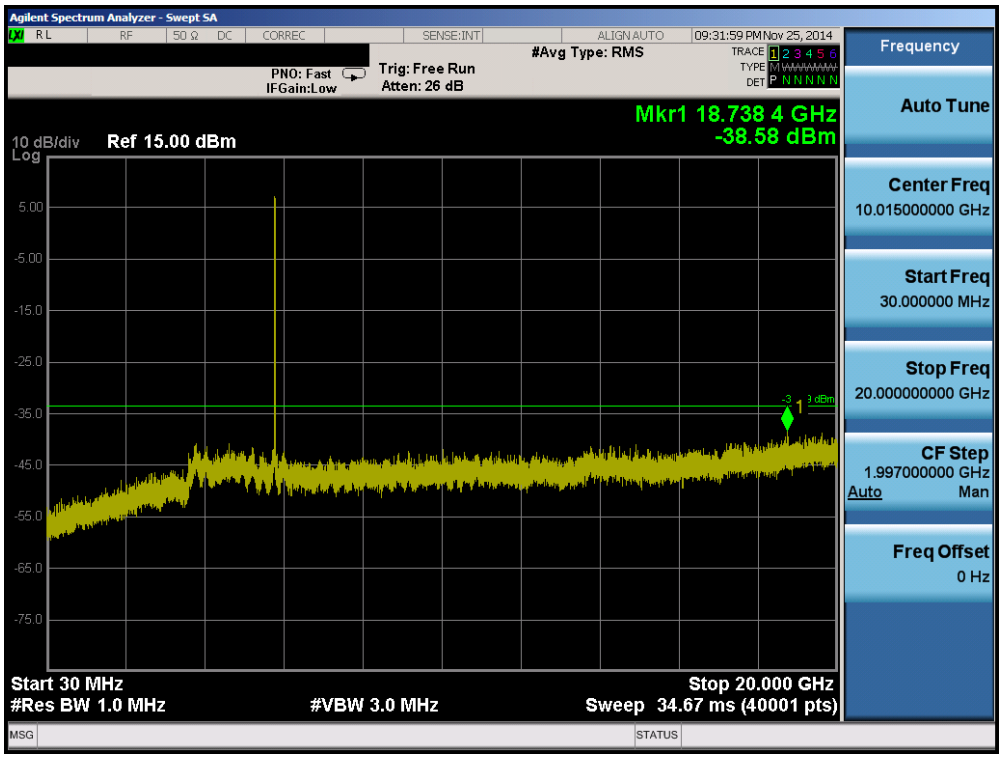
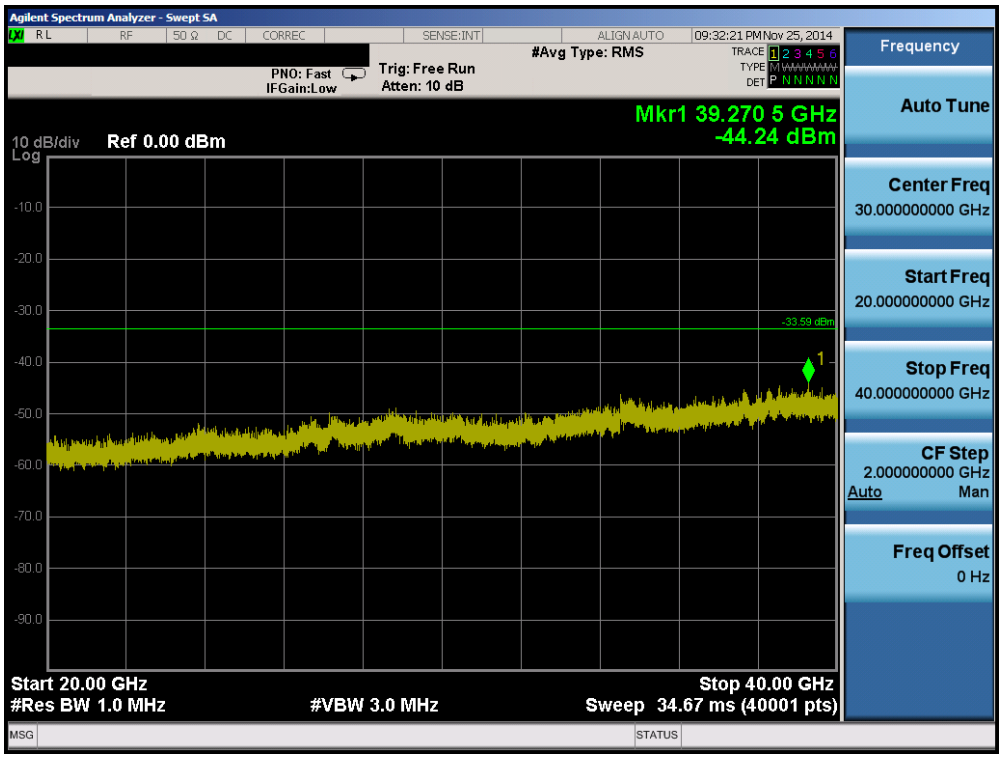


Plot 6-121. Conducted Spurious Plot (802.11a – Ch. 157)



Plot 6-122. Conducted Spurious Plot (802.11a – Ch. 157)

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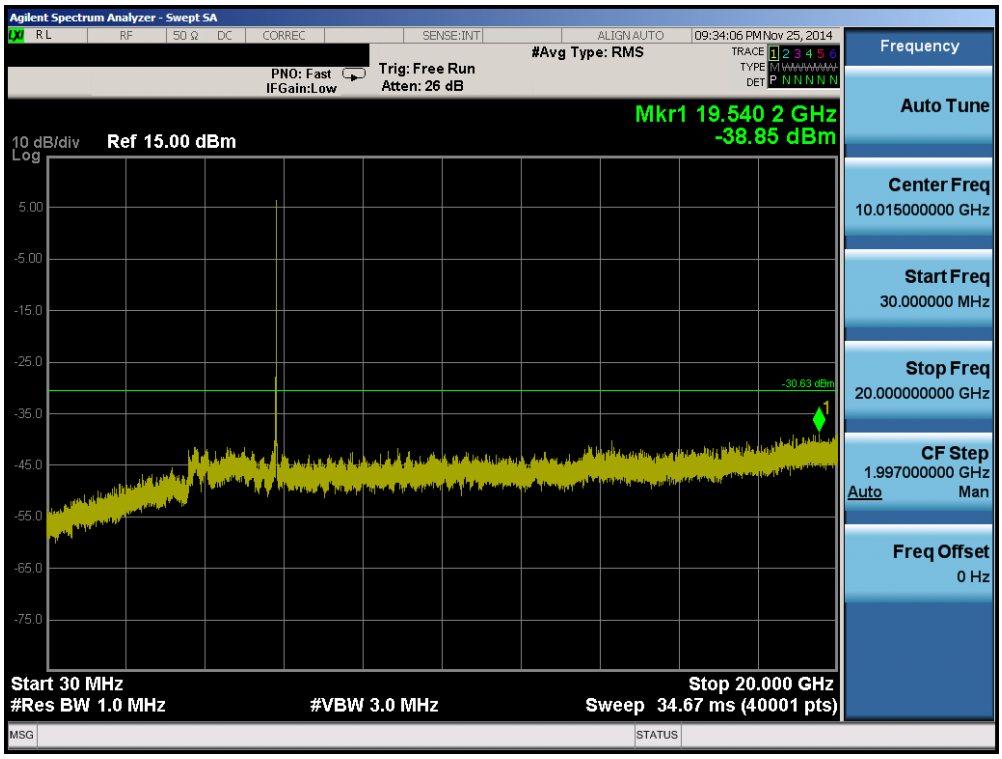
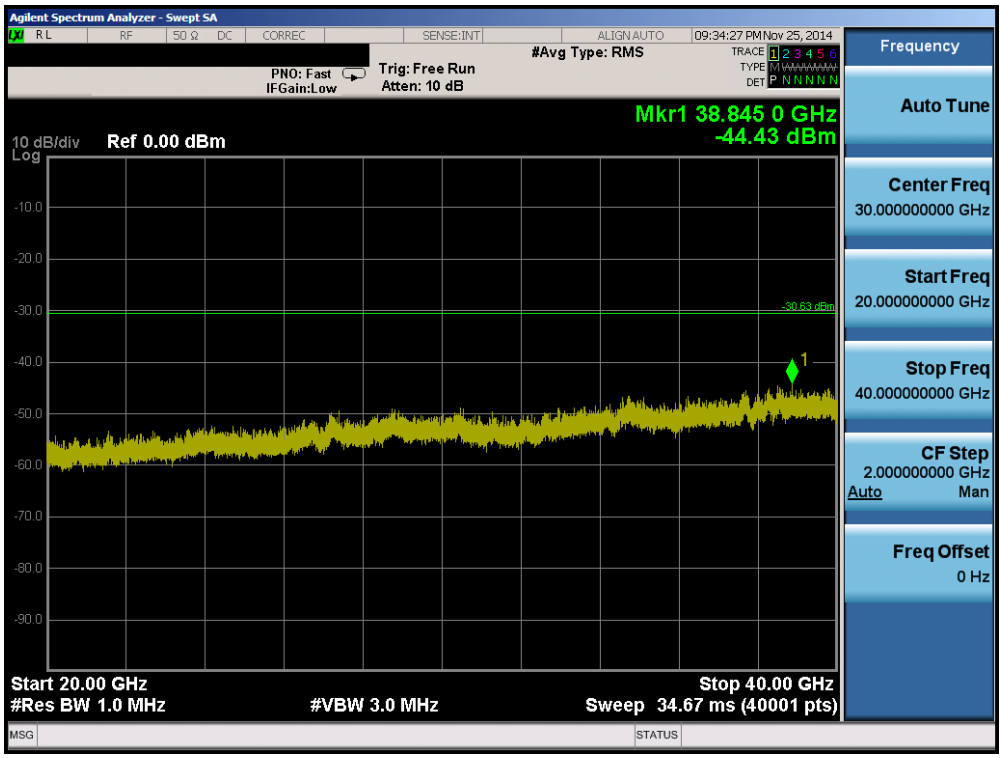


Plot 6-123. Conducted Spurious Plot (802.11a – Ch. 165)



Plot 6-124. Conducted Spurious Plot (802.11a – Ch. 165)

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6.7 Radiated Spurious Emission Measurements – Above 1 GHz

§15.247(d) §15.205 & §15.209

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle (>98%), at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table 6-31 per Section 15.209.

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

Table 6-31. Radiated Limits

Test Procedures Used

KDB 558074 v03r02 – Section 12.1, 12.2.7

Test Settings

Average Field Strength Measurements per Section 12.2.5.1 of KDB 558074 v03r02

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = power average (RMS)
5. Number of measurement points = 1001 (Number of points must be ≥ 2 x span/RBW)
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces

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Peak Field Strength Measurements per Section 12.2.4 of KDB 558074 v03r02

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

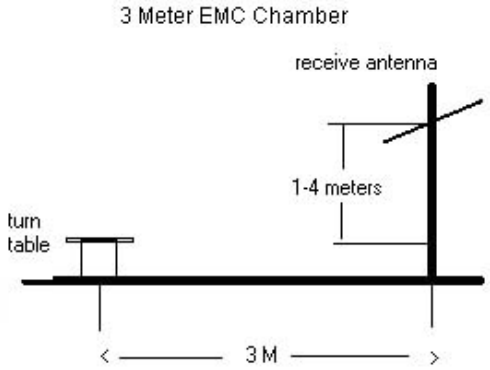

Figure 6-6. Test Instrument & Measurement Setup

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Test Notes

1. The optional test procedures for antenna port conducted measurements of unwanted emissions per the guidance of KDB 558074 v03r02 were not used to evaluate this device for compliance to radiated limits. All radiated spurious emissions levels were measured in a radiated test setup.
2. All emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 6-10.
3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
4. The battery used with this device for testing (Model:EB-BN910BBK) contains an embedded NFC antenna.
5. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, average and peak measurements were taken using linearly polarized horn antennas. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
6. Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

Sample Calculations

Determining Spurious Emissions Levels

- Field Strength Level $_{[dB\mu V/m]}$ = Analyzer Level $_{[dBm]}$ + 107 + AFCL $_{[dB/m]}$
- AFCL $_{[dB/m]}$ = Antenna Factor $_{[dB/m]}$ + Cable Loss $_{[dB]}$
- Margin $_{[dB]}$ = Field Strength Level $_{[dB\mu V/m]}$ – Limit $_{[dB\mu V/m]}$

Radiated Band Edge Measurement Offset

- The amplitude offset shown in the radiated restricted band edge plots in Section 6.8 was calculated using the formula:
  Offset (dB) = (Antenna Factor + Cable Loss + 10 dB Attenuator) – Preamplifier Gain

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Antenna-1 Radiated Spurious Emission Measurements

§15.247(d) §15.205 & §15.209

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	01

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4824.00	-100.96	Avg	H	40.47	46.51	53.98	-7.47
4824.00	-94.03	Peak	H	40.47	53.44	73.98	-20.54
12060.00	-112.18	Avg	H	46.53	41.35	53.98	-12.63
12060.00	-100.50	Peak	H	46.53	53.03	73.98	-20.95

Table 6-32. Radiated Measurements

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2437MHz
Channel:	06

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4874.00	-103.23	Avg	H	40.50	44.27	53.98	-9.71
4874.00	-95.38	Peak	H	40.50	52.12	73.98	-21.86
7311.00	-112.57	Avg	H	42.95	37.38	53.98	-16.60
7311.00	-100.86	Peak	H	42.95	49.09	73.98	-24.89
12185.00	-111.24	Avg	H	46.68	42.44	53.98	-11.54
12185.00	-100.02	Peak	H	46.68	53.66	73.98	-20.32

Table 6-33. Radiated Measurements

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Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4924.00	-102.28	Avg	H	40.50	45.22	53.98	-8.76
4924.00	-94.78	Peak	H	40.50	52.72	73.98	-21.26
7386.00	-113.23	Avg	H	42.95	36.72	53.98	-17.26
7386.00	-101.62	Peak	H	42.95	48.33	73.98	-25.65
12310.00	-112.27	Avg	H	46.84	41.57	53.98	-12.41
12310.00	-99.88	Peak	H	46.84	53.96	73.98	-20.02

Table 6-34. Radiated Measurements

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	5745MHz
Channel:	149

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
11490.00	-102.76	Avg	H	45.81	0.00	50.05	53.98	-3.93
11490.00	-89.41	Peak	H	45.81	0.00	63.40	73.98	-10.58
22980.00	-112.93	Avg	H	49.94	-9.54	34.46	53.98	-19.51
22980.00	-102.74	Peak	H	49.94	-9.54	44.65	73.98	-29.32

Table 6-35. Radiated Measurements

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Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	5785MHz
Channel:	157

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
11570.00	-102.49	Avg	H	45.89	50.40	53.98	-3.58
11570.00	-103.27	Peak	H	45.89	49.62	73.98	-24.36

Table 6-36. Radiated Measurements

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	5825MHz
Channel:	165

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
11650.00	-102.17	Avg	H	45.97	50.81	53.98	-3.17
11650.00	-88.81	Peak	H	45.97	64.17	73.98	-9.81

Table 6-37. Radiated Measurements

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Antenna-2 Radiated Spurious Emission Measurements

§15.247(d) §15.205 & §15.209

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	01

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4824.00	-102.18	Avg	H	40.47	45.29	53.98	-8.69
4824.00	-95.53	Peak	H	40.47	51.94	73.98	-22.04
12060.00	-112.43	Avg	H	46.53	41.10	53.98	-12.88
12060.00	-100.74	Peak	H	46.53	52.79	73.98	-21.19

Table 6-38. Radiated Measurements

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2437MHz
Channel:	06

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4874.00	-104.49	Avg	H	40.50	43.01	53.98	-10.97
4874.00	-97.28	Peak	H	40.50	50.22	73.98	-23.76
7311.00	-113.09	Avg	H	42.95	36.86	53.98	-17.12
7311.00	-101.82	Peak	H	42.95	48.13	73.98	-25.85
12185.00	-111.97	Avg	H	46.68	41.71	53.98	-12.27
12185.00	-102.21	Peak	H	46.68	51.47	73.98	-22.51

Table 6-39. Radiated Measurements

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Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4924.00	-103.24	Avg	H	40.50	44.26	53.98	-9.72
4924.00	-95.20	Peak	H	40.50	52.30	73.98	-21.68
7386.00	-112.16	Avg	H	42.95	37.79	53.98	-16.19
7386.00	-99.62	Peak	H	42.95	50.33	73.98	-23.65
12310.00	-110.19	Avg	H	46.84	43.65	53.98	-10.33
12310.00	-99.78	Peak	H	46.84	54.06	73.98	-19.92

Table 6-40. Radiated Measurements

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	5745MHz
Channel:	149

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
11490.00	-102.79	Avg	H	45.81	0.00	50.02	53.98	-3.96
11490.00	-87.27	Peak	H	45.81	0.00	65.54	73.98	-8.44
22980.00	-112.83	Avg	H	49.94	-9.54	34.56	53.98	-19.41
22980.00	-103.06	Peak	H	49.94	-9.54	44.33	73.98	-29.64

Table 6-41. Radiated Measurements

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Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	5785MHz
Channel:	157

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
11570.00	-102.28	Avg	H	45.89	50.61	53.98	-3.37
11570.00	-85.92	Peak	H	45.89	66.97	73.98	-7.01

Table 6-42. Radiated Measurements

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	5825MHz
Channel:	165

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
11650.00	-102.78	Avg	H	45.97	50.20	53.98	-3.78
11650.00	-86.81	Peak	H	45.97	66.17	73.98	-7.81

Table 6-43. Radiated Measurements

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MIMO Radiated Spurious Emission Measurements

§15.247(d) §15.205 & §15.209

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS8
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	01

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4824.00	-101.28	Avg	H	40.47	46.19	53.98	-7.79
4824.00	-95.29	Peak	H	40.47	52.18	73.98	-21.80
12060.00	-112.25	Avg	H	46.53	41.28	53.98	-12.70
12060.00	-100.01	Peak	H	46.53	53.52	73.98	-20.46

Table 6-44. Radiated Measurements

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS8
Distance of Measurements:	3 Meters
Operating Frequency:	2437MHz
Channel:	06

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4874.00	-106.79	Avg	H	40.50	40.71	53.98	-13.27
4874.00	-95.97	Peak	H	40.50	51.53	73.98	-22.45
7311.00	-109.84	Avg	H	42.95	40.11	53.98	-13.87
7311.00	-97.99	Peak	H	42.95	51.96	73.98	-22.02
12185.00	-112.31	Avg	H	46.68	41.37	53.98	-12.61
12185.00	-100.64	Peak	H	46.68	53.04	73.98	-20.94

Table 6-45. Radiated Measurements

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Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS8
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4924.00	-100.32	Avg	H	40.50	47.18	53.98	-6.80
4924.00	-86.44	Peak	H	40.50	61.06	73.98	-12.92
7386.00	-109.50	Avg	H	42.95	40.45	53.98	-13.53
7386.00	-97.00	Peak	H	42.95	52.95	73.98	-21.03
12310.00	-108.49	Avg	H	46.84	45.35	53.98	-8.63
12310.00	-96.38	Peak	H	46.84	57.46	73.98	-16.52

Table 6-46. Radiated Measurements

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS8
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	5745MHz
Channel:	149

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
11490.00	-102.29	Avg	H	45.81	0.00	50.52	53.98	-3.46
11490.00	-88.21	Peak	H	45.81	0.00	64.60	73.98	-9.38
22980.00	-112.87	Avg	H	49.94	-9.54	34.52	53.98	-19.45
22980.00	-103.98	Peak	H	49.94	-9.54	43.41	73.98	-30.56

Table 6-47. Radiated Measurements

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Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS8
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	5785MHz
Channel:	157

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
11570.00	-102.03	Avg	H	45.89	50.86	53.98	-3.12
11570.00	-87.58	Peak	H	45.89	65.31	73.98	-8.67

Table 6-48. Radiated Measurements

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS8
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	5825MHz
Channel:	165

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
11650.00	-102.03	Avg	H	45.97	50.95	53.98	-3.03
11650.00	-87.10	Peak	H	45.97	65.88	73.98	-8.10

Table 6-49. Radiated Measurements

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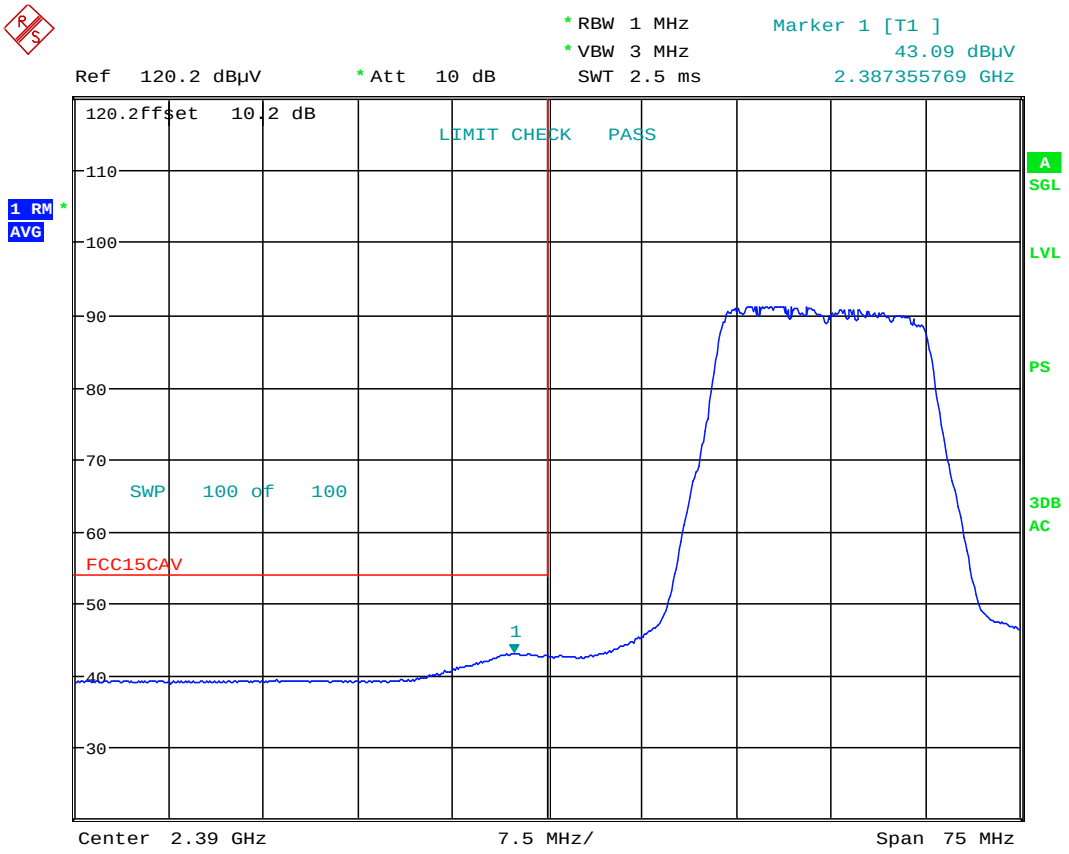
6.8 Antenna-1 Radiated Restricted Band Edge Measurements

§15.205 §15.209

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting.

Worst Case Mode:	802.11g
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	1



Date: 17.DEC.2014 20:52:53

Plot 6-125. Radiated Restricted Lower Band Edge Measurement (Average)

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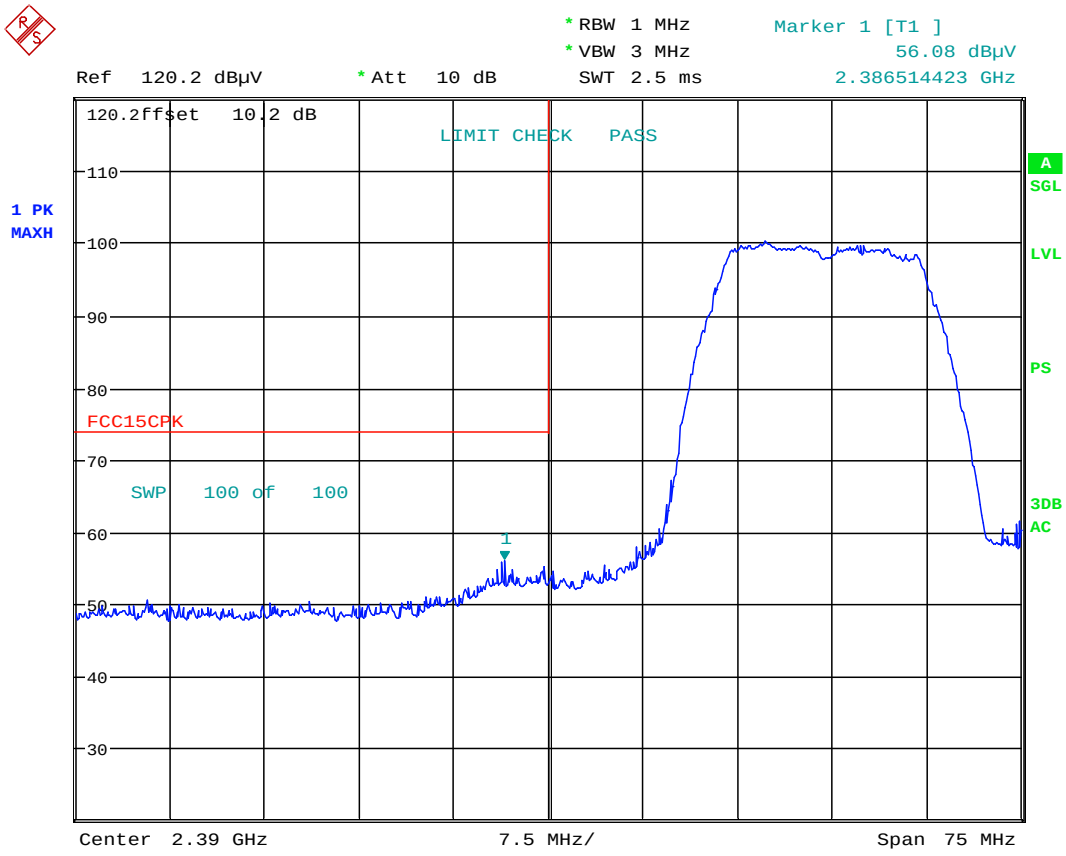
Radiated Restricted Band Edge Measurements

§15.205 §15.209



Date: 17.DEC.2014 20:52:09

Plot 6-126. Radiated Restricted Lower Band Edge Measurement (Peak)

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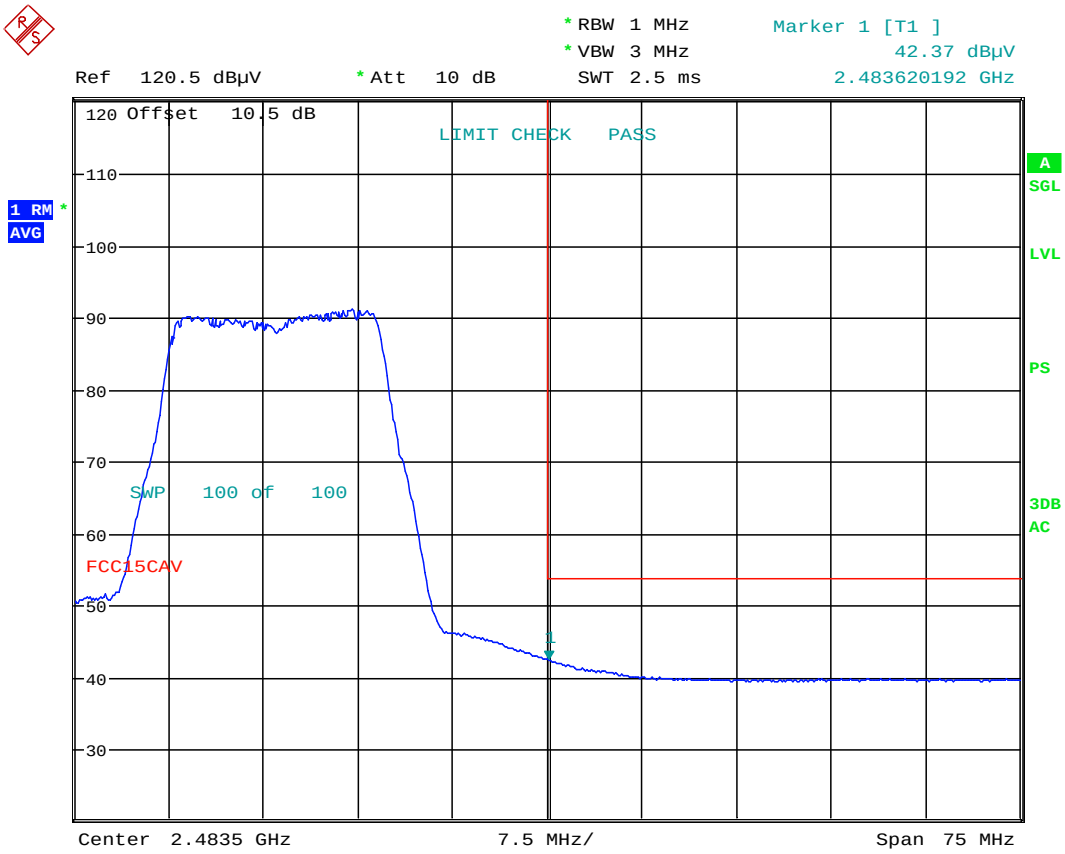
Radiated Restricted Band Edge Measurements

§15.205 §15.209

Worst Case Mode:	802.11g
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11



Date: 17.DEC.2014 21:03:05

Plot 6-127. Radiated Restricted Upper Band Edge Measurement (Average)

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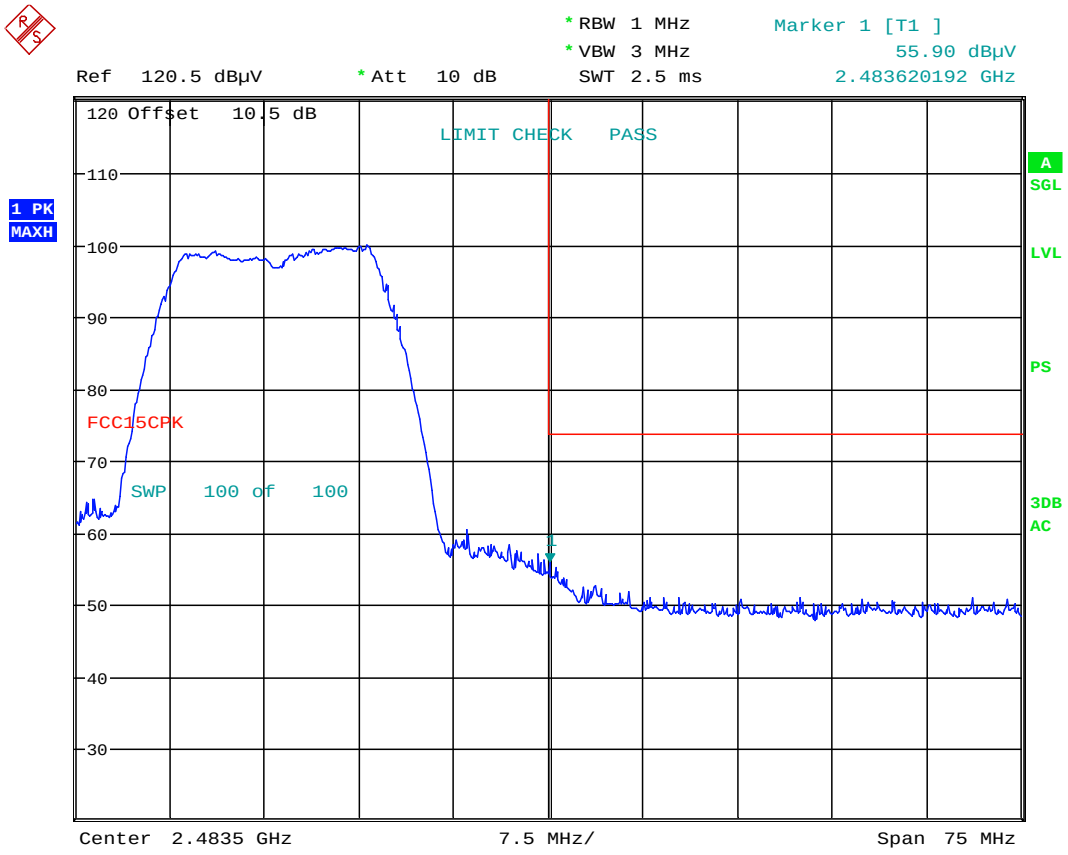
Radiated Restricted Band Edge Measurements

§15.205 §15.209



Date: 17.DEC.2014 21:02:23

Plot 6-128. Radiated Restricted Upper Band Edge Measurement (Peak)

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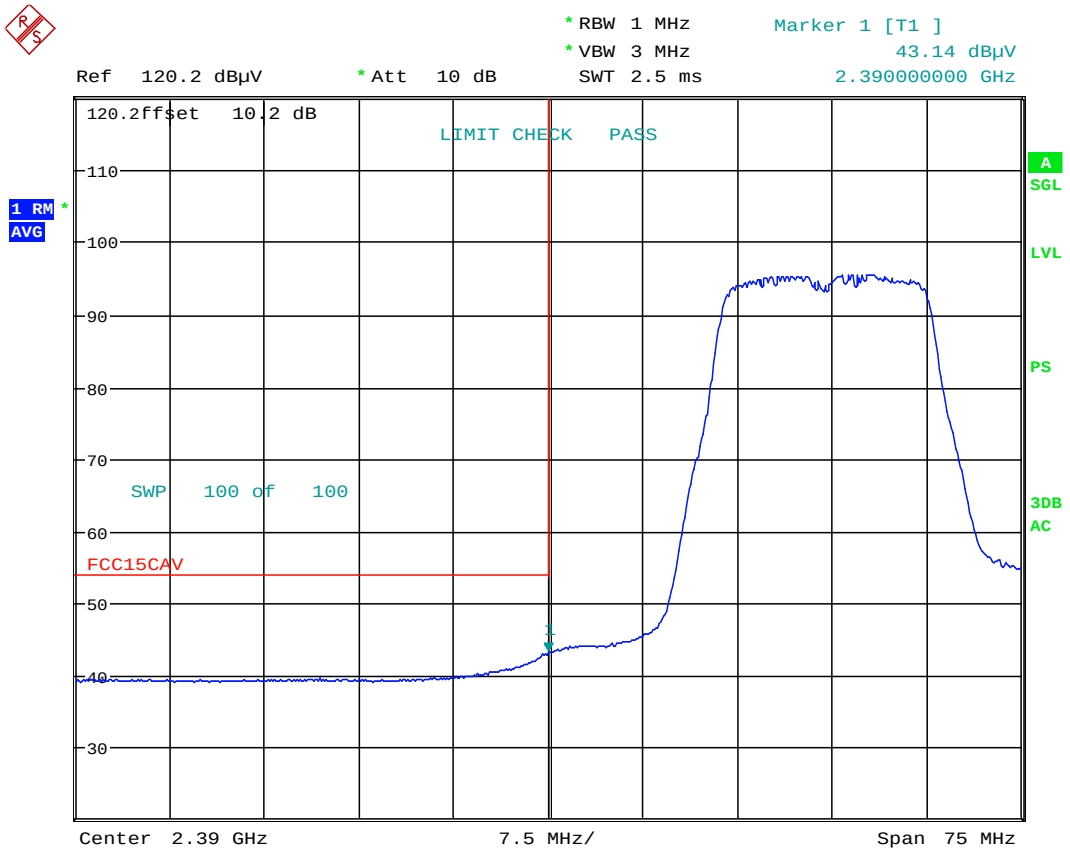
6.9 Antenna-2 Radiated Restricted Band Edge Measurements

§15.205 §15.209

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting.

Worst Case Mode:	802.11g
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	1



Date: 17.DEC.2014 21:23:24

Plot 6-129. Radiated Restricted Lower Band Edge Measurement (Average)

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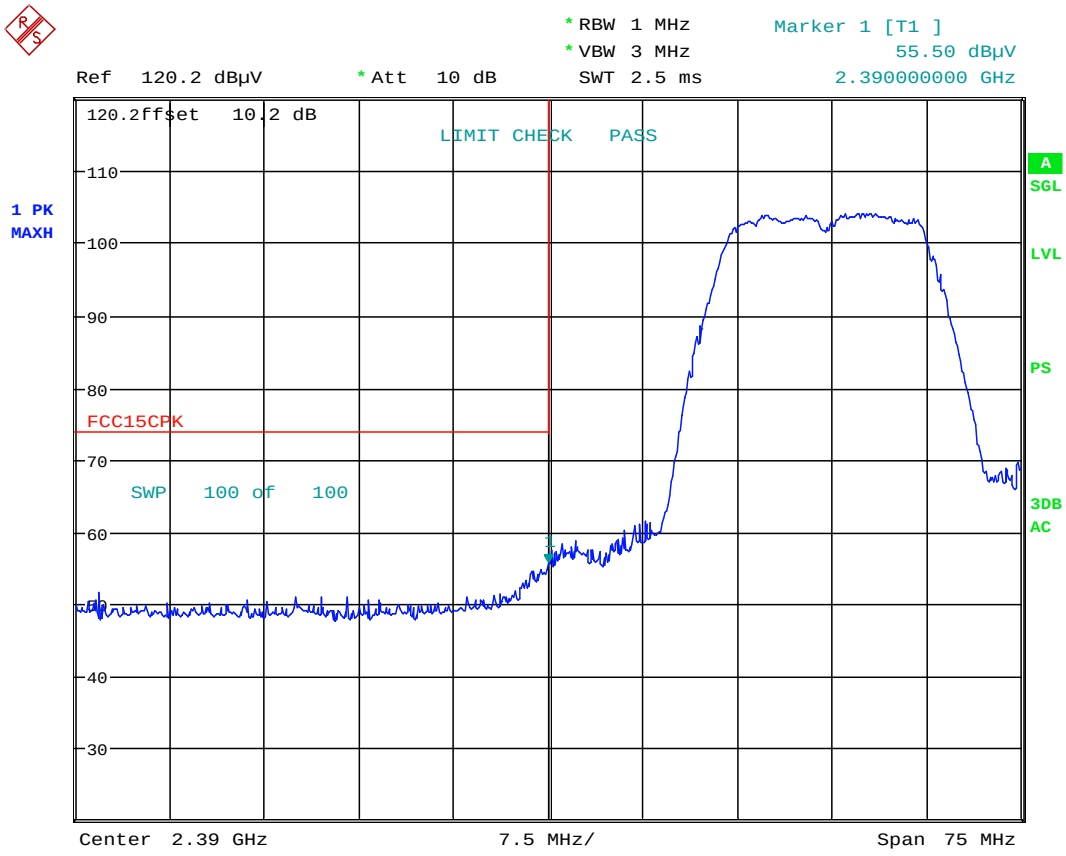
Radiated Restricted Band Edge Measurements

§15.205 §15.209



Date: 17.DEC.2014 21:23:03

Plot 6-130. Radiated Restricted Lower Band Edge Measurement (Peak)

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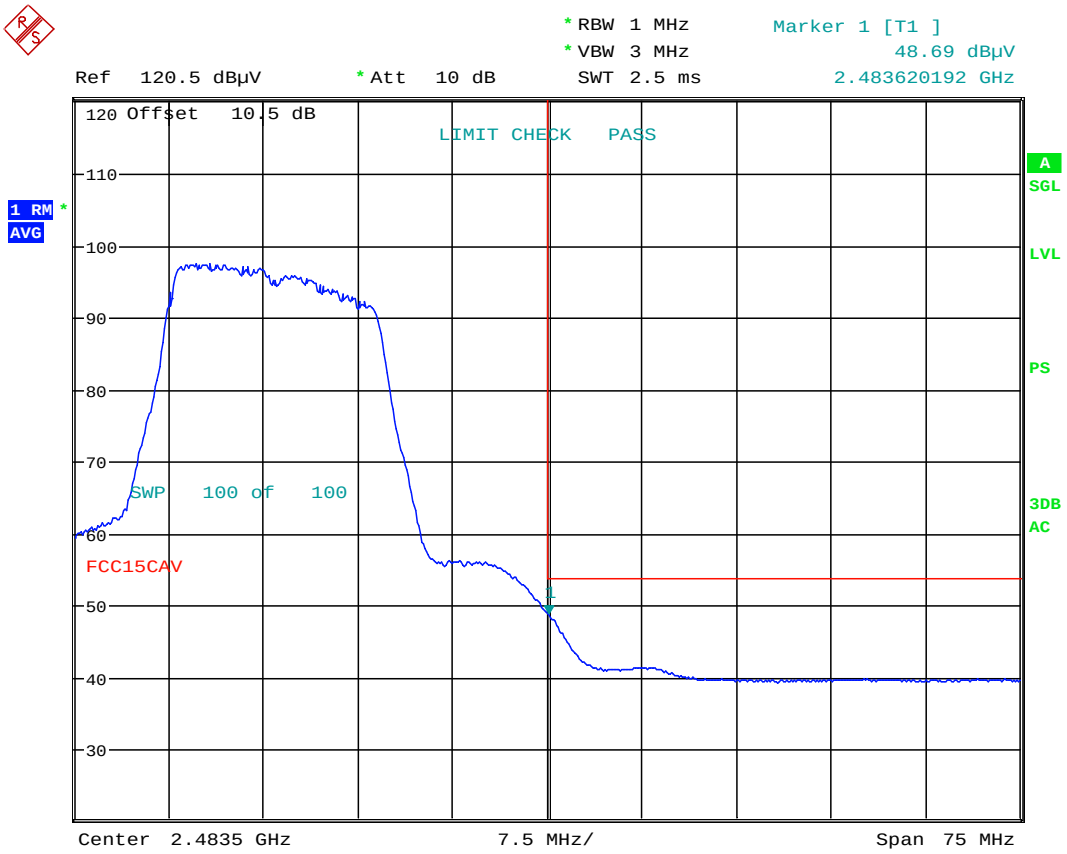
Radiated Restricted Band Edge Measurements

§15.205 §15.209

Worst Case Mode:	802.11g
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11



Date: 17.DEC.2014 21:15:18

Plot 6-131. Radiated Restricted Upper Band Edge Measurement (Average)

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Radiated Restricted Band Edge Measurements

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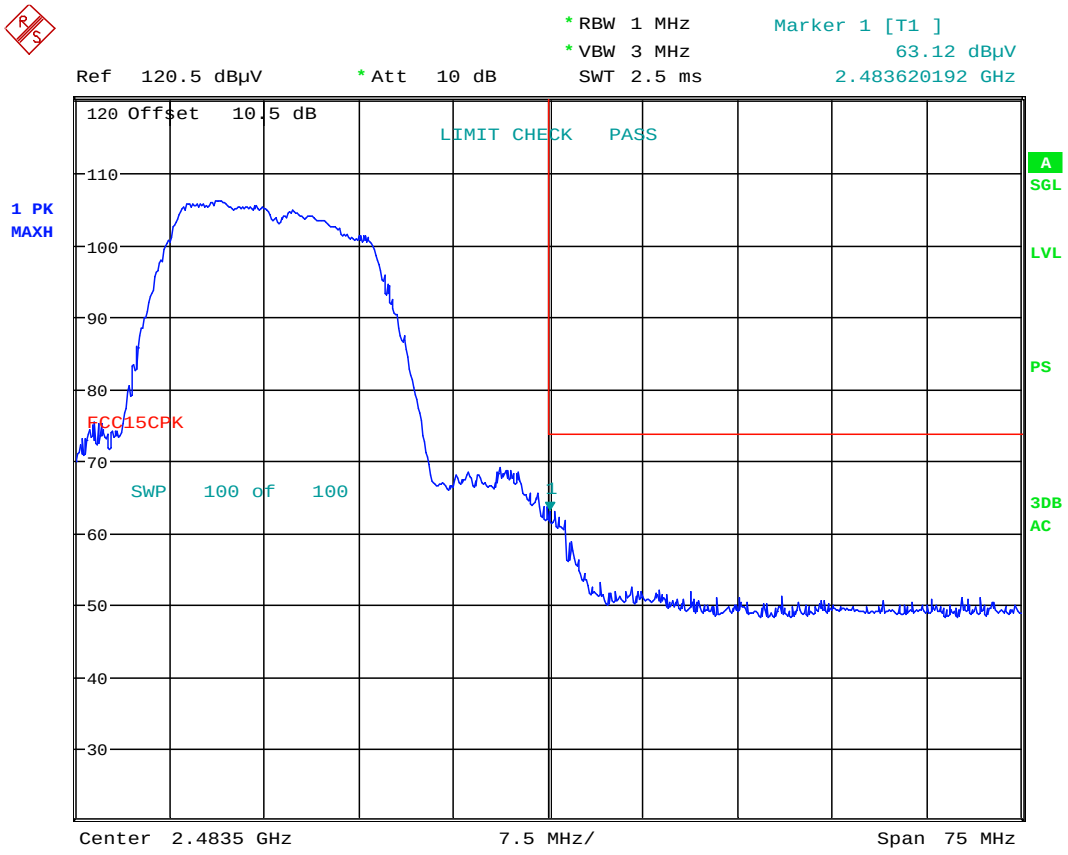

Date: 17.DEC.2014 21:14:54

Plot 6-132. Radiated Restricted Upper Band Edge Measurement (Peak)

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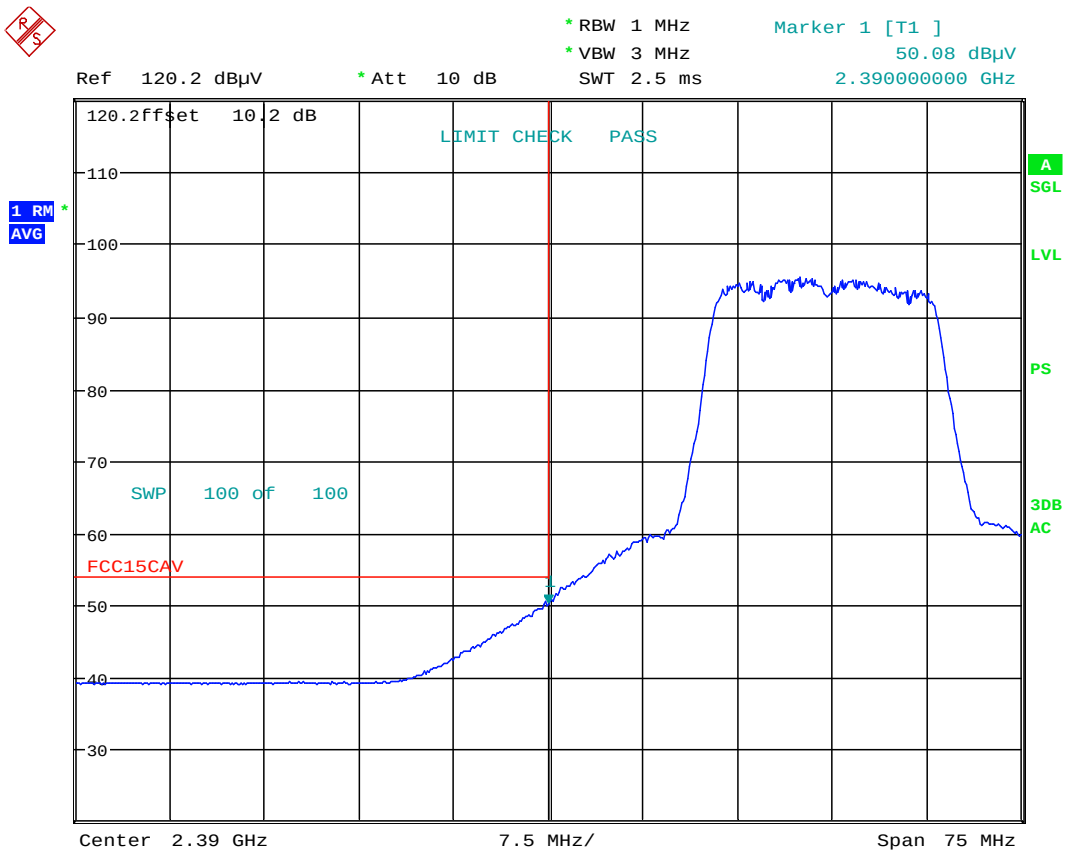
6.10 MIMO Radiated Restricted Band Edge Measurements

§15.205 §15.209

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting.

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS8
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	1



Date: 17.DEC.2014 21:31:35

Plot 6-133. Radiated Restricted Lower Band Edge Measurement (Average)

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Radiated Restricted Band Edge Measurements

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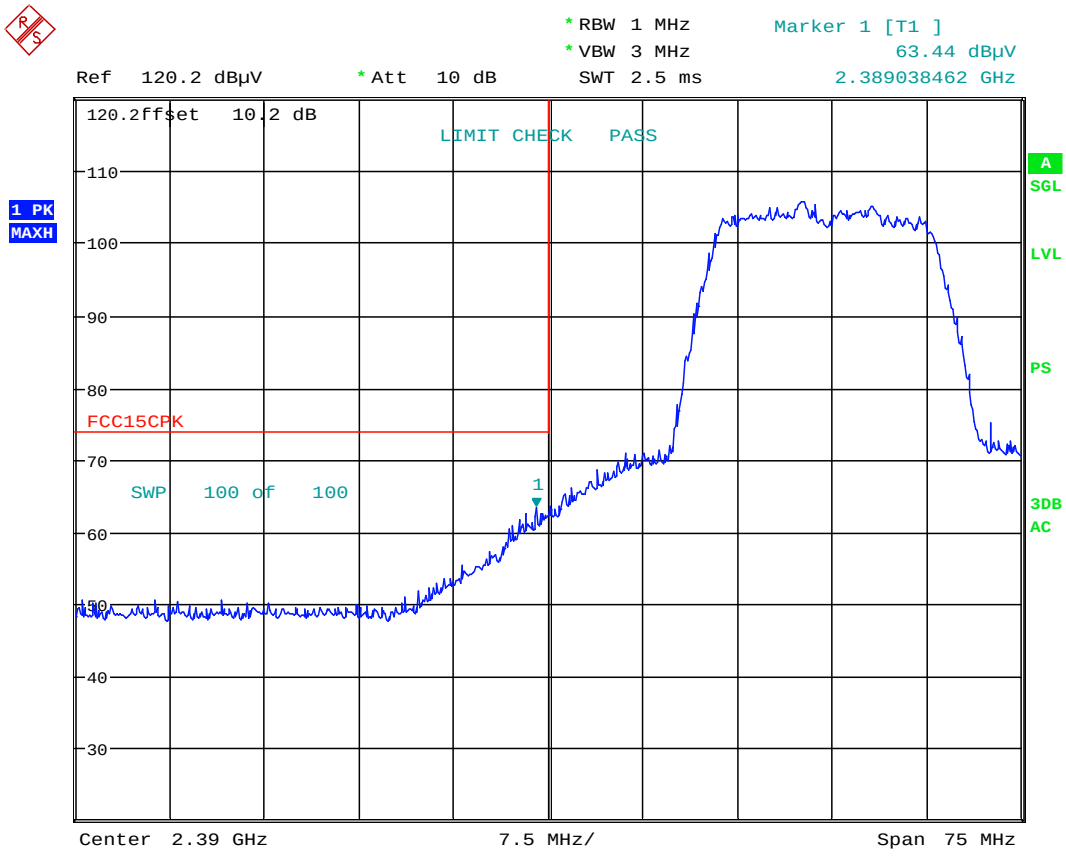

Date: 17.DEC.2014 21:30:52

Plot 6-134. Radiated Restricted Lower Band Edge Measurement (Peak)

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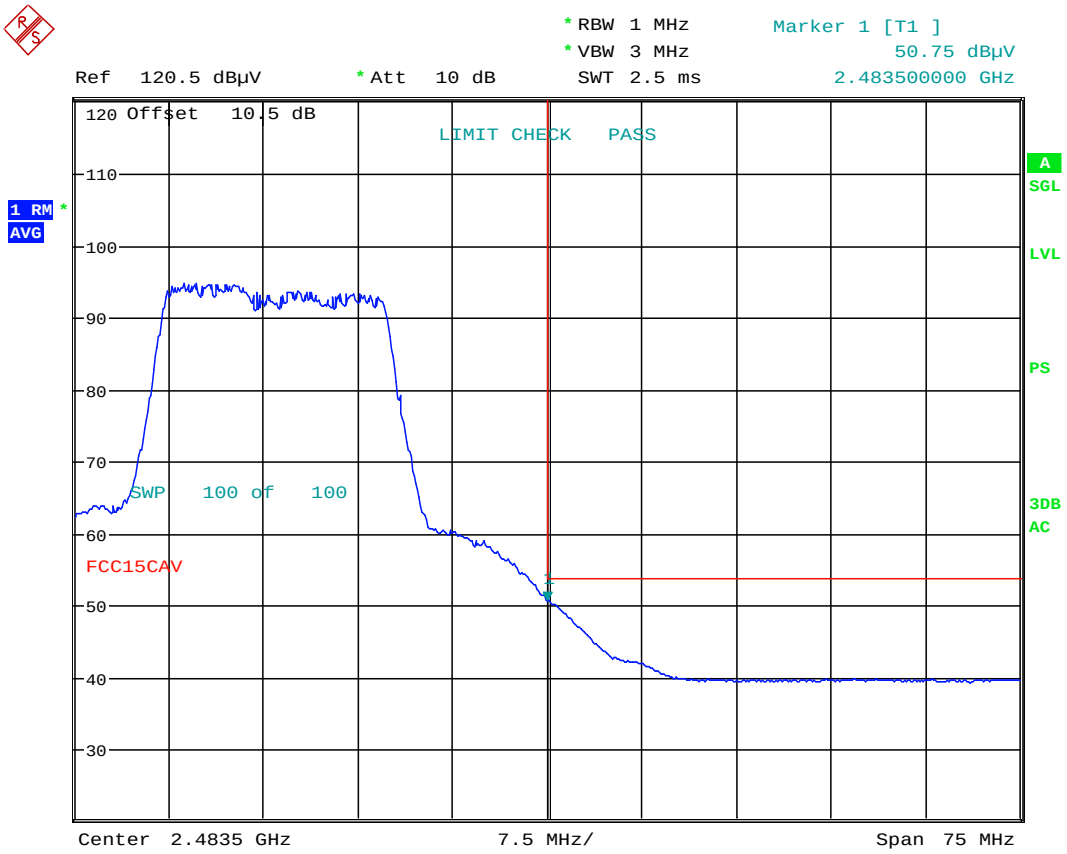
Radiated Restricted Band Edge Measurements

§15.205 §15.209

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS8
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11



Date: 17.DEC.2014 21:37:11

Plot 6-135. Radiated Restricted Upper Band Edge Measurement (Average)

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Radiated Restricted Band Edge Measurements

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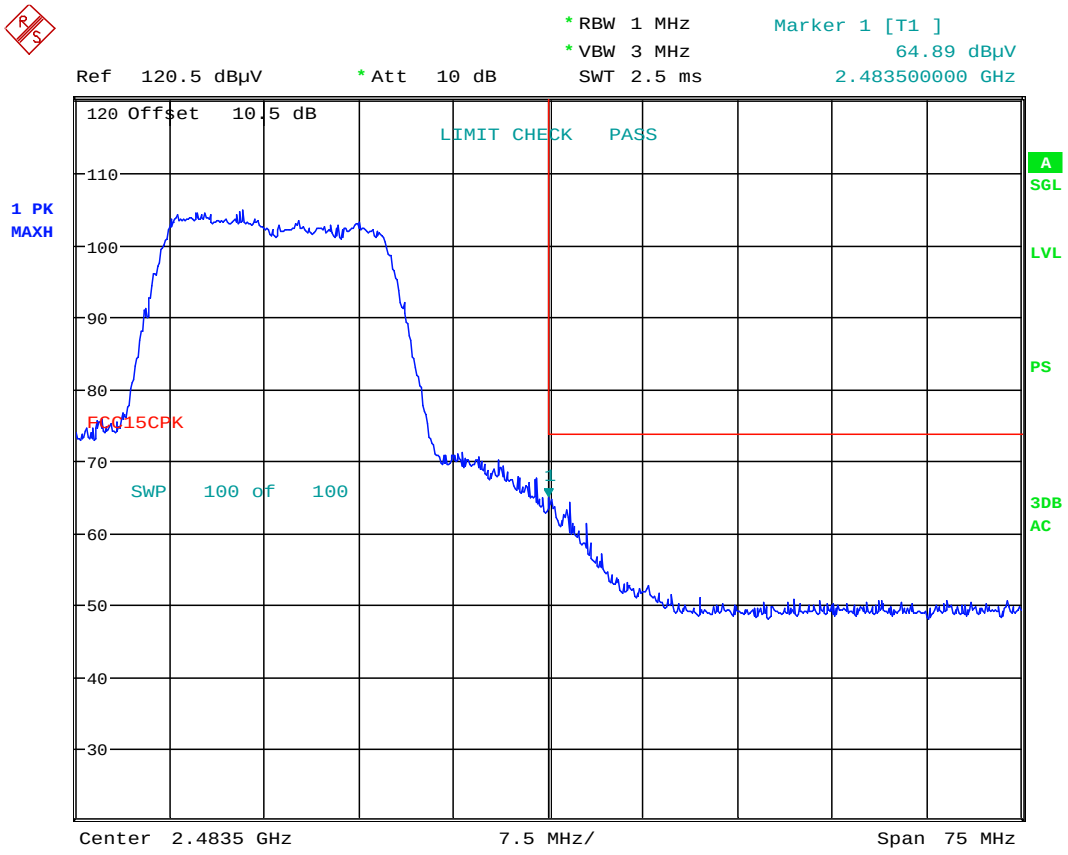

Date: 17.DEC.2014 21:36:04

Plot 6-136. Radiated Restricted Upper Band Edge Measurement (Peak)

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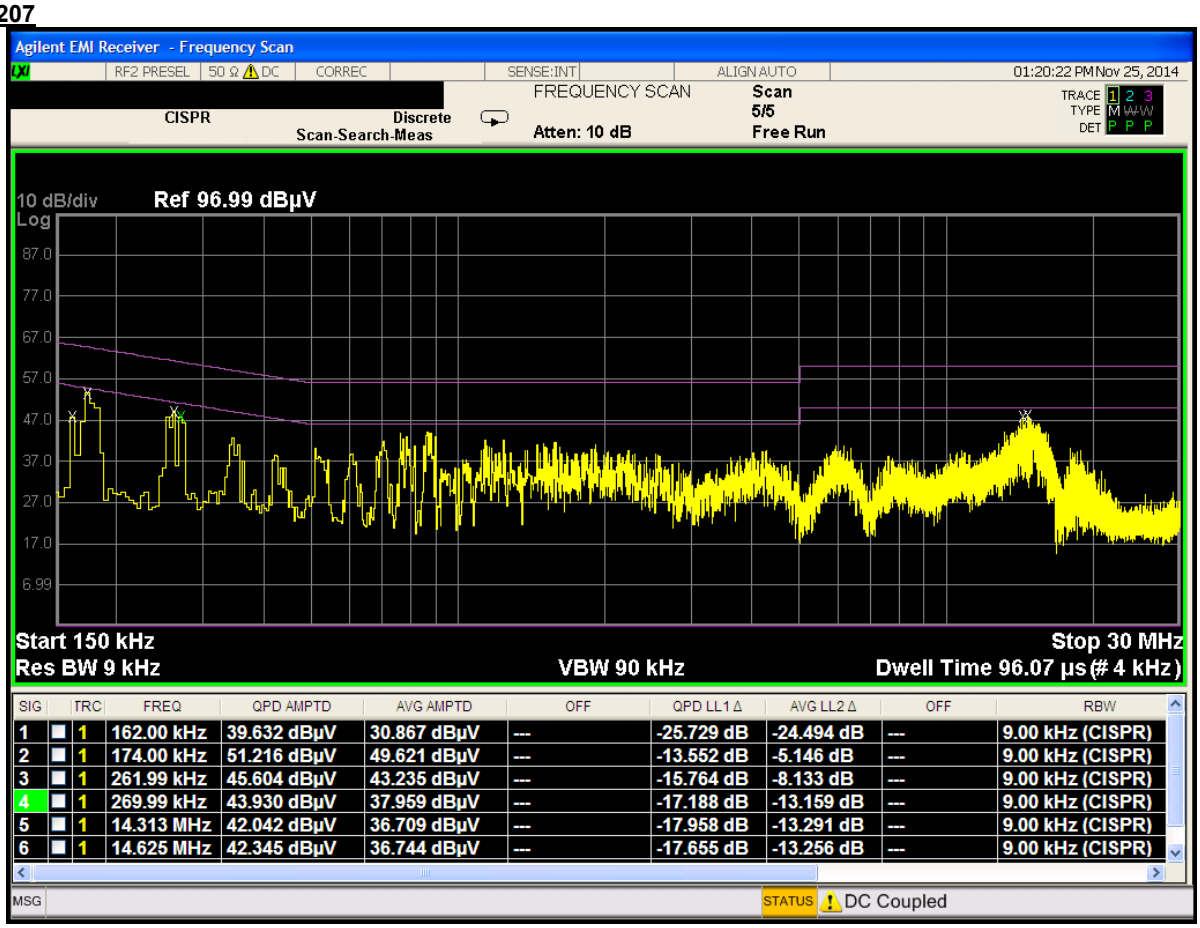
6.11 Line-Conducted Test Data

§15.207



SIG		TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	RBW
1		1	162.00 kHz	39.632 dBµV	30.867 dBµV	---	-25.729 dB	-24.494 dB	---	9.00 kHz (CISPR)
2		1	174.00 kHz	51.216 dBµV	49.621 dBµV	---	-13.552 dB	-5.146 dB	---	9.00 kHz (CISPR)
3		1	261.99 kHz	45.604 dBµV	43.235 dBµV	---	-15.764 dB	-8.133 dB	---	9.00 kHz (CISPR)
4		1	269.99 kHz	43.930 dBµV	37.959 dBµV	---	-17.188 dB	-13.159 dB	---	9.00 kHz (CISPR)
5		1	14.313 MHz	42.042 dBµV	36.709 dBµV	---	-17.958 dB	-13.291 dB	---	9.00 kHz (CISPR)
6		1	14.625 MHz	42.345 dBµV	36.744 dBµV	---	-17.655 dB	-13.256 dB	---	9.00 kHz (CISPR)

Plot 6-137. Line Conducted Plot with 802.11b (L1)

Notes:

1. All modes of operation, data rates, and test channels were investigated and the worst-case emissions are reported in 802.11b mode using 1Mbps on Channel 6. The emissions found were not affected by the choice of channel used during testing.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Factor (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Factor (dB)
5. Margin (dB) = QP/AV Limit (dBµV) – QP/AV Level (dBµV)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

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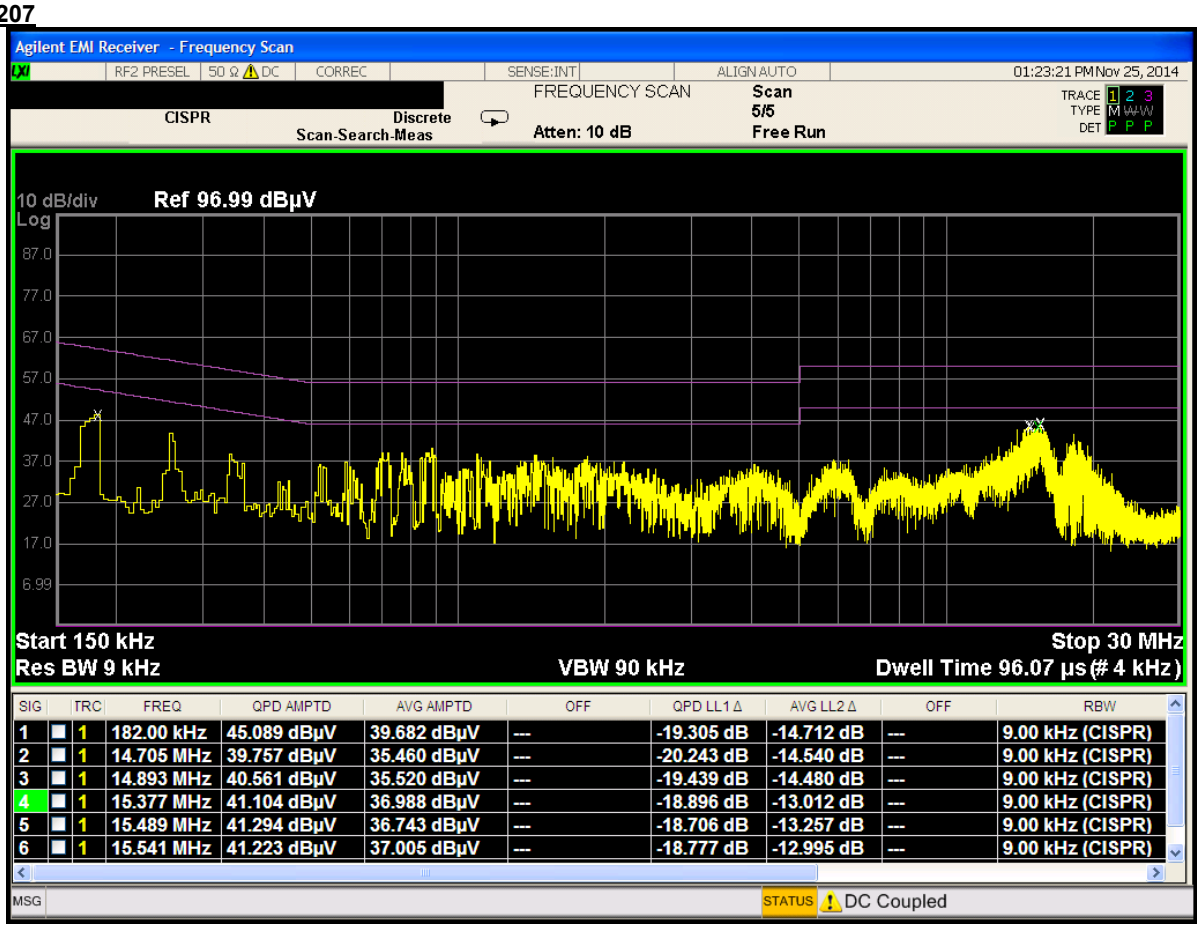
Line-Conducted Test Data

§15.207



SIG		TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	RBW
1		1	182.00 kHz	45.089 dBµV	39.682 dBµV	---	-19.305 dB	-14.712 dB	---	9.00 kHz (CISPR)
2		1	14.705 MHz	39.757 dBµV	35.460 dBµV	---	-20.243 dB	-14.540 dB	---	9.00 kHz (CISPR)
3		1	14.893 MHz	40.561 dBµV	35.520 dBµV	---	-19.439 dB	-14.480 dB	---	9.00 kHz (CISPR)
4		1	15.377 MHz	41.104 dBµV	36.988 dBµV	---	-18.896 dB	-13.012 dB	---	9.00 kHz (CISPR)
5		1	15.489 MHz	41.294 dBµV	36.743 dBµV	---	-18.706 dB	-13.257 dB	---	9.00 kHz (CISPR)
6		1	15.541 MHz	41.223 dBµV	37.005 dBµV	---	-18.777 dB	-12.995 dB	---	9.00 kHz (CISPR)

Plot 6-138. Line Conducted Plot with 802.11b (N)

Notes:

1. All modes of operation, data rates, and test channels were investigated and the worst-case emissions are reported in 802.11b mode using 1Mbps on Channel 6. The emissions found were not affected by the choice of channel used during testing.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Factor (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Factor (dB)
5. Margin (dB) = QP/AV Limit (dBµV) – QP/AV Level (dBµV)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

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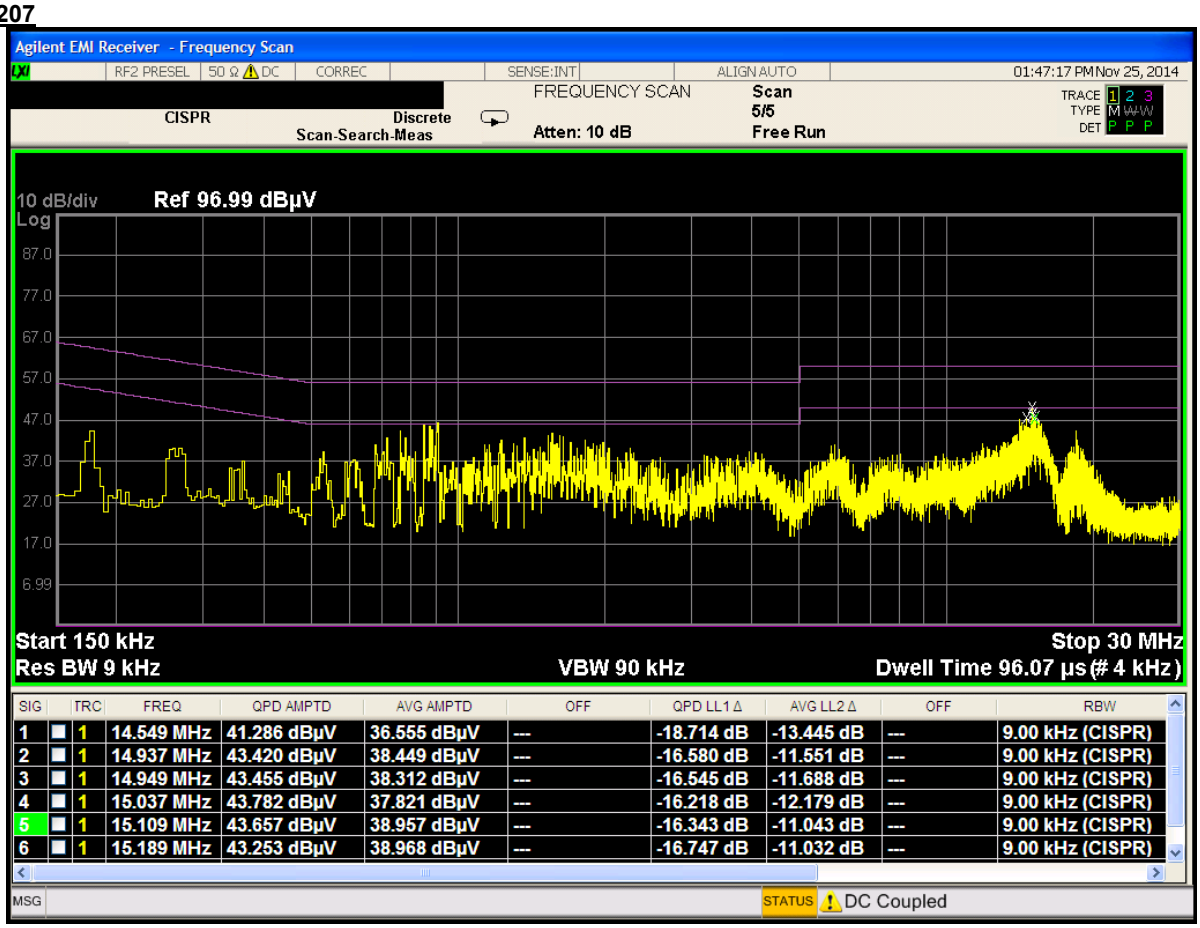
Line-Conducted Test Data

§15.207



SIG		TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	RBW
1		1	14.549 MHz	41.286 dBµV	36.555 dBµV	---	-18.714 dB	-13.445 dB	---	9.00 kHz (CISPR)
2		1	14.937 MHz	43.420 dBµV	38.449 dBµV	---	-16.580 dB	-11.551 dB	---	9.00 kHz (CISPR)
3		1	14.949 MHz	43.455 dBµV	38.312 dBµV	---	-16.545 dB	-11.688 dB	---	9.00 kHz (CISPR)
4		1	15.037 MHz	43.782 dBµV	37.821 dBµV	---	-16.218 dB	-12.179 dB	---	9.00 kHz (CISPR)
5		1	15.109 MHz	43.657 dBµV	38.957 dBµV	---	-16.343 dB	-11.043 dB	---	9.00 kHz (CISPR)
6		1	15.189 MHz	43.253 dBµV	38.968 dBµV	---	-16.747 dB	-11.032 dB	---	9.00 kHz (CISPR)

Plot 6-139. Line Conducted Plot with 802.11a (L1)

Notes:

1. All modes of operation, data rates, and test channels were investigated and the worst-case emissions are reported in 802.11a mode using 6Mbps on Channel 157. The emissions found were not affected by the choice of channel used during testing.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Factor (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Factor (dB)
5. Margin (dB) = QP/AV Limit (dBµV) – QP/AV Level (dBµV)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

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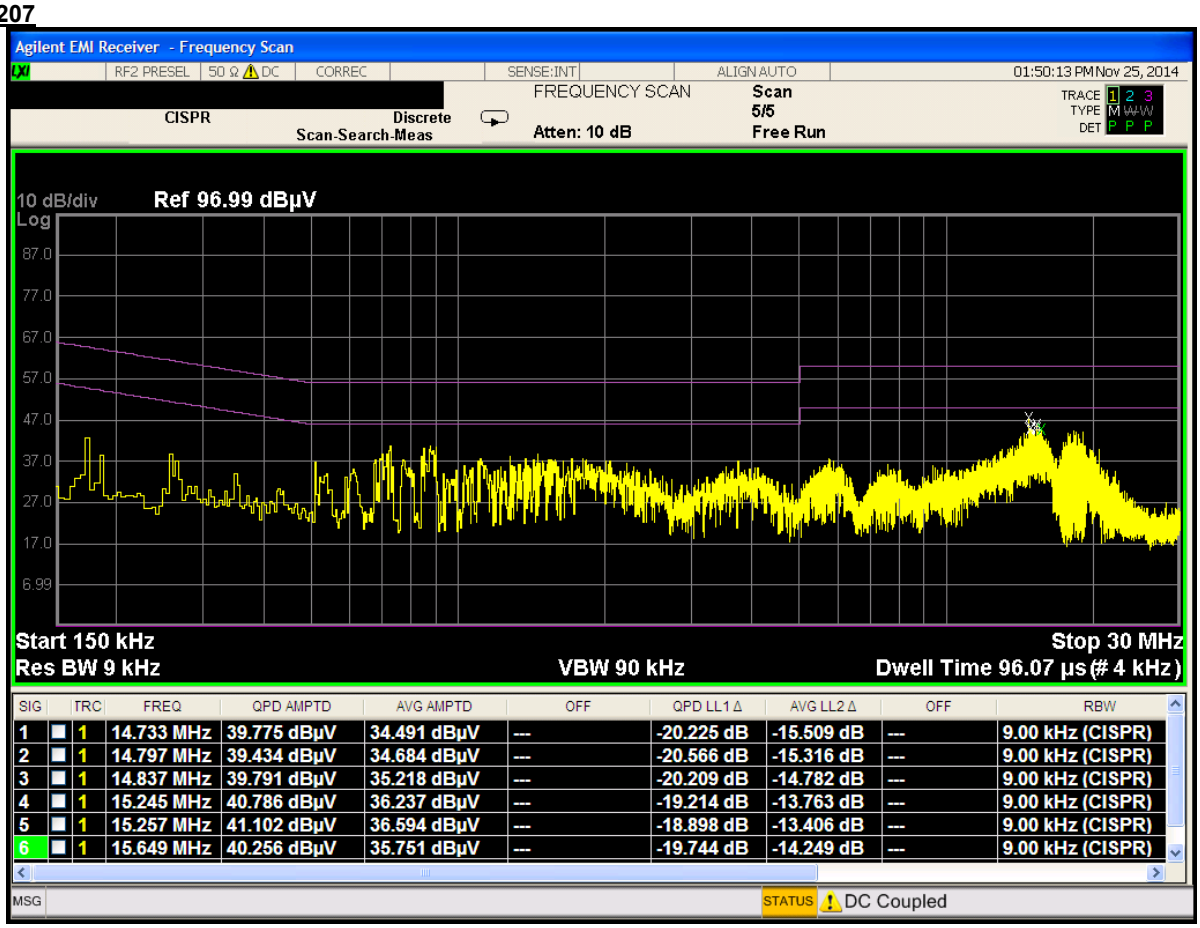
Line-Conducted Test Data

§15.207



SIG		TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	RBW
1		1	14.733 MHz	39.775 dBµV	34.491 dBµV	---	-20.225 dB	-15.509 dB	---	9.00 kHz (CISPR)
2		1	14.797 MHz	39.434 dBµV	34.684 dBµV	---	-20.566 dB	-15.316 dB	---	9.00 kHz (CISPR)
3		1	14.837 MHz	39.791 dBµV	35.218 dBµV	---	-20.209 dB	-14.782 dB	---	9.00 kHz (CISPR)
4		1	15.245 MHz	40.786 dBµV	36.237 dBµV	---	-19.214 dB	-13.763 dB	---	9.00 kHz (CISPR)
5		1	15.257 MHz	41.102 dBµV	36.594 dBµV	---	-18.898 dB	-13.406 dB	---	9.00 kHz (CISPR)
6		1	15.649 MHz	40.256 dBµV	35.751 dBµV	---	-19.744 dB	-14.249 dB	---	9.00 kHz (CISPR)

Plot 6-140. Line Conducted Plot with 802.11a (N)

Notes:

1. All modes of operation, data rates, and test channels were investigated and the worst-case emissions are reported in 802.11a mode using 6Mbps on Channel 157. The emissions found were not affected by the choice of channel used during testing.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Factor (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Factor (dB)
5. Margin (dB) = QP/AV Limit (dBµV) – QP/AV Level (dBµV)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

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7.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMN916KOR** is in compliance with Part 15C of the FCC Rules.

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