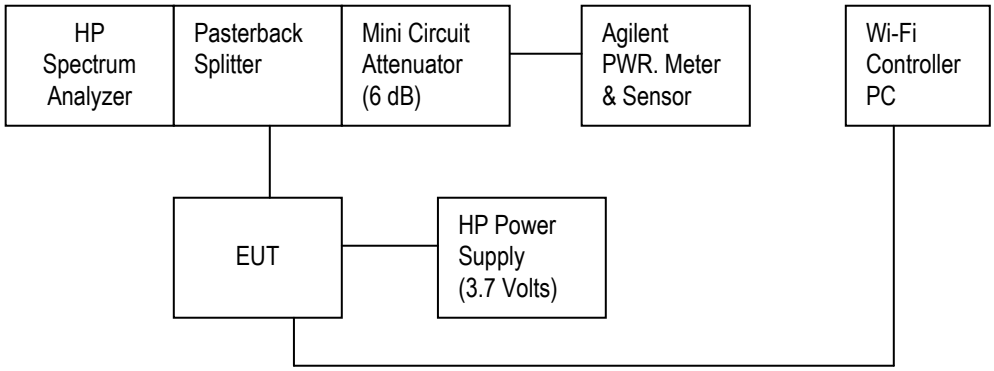
APPENDIX 6 – 802.11b/g/n CONDUCTED EMISSIONS TEST DATA/PLOTS

802.11b/g/n RF Conducted Emission Test Results

Test Setup Diagram



UNIT	MANUFACTURER	MODEL	SERIAL NUMBER
Attenuator 1	Mini-Circuits	BW-S6W2+	0647
Attenuator 2	Mini-Circuits	BW-S6W2+	0648
Attenuator 3	Mini-Circuits	BW-S20-2W263+	1234
Splitter 1	Weinschel	1515	MES 92

A reference offset of 20.4 dB was applied to the spectrum analyzer and 6.6 dB was applied to the Power Meter reference level for the attenuators and coaxial cable loss in the test circuit.

Date of test: May 2, 2014
The measurements on the BlackBerry® smartphone were performed by Chuan Tran.

The environmental test conditions were: Temperature: 27.5 ºC
Relative Humidity: 31.2 %

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802.11b/g/n RF Conducted Emission Test Results cont'd

Following tests were performed on the model RGY181LW.

6 dB Bandwidth

The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(a)(2) and RSS-210. Channels 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4, and 7 for 802.11n mode.

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
1	1 Mbps	≥ 500	8.60
	5.5 Mbps	≥ 500	9.08
	11 Mbps	≥ 500	9.56
	6 Mbps	≥ 500	15.16
	24 Mbps	≥ 500	**16.48**
	54 Mbps	≥ 500	**16.48**
	MCS 0	≥ 500	**16.48**
	MCS 4	≥ 500	**16.48**
	MCS 7	≥ 500	**16.48**
6	1 Mbps	≥ 500	8.12
	5.5 Mbps	≥ 500	8.60
	11 Mbps	≥ 500	**9.92**
	6 Mbps	≥ 500	15.16
	24 Mbps	≥ 500	16.44
	54 Mbps	≥ 500	**16.48**
	MCS 0	≥ 500	**16.48**
	MCS 4	≥ 500	**16.48**
	MCS 7	≥ 500	**16.48**
11	1 Mbps	≥ 500	8.16
	5.5 Mbps	≥ 500	8.16
	11 Mbps	≥ 500	9.20
	6 Mbps	≥ 500	15.12
	24 Mbps	≥ 500	**16.48**
	54 Mbps	≥ 500	**16.48**
	MCS 0	≥ 500	**16.48**
	MCS 4	≥ 500	16.44
	MCS 7	≥ 500	**16.48**

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802.11b/g/n RF Conducted Emission Test Results cont'd

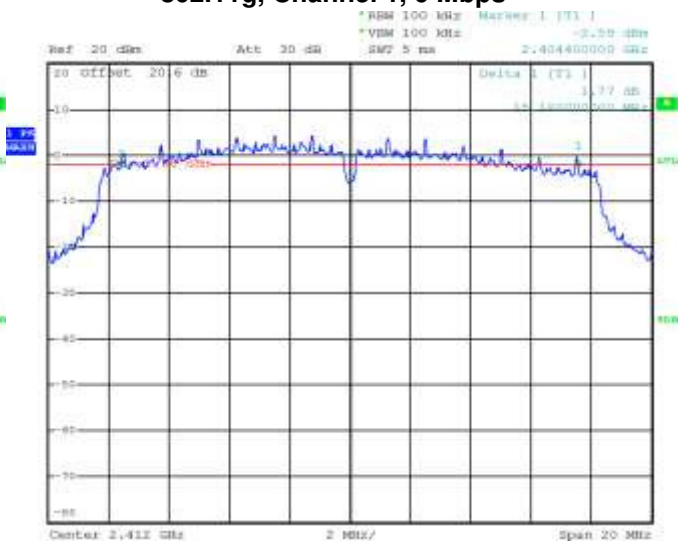
See figures 6-1 to 6-9 for the plots of the 6 dB bandwidth measurements for Channels 1, 6, and 11, at 1 Mbps each for 802.11b mode, 6 Mbps each for 802.11g mode, and MCS 0 each for 802.11n mode.

Figure 6-1: 6 dB Bandwidth
802.11b, Channel 1, 1 Mbps

Figure 6-2: 6 dB Bandwidth
802.11b, Channel 6, 1 Mbps

Figure 6-3: 6 dB Bandwidth
802.11b, Channel 11, 1 Mbps

Figure 6-4: 6 dB Bandwidth
802.11g, Channel 1, 6 Mbps



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802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 6-5: 6 dB Bandwidth
802.11g, Channel 6, 6 Mbps

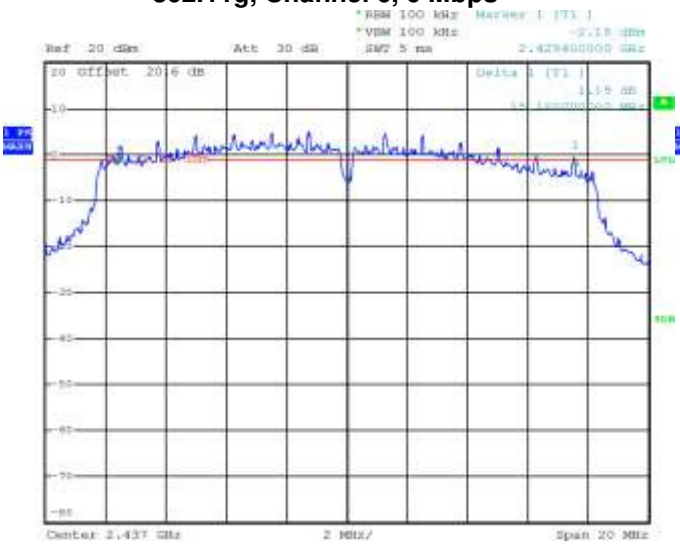

Figure 6-6: 6 dB Bandwidth
802.11g, Channel 11, 6 Mbps

Figure 6-7: 6 dB Bandwidth
802.11n, Channel 1, MCS 0

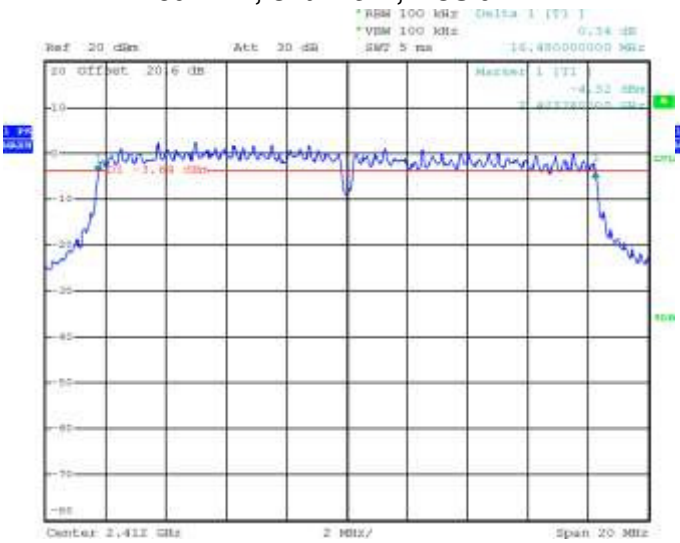

Figure 6-8: 6 dB Bandwidth
802.11n, Channel 6, MCS 0

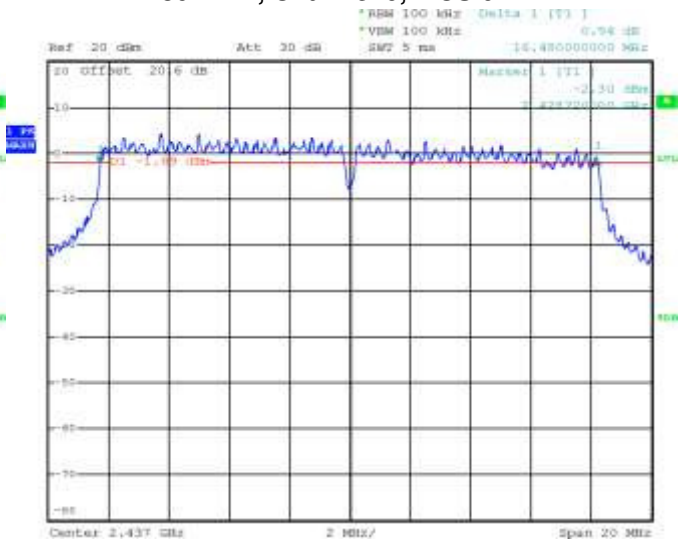

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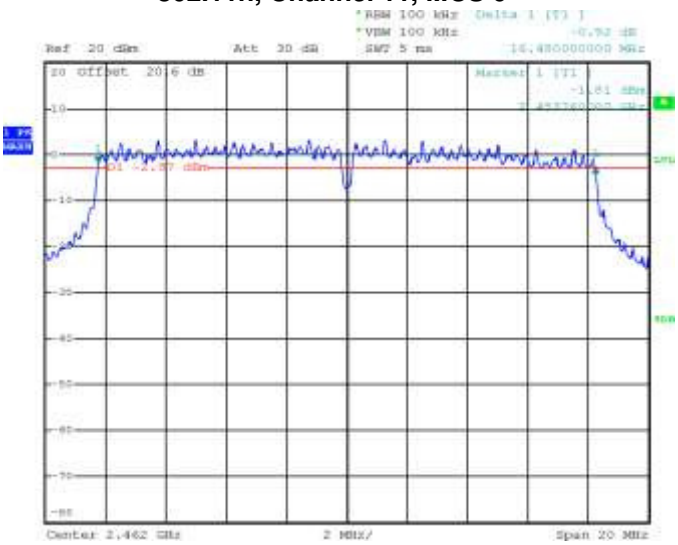
Figure 6-9: 6 dB Bandwidth
802.11n, Channel 11, MCS 0



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802.11b/g/n RF Conducted Emission Test Results cont'd

Maximum Conducted Output Power

The EUT met the requirements of the maximum conducted output power of class 2 as per 47 CFR 15.247(b)(3) and RSS-210. Channels 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11 Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4 and 7 for 802.11n mode using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 18.4 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (W)
1	1 Mbps	< 1.00	15.71	0.0373
	5.5 Mbps	< 1.00	15.61	0.0364
	11 Mbps	< 1.00	15.49	0.0354
	6 Mbps	< 1.00	15.33	0.0342
	24 Mbps	< 1.00	14.76	0.0299
	54 Mbps	< 1.00	12.68	0.0185
	MCS 0	< 1.00	15.12	0.0325
	MCS 4	< 1.00	14.46	0.0279
	MCS 7	< 1.00	11.12	0.0129
6	1 Mbps	< 1.00	16.00	0.0398
	5.5 Mbps	< 1.00	15.83	0.0383
	11 Mbps	< 1.00	15.81	0.0381
	6 Mbps	< 1.00	**15.81**	0.0381
	24 Mbps	< 1.00	15.45	0.0351
	54 Mbps	< 1.00	13.35	0.0216
	MCS 0	< 1.00	**15.46**	0.0351
	MCS 4	< 1.00	14.96	0.0313
	MCS 7	< 1.00	11.60	0.0145

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802.11b/g/n RF Conducted Emission Test Results cont'd

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (W)
11	1 Mbps	< 1.00	**16.05**	0.0403
	5.5 Mbps	< 1.00	15.91	0.0390
	11 Mbps	< 1.00	15.78	0.0379
	6 Mbps	< 1.00	15.70	0.0372
	24 Mbps	< 1.00	15.21	0.0332
	54 Mbps	< 1.00	13.03	0.0201
	MCS 0	< 1.00	15.44	0.0350
	MCS 4	< 1.00	14.82	0.0303
	MCS 7	< 1.00	11.53	0.0142

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802.11b/g/n RF Conducted Emission Test Results cont'd

Band Edge Compliance

The EUT met the requirements of the band edge compliance as per 47 CFR 15.247(c) and RSS-210. Channels 1 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11 Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4 and 7 for 802.11n mode.

Channel	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
1	1 Mbps	< -20	-47.67	-27.67
	5.5 Mbps	< -20	-48.77	-28.77
	11 Mbps	< -20	-48.92	-28.92
	6 Mbps	< -20	-31.08	-11.08
	24 Mbps	< -20	-31.83	-11.83
	54 Mbps	< -20	-32.94	-12.94
	MCS 0	< -20	-30.41	-10.41
	MCS 4	< -20	-36.13	-16.13
	MCS 7	< -20	-40.71	-20.71
11	1 Mbps	< -20	-45.27	-25.27
	5.5 Mbps	< -20	-44.63	-24.63
	11 Mbps	< -20	-42.82	-22.82
	6 Mbps	< -20	-38.92	-18.92
	24 Mbps	< -20	-37.30	-17.30
	54 Mbps	< -20	37.42	57.42
	MCS 0	< -20	-37.08	-17.08
	MCS 4	< -20	-36.94	-16.94
	MCS 7	< -20	-37.05	-17.05

See figures 6-10 to 6-15 for the plots of the band edge compliance measurements for Channels 1 and 11, at 1 Mbps each for 802.11b mode, 6 Mbps each for 802.11g mode, and MCS 0 each for 802.11n mode.

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802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 6-10: Band Edge Compliance
802.11b, Channel 1, 1 Mbps

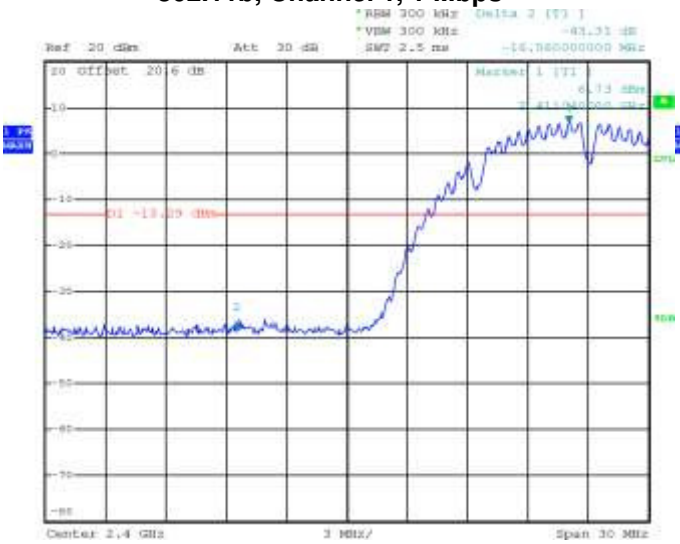


Figure 6-11: Band Edge Compliance
802.11b, Channel 11, 1 Mbps

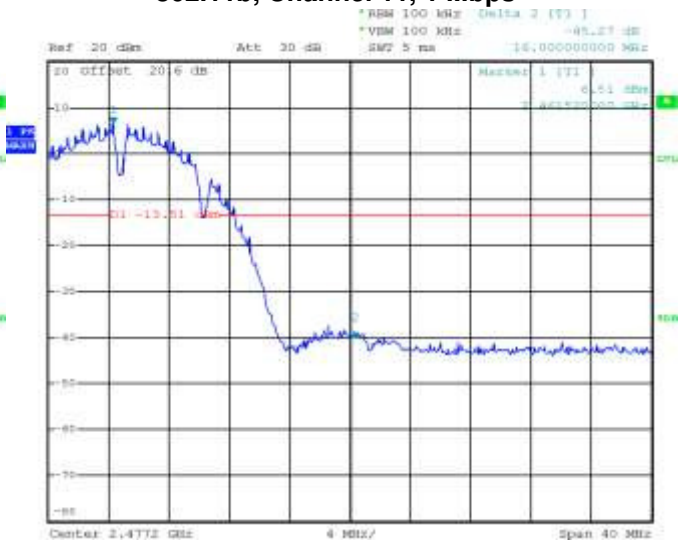


Figure 6-12: Band Edge Compliance
802.11g, Channel 1, 6 Mbps

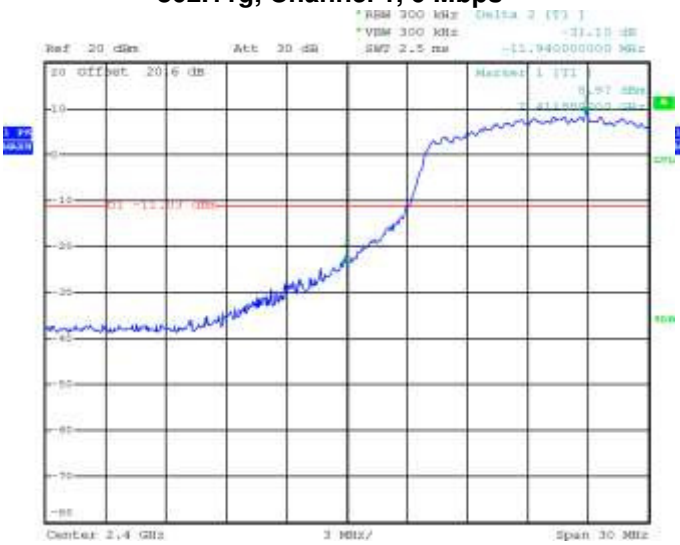
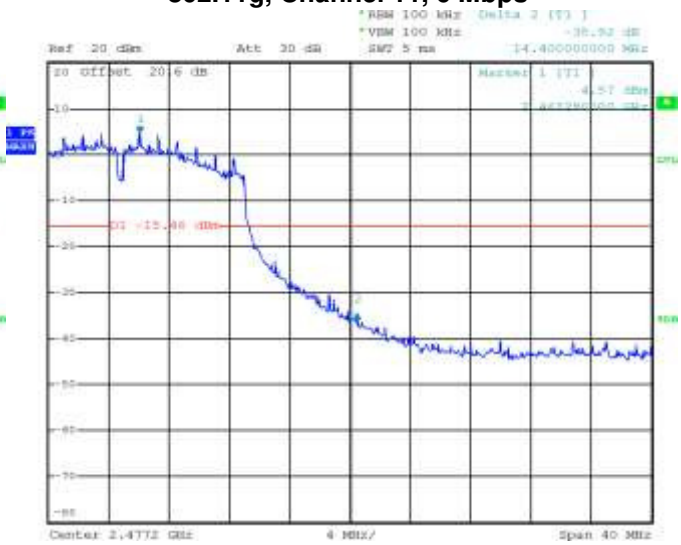


Figure 6-13: Band Edge Compliance
802.11g, Channel 11, 6 Mbps



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802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 6-14: Band Edge Compliance
802.11n, Channel 1, MCS 0

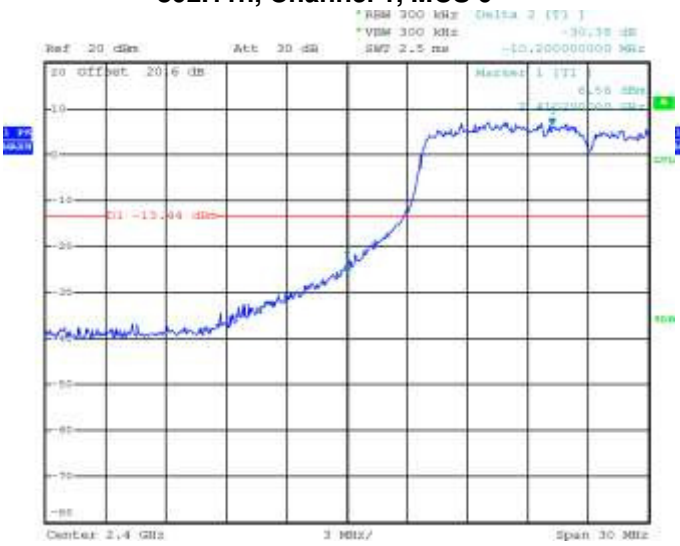
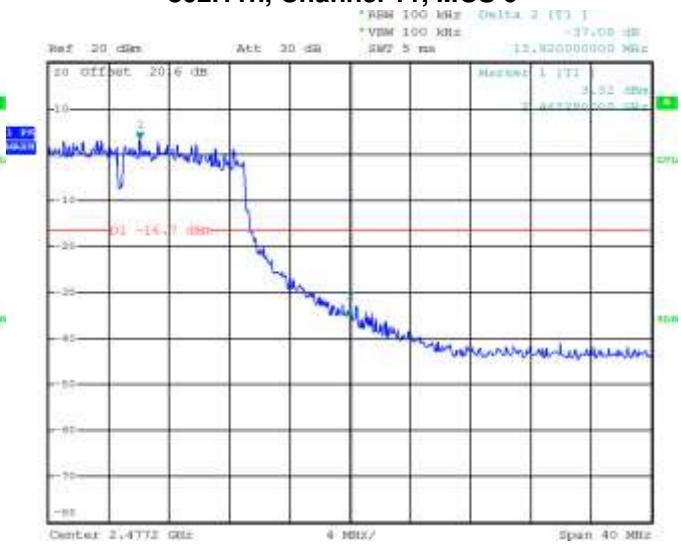


Figure 6-15: Band Edge Compliance
802.11n, Channel 11, MCS 0



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802.11b/g/n RF Conducted Emission Test Results cont'd

Peak Power Spectral Density

The EUT met the requirements of the peak power spectral density as per 47 CFR 15.247(d) and RSS-210. Channels 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11 Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4, and 7 for 802.11n mode.

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
1	1 Mbps	< 8.00	-3.94	-11.94
	5.5 Mbps	< 8.00	-2.79	-10.79
	11 Mbps	< 8.00	-5.77	-13.77
	6 Mbps	< 8.00	-7.72	-15.72
	24 Mbps	< 8.00	-6.27	-14.27
	54 Mbps	< 8.00	-7.92	-15.92
	MCS 0	< 8.00	-7.72	-15.72
	MCS 4	< 8.00	-7.76	-15.76
	MCS 7	< 8.00	-7.32	-15.32
6	1 Mbps	< 8.00	-2.49	-10.49
	5.5 Mbps	< 8.00	-2.53	-10.53
	11 Mbps	< 8.00	-3.96	-11.96
	6 Mbps	< 8.00	-6.89	-14.89
	24 Mbps	< 8.00	-6.24	-14.24
	54 Mbps	< 8.00	-7.96	-15.96
	MCS 0	< 8.00	-7.64	-15.64
	MCS 4	< 8.00	-7.25	-15.25
	MCS 7	< 8.00	-8.12	-16.12
11	1 Mbps	< 8.00	-5.74	-13.74
	5.5 Mbps	< 8.00	-6.44	-14.44
	11 Mbps	< 8.00	-7.86	-15.86
	6 Mbps	< 8.00	-6.54	-14.54
	24 Mbps	< 8.00	-9.29	-17.29
	54 Mbps	< 8.00	-10.40	-18.40
	MCS 0	< 8.00	-6.97	-14.97
	MCS 4	< 8.00	-9.29	-17.29
	MCS 7	< 8.00	-10.97	-18.97

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802.11b/g/n RF Conducted Emission Test Results cont'd

See figures 6-16 to 6-24 for the plots of the peak power spectral density for Channels 1, 6 and 11, at 1 Mbps each for 802.11b mode, 6 Mbps each for 802.11g mode, and MCS 0 for 802.11n mode.

Figure 6-16: Peak Power Spectral Density 802.11b, Channel 1, 1 Mbps

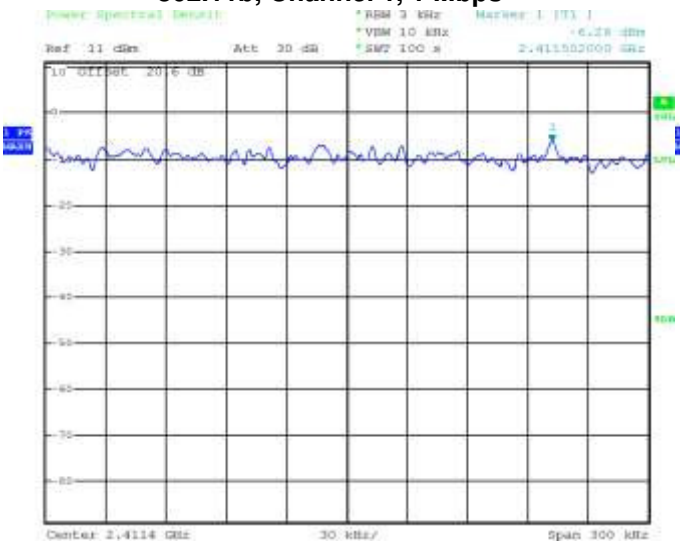


Figure 6-17: Peak Power Spectral Density 802.11b, Channel 6, 1 Mbps

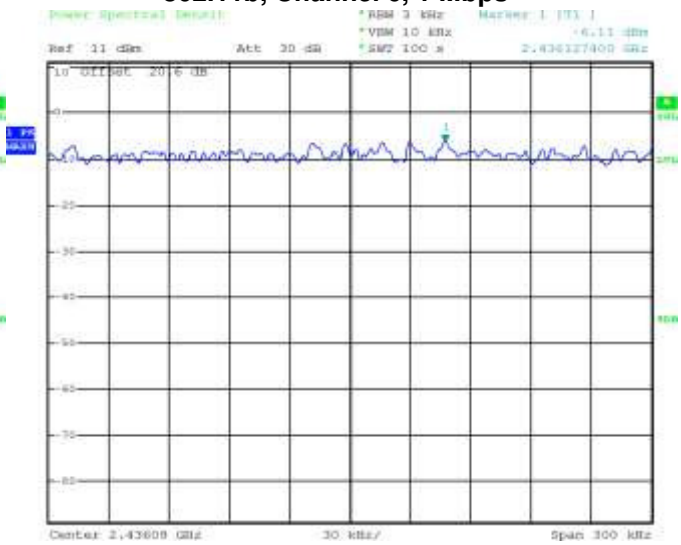
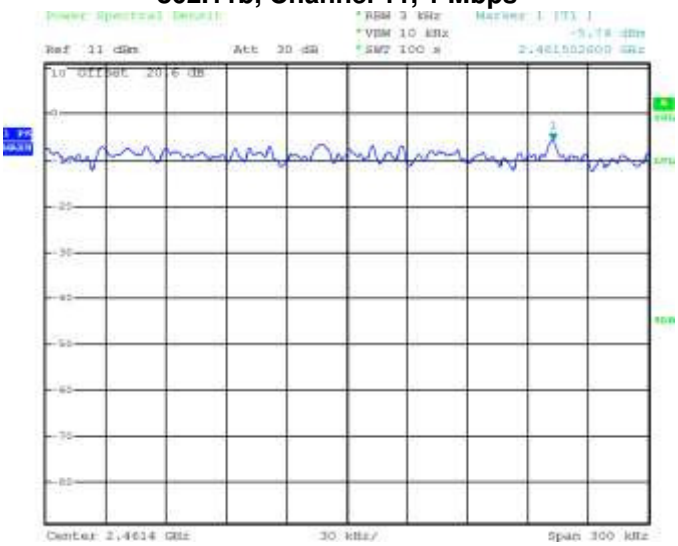


Figure 6-18: Peak Power Spectral Density 802.11b, Channel 11, 1 Mbps



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802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 6-19: Peak Power Spectral Density
802.11g, Channel 1, 6 Mbps

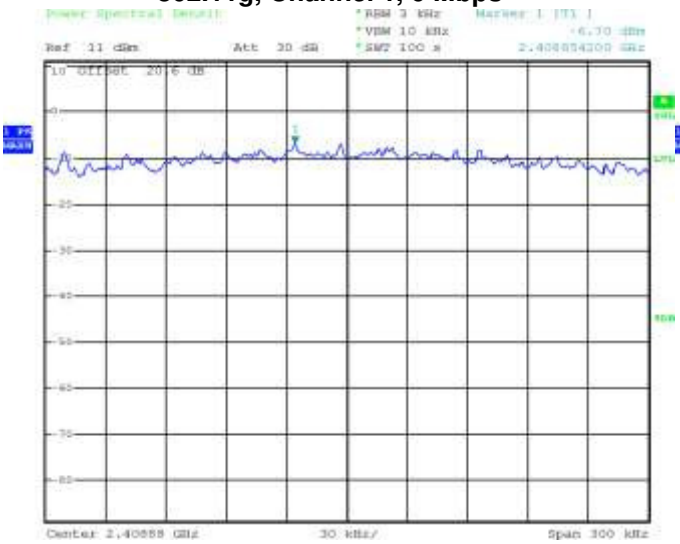


Figure 6-20: Peak Power Spectral Density
802.11g, Channel 6, 6 Mbps

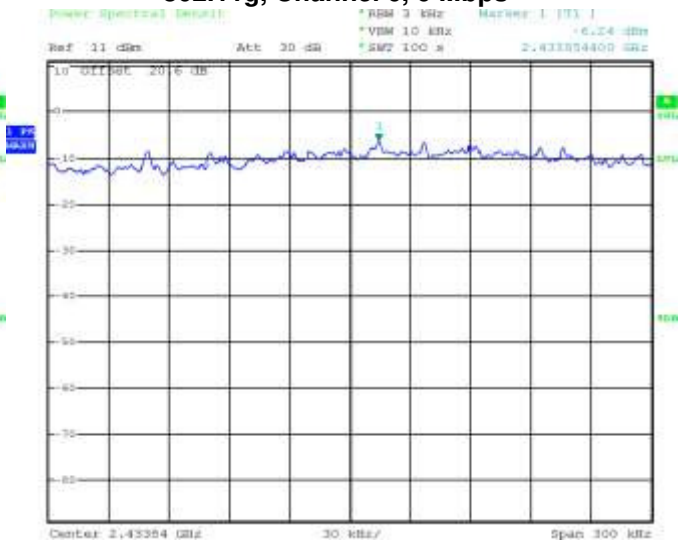
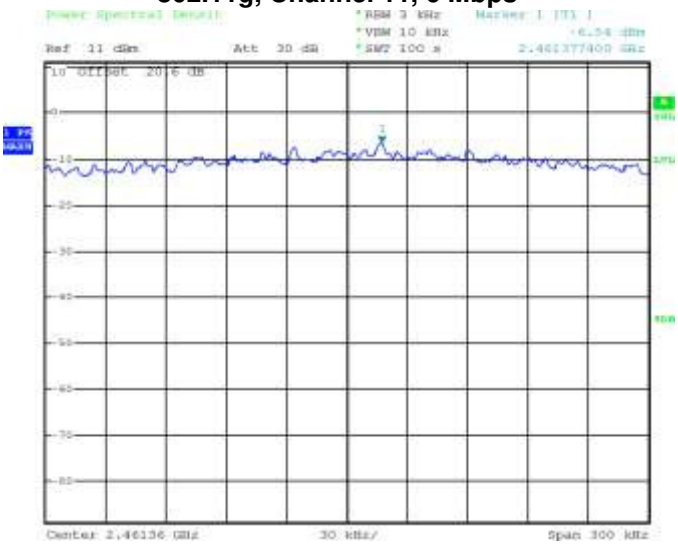


Figure 6-21: Peak Power Spectral Density
802.11g, Channel 11, 6 Mbps



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802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 6-22: Peak Power Spectral Density
802.11n, Channel 1, MCS 0

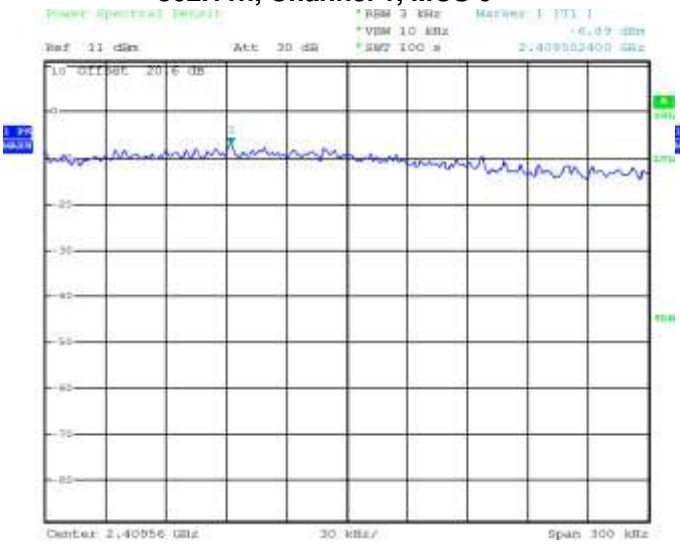


Figure 6-23: Peak Power Spectral Density
802.11n, Channel 6, MCS 0

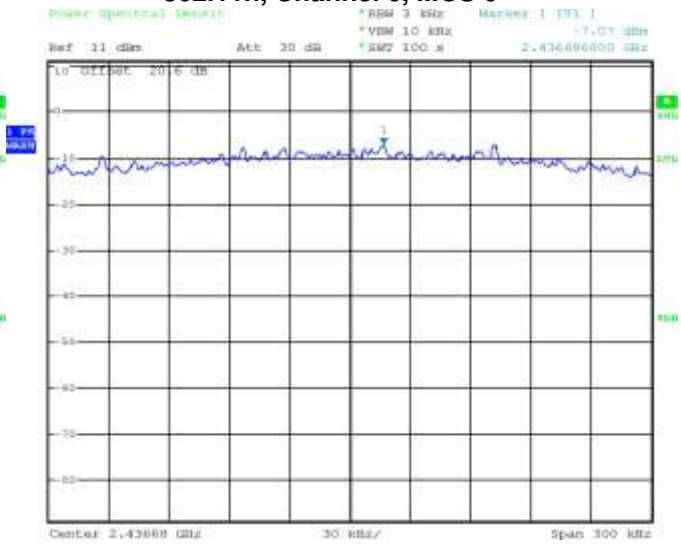
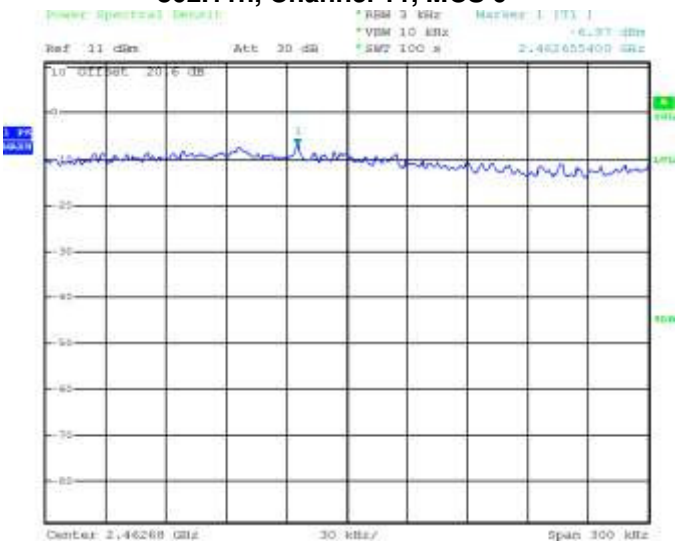


Figure 6-24: Peak Power Spectral Density
802.11n, Channel 11, MCS 0



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802.11b/g/n RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. Channels 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11 Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4, and 7 for 802.11n mode. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 18.4 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
1	1 Mbps	18.08	-35.44	-53.52	-20
	5.5 Mbps	17.97	-37.48	-55.45	-20
	11 Mbps	17.85	-35.43	-53.28	-20
	6 Mbps	17.72	-40.28	-58.00	-20
	24 Mbps	17.18	-40.27	-57.45	-20
	54 Mbps	15.66	-40.88	-56.54	-20
	MCS 0	17.47	-39.97	-57.44	-20
	MCS 4	14.93	-39.31	-54.24	-20
	MCS 7	13.51	-39.19	-52.70	-20
6	1 Mbps	18.47	-35.66	-54.13	-20
	5.5 Mbps	18.45	-37.09	-55.54	-20
	11 Mbps	18.22	-37.45	-55.67	-20
	6 Mbps	18.03	-40.70	-58.73	-20
	24 Mbps	17.60	-38.61	-56.21	-20
	54 Mbps	16.01	-39.00	-55.01	-20
	MCS 0	18.03	-39.65	-57.68	-20
	MCS 4	15.30	-40.89	-56.19	-20
	MCS 7	13.98	-39.00	-52.98	-20

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802.11b/g/n RF Conducted Emission Test Results cont'd

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
11	1 Mbps	16.05	-40.54	-56.59	-20
	5.5 Mbps	15.91	-40.47	-56.38	-20
	11 Mbps	15.78	-39.94	-55.72	-20
	6 Mbps	15.70	-15.57	-31.28	-20
	24 Mbps	15.21	-40.79	-56.00	-20
	54 Mbps	13.03	-40.38	-53.42	-20
	MCS 0	15.44	-20.63	-36.07	-20
	MCS 4	14.82	-17.96	-32.78	-20
	MCS 7	11.53	-40.41	-51.94	-20

The emissions were in the NF.

See figures 6-25 to 6-33 for the plots of the spurious RF conducted emissions for Channels 1, 6 and 11, at 1 Mbps each for 802.11b mode, 6 Mbps each for 802.11g mode, and MCS 0 each for 802.11n mode.

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802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 6-25: Spurious Conducted RF Emissions
802.11b, Channel 1, 1 Mbps

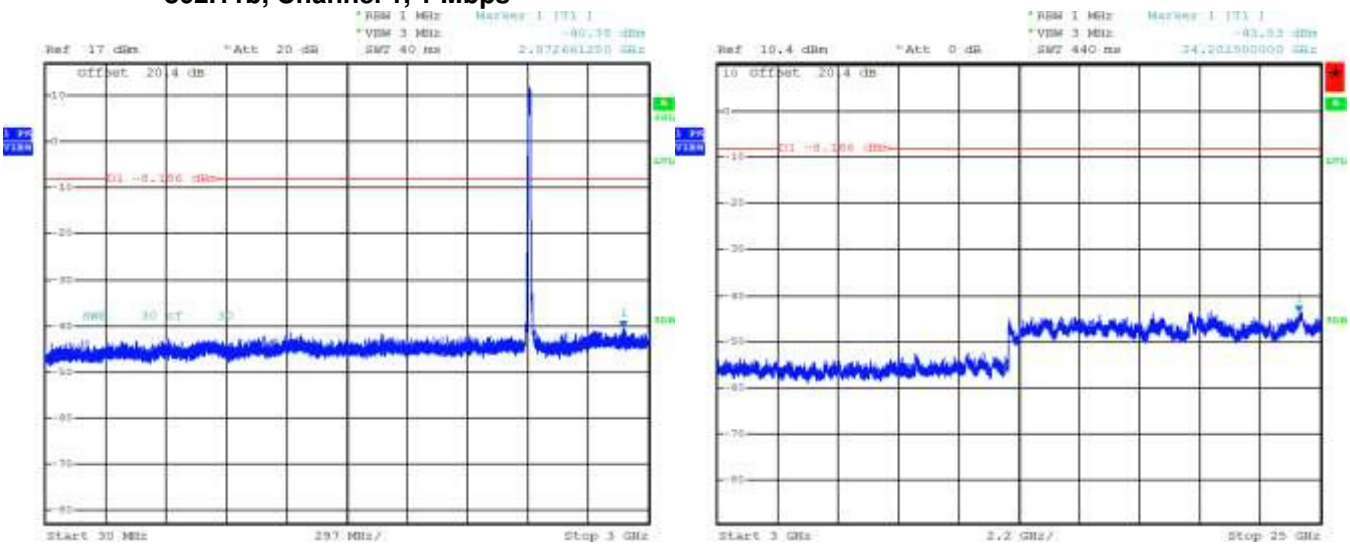
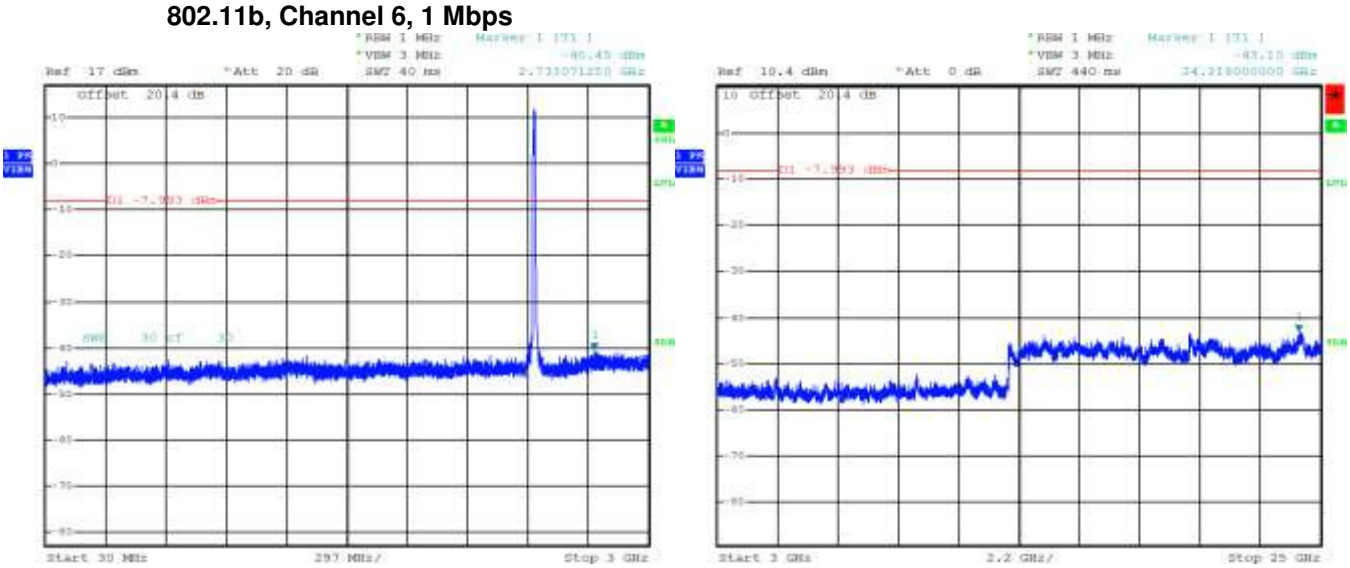


Figure 6-26 : Spurious Conducted RF Emissions
802.11b, Channel 6, 1 Mbps



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802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 6-27: Spurious Conducted RF Emissions
802.11b, Channel 11, 1 Mbps

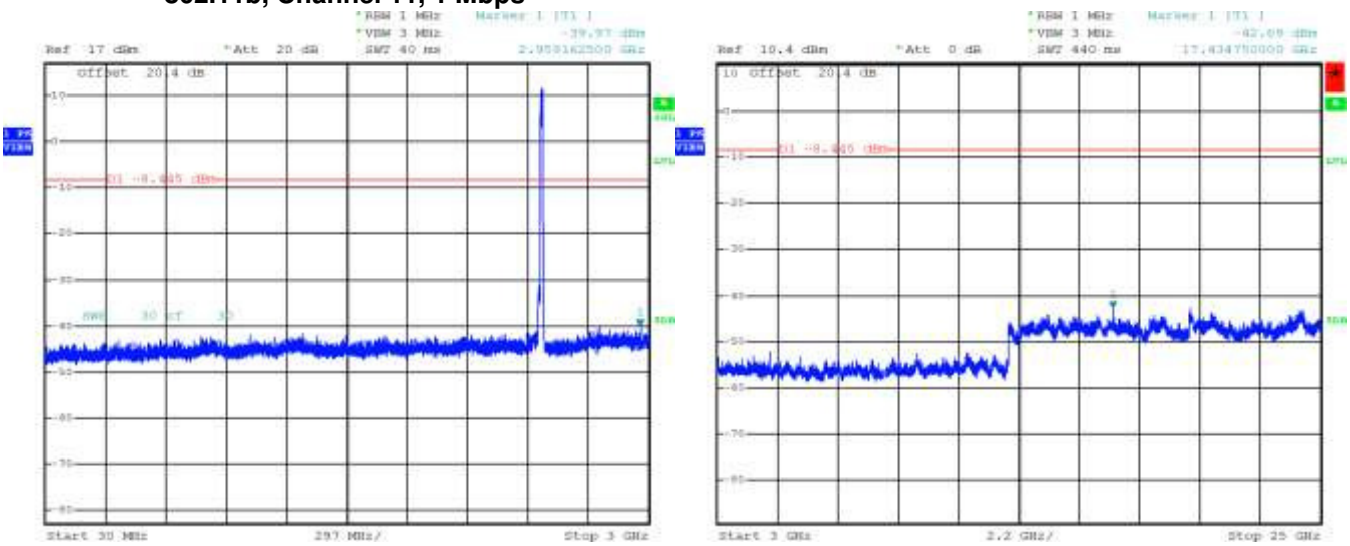
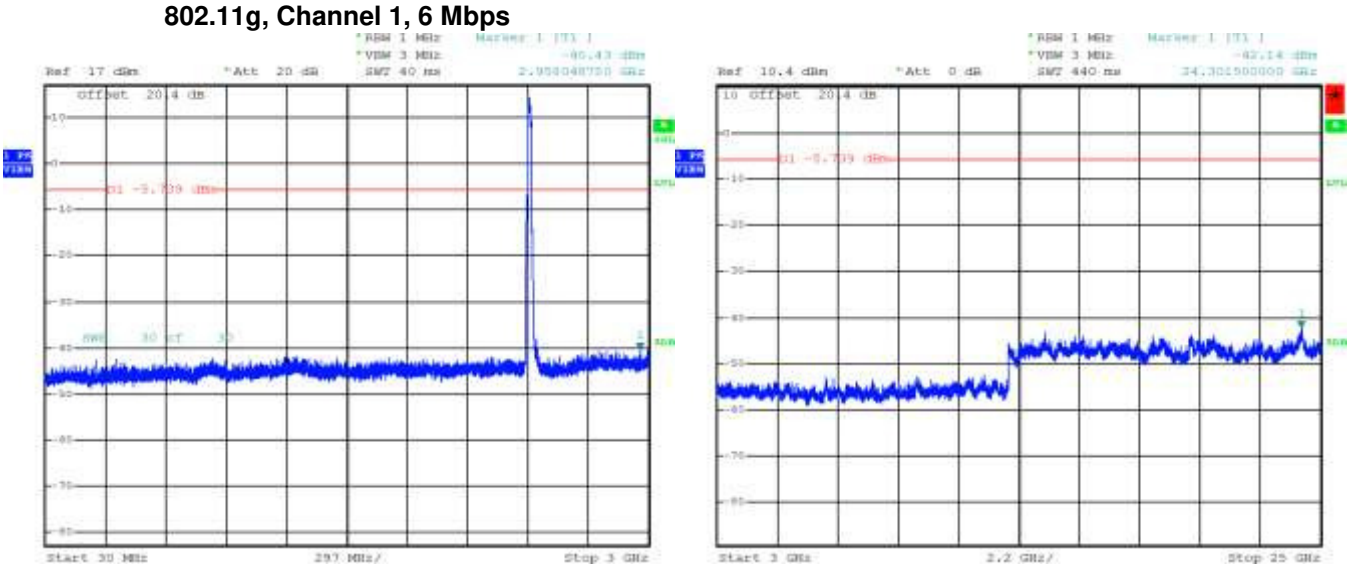


Figure 6-28: Spurious Conducted RF Emissions
802.11g, Channel 1, 6 Mbps



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802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 6-29: Spurious Conducted RF Emissions
802.11g, Channel 6, 6 Mbps

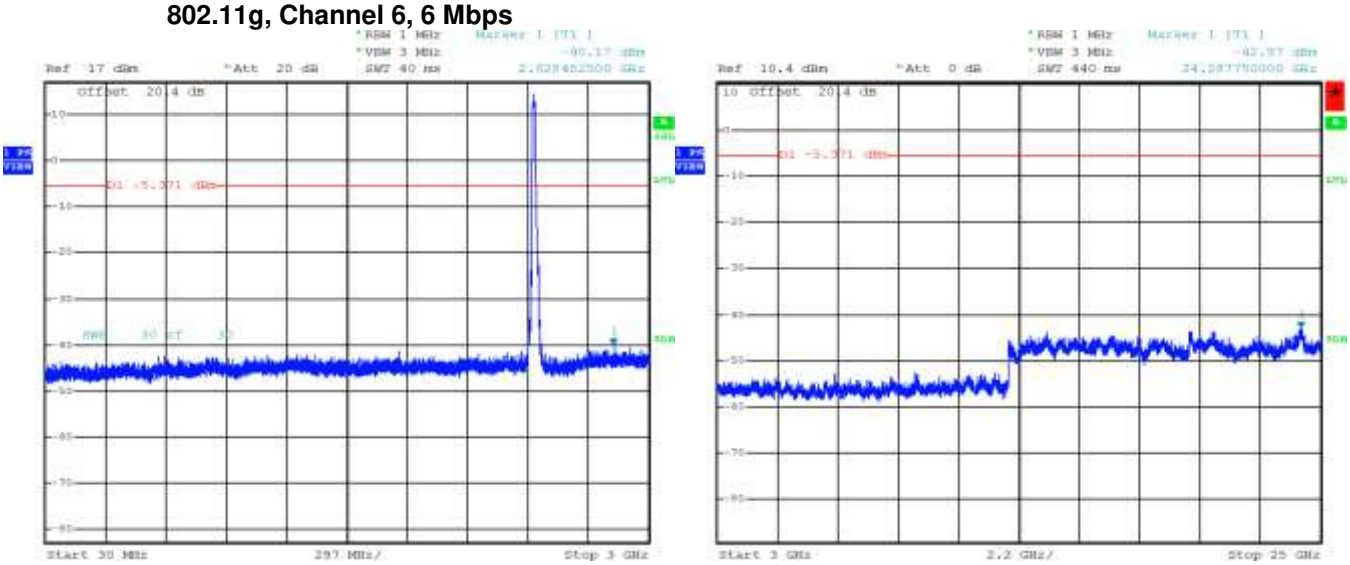
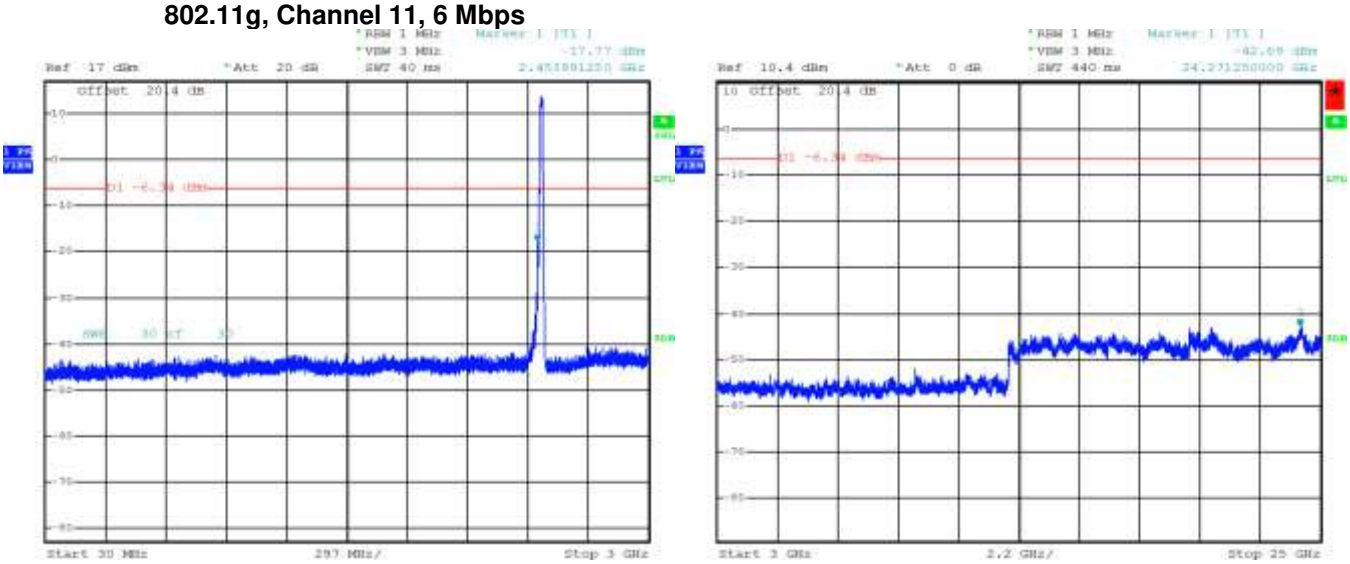


Figure 6-30: Spurious Conducted RF Emissions
802.11g, Channel 11, 6 Mbps



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802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 6-31: Spurious Conducted RF Emissions
802.11n, Channel 1, MCS 0

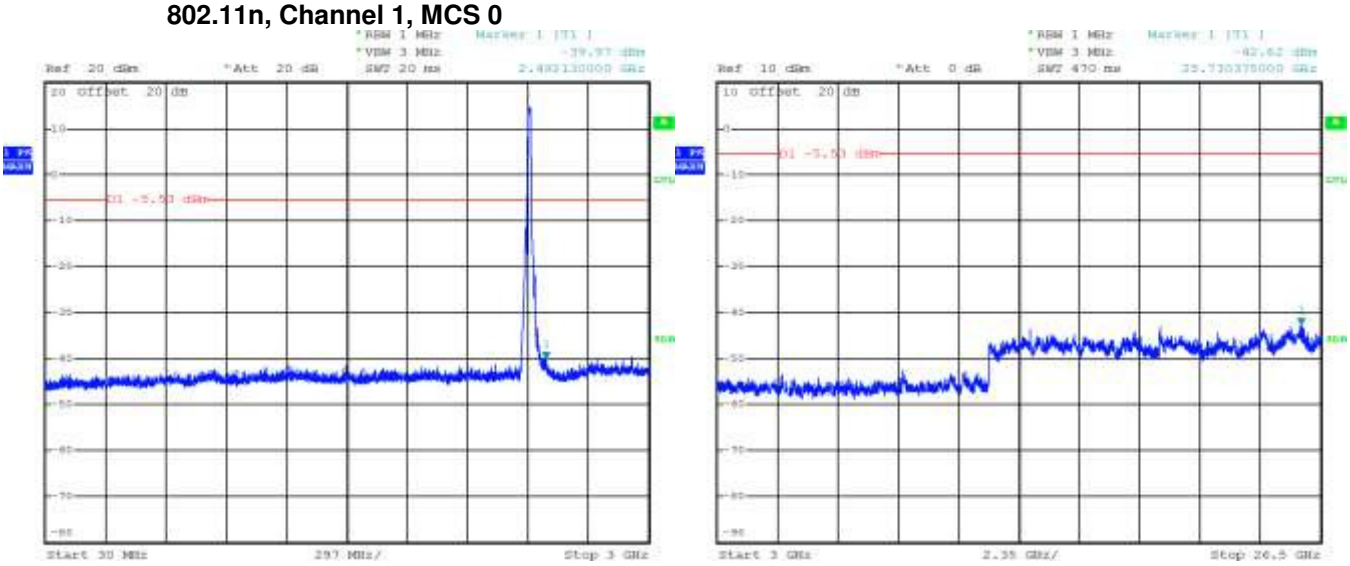
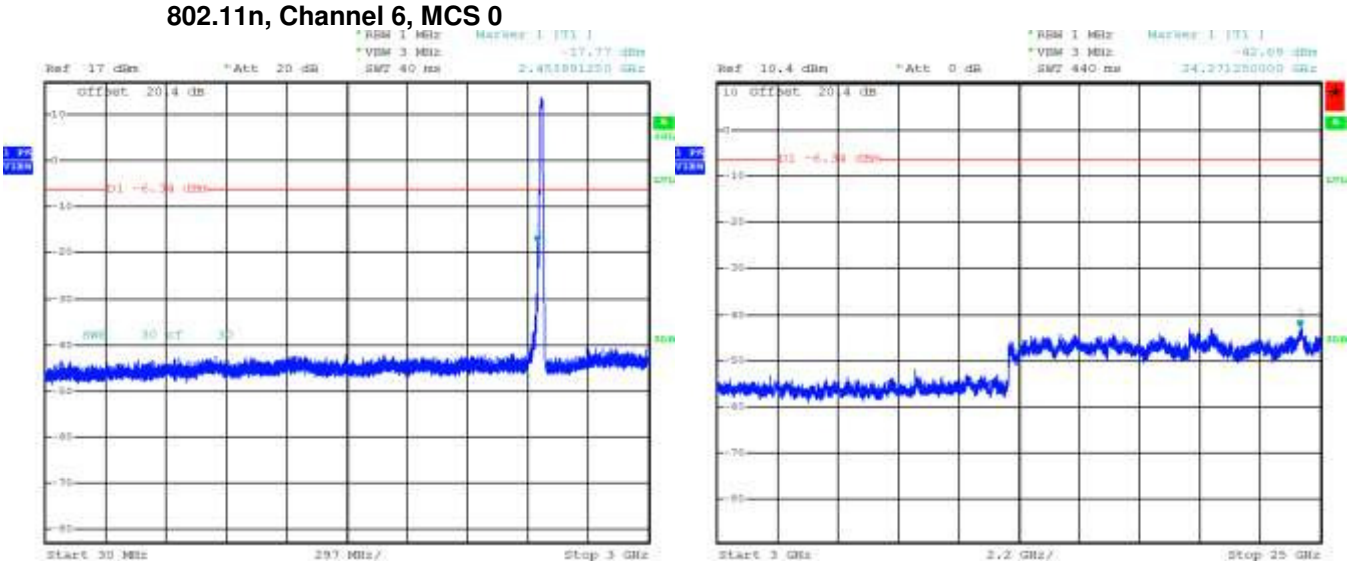


Figure 6-32: Spurious Conducted RF Emissions
802.11n, Channel 6, MCS 0



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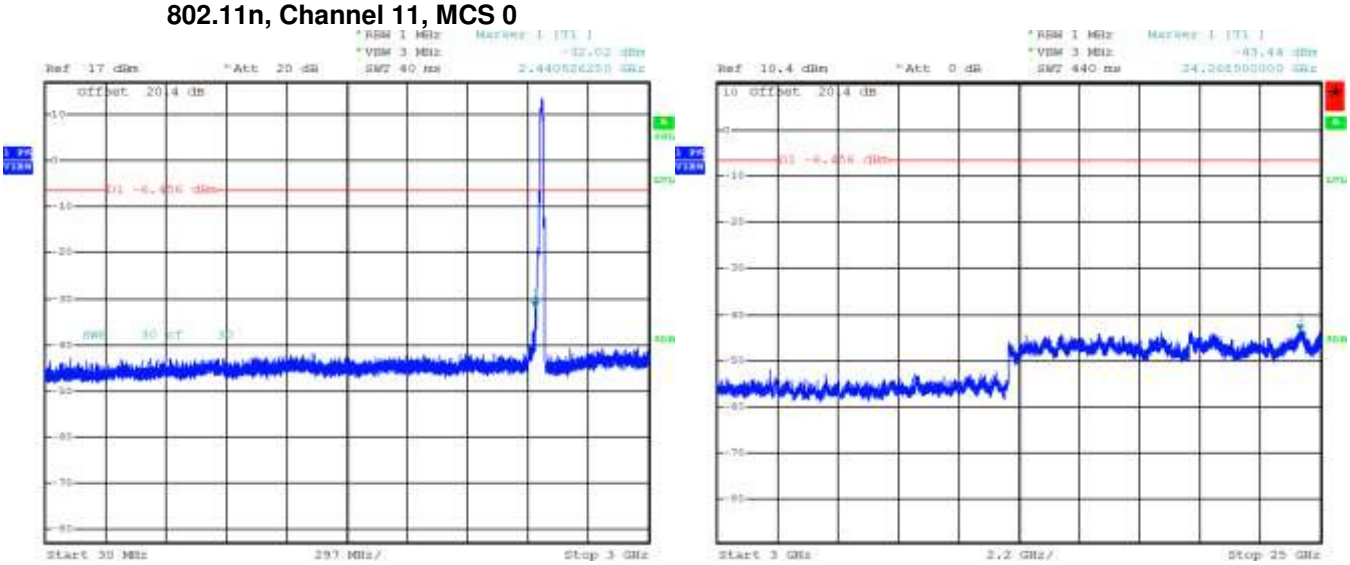
802.11b/g/n RF Conducted Emission Test Results cont'd

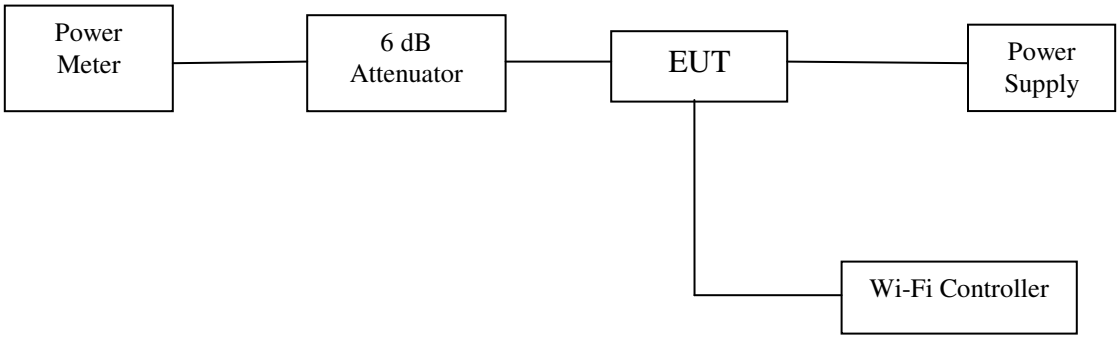
Figure 6-33: Spurious Conducted RF Emissions
802.11n, Channel 11, MCS 0

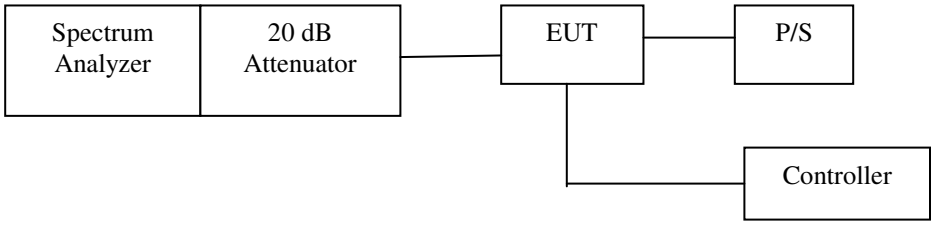


APPENDIX 7 – 802.11a/n CONDUCTED EMISSIONS TEST DATA/PLOTS

802.11a/n RF Conducted Emission Test Results

Test Setup Diagram





A reference offset of 8.9 dB was applied to the spectrum analyzer and 7.4 dB to the Power Meter reference level for the attenuators and coaxial cable loss in the test circuit.

Date of test: May 8 – June 10, 2014
The measurements were performed by Chuan Pao Tran.

The environmental test conditions were: Temperature: 25.8 – 26.3 ºC
Relative Humidity: 28.2 – 31.2 %

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802.11a RF Conducted Emission Test Results cont'd

Following tests were performed on the model RGY181LW.

6 dB Bandwidth

The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(a) (2) and RSS-210. Channels 36, 44, 48, 52, 60, 64, 100, 140, 149, 157, 161 and 165 were measured at 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11a mode.

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
36	6 Mbps	≥ 500	16.38
	24 Mbps	≥ 500	**16.51**
	54 Mbps	≥ 500	16.44
48	6 Mbps	≥ 500	16.41
	24 Mbps	≥ 500	16.47
	54 Mbps	≥ 500	16.44
64	6 Mbps	≥ 500	16.38
	24 Mbps	≥ 500	**16.51**
	54 Mbps	≥ 500	16.44
100	6 Mbps	≥ 500	16.41
	24 Mbps	≥ 500	16.48
	54 Mbps	≥ 500	16.44
140	6 Mbps	≥ 500	16.41
	24 Mbps	≥ 500	**16.51**
	54 Mbps	≥ 500	16.44
165	6 Mbps	≥ 500	16.41
	24 Mbps	≥ 500	16.47
	54 Mbps	≥ 500	16.47

See figures 7-1 to 7-6 for the plots of the 6 dB bandwidth measurements for Channel 36, 48, 64, 100, 140, and 165 at 6 Mbps each for 802.11a mode

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802.11n RF Conducted Emission Test Results

6 dB Bandwidth

The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(a) (2) and RSS-210. Channels 36, 64 and 165 were measured at MCS 0, MCS 4 an MCS 7 each for 802.11n mode.

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
36	MCS0	≥ 500	**16.51**
	MCS4	≥ 500	16.44
	MCS7	≥ 500	16.44
64	MCS0	≥ 500	16.44
	MCS4	≥ 500	16.44
	MCS7	≥ 500	16.44
165	MCS0	≥ 500	16.44
	MCS4	≥ 500	16.44
	MCS7	≥ 500	16.44

See figures 7-7 to 7-9 for the plots of the 6 dB bandwidth measurements for Channel 36, 100 and 165 at MCS 0 each for 802.11n mode.

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802.11a RF Conducted Emission Test Results cont'd

Figure 7-1: 6 dB Bandwidth
802.11a, Channel 36, 6 Mbps

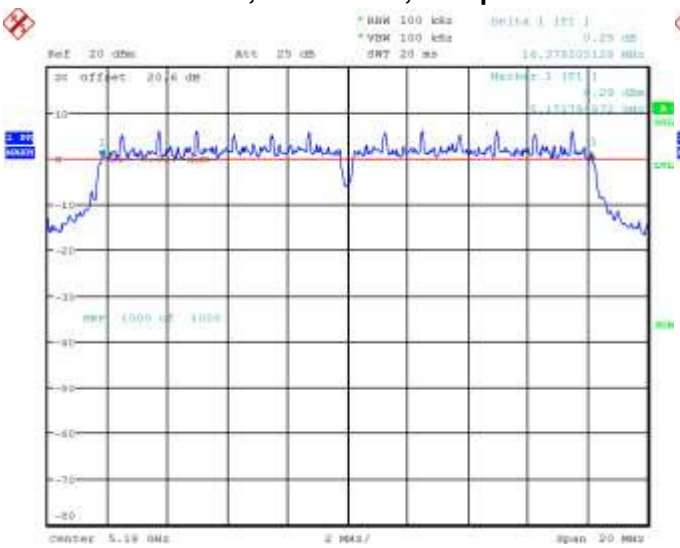


Figure 7-2: 6 dB Bandwidth
802.11a, Channel 48, 6 Mbps

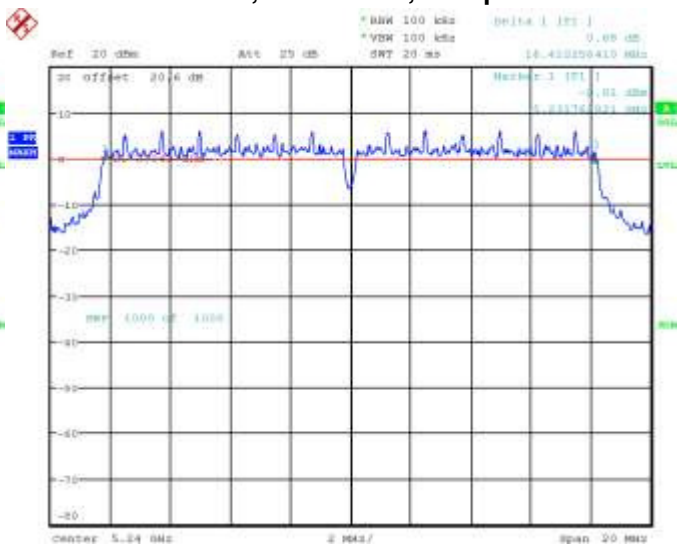


Figure 7-3: 6 dB Bandwidth
802.11a, Channel 64, 6 Mbps

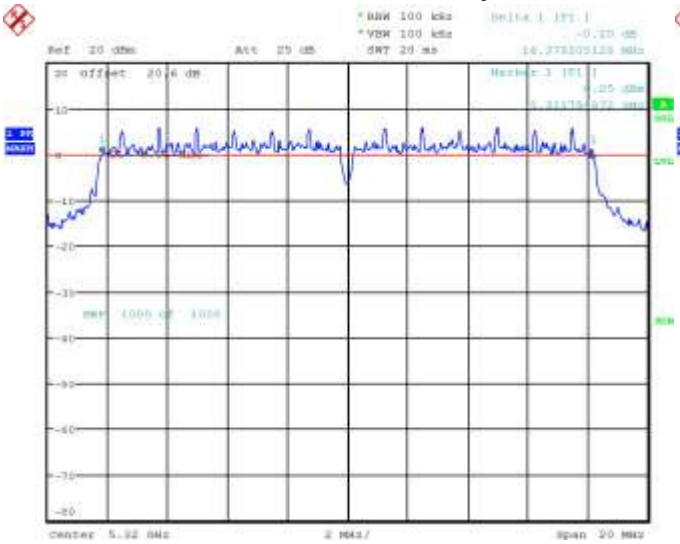
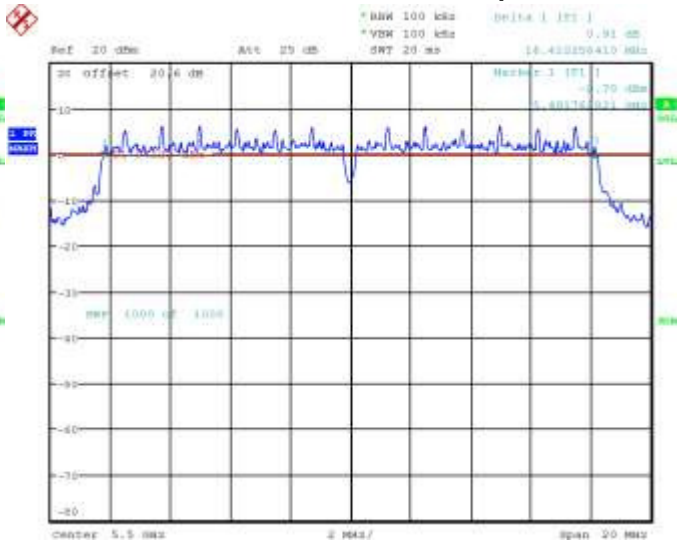


Figure 7-4: 6 dB Bandwidth
802.11a, Channel 100, 6 Mbps



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802.11a RF Conducted Emission Test Results cont'd

Figure 7-5: 6 dB Bandwidth
802.11a, Channel 140, 6 Mbps

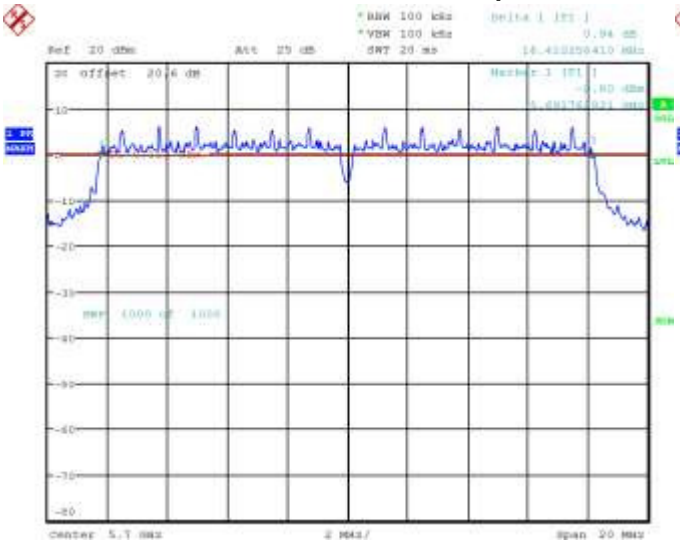
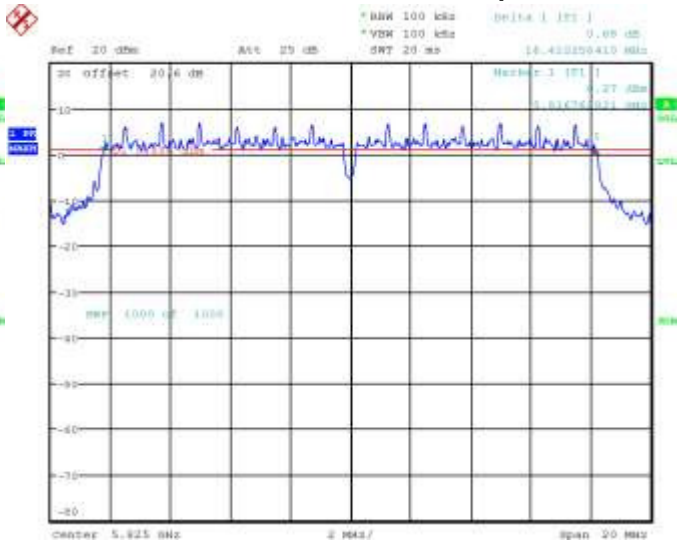


Figure 7-6: 6 dB Bandwidth
802.11a, Channel 165, 6 Mbps



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802.11a RF Conducted Emission Test Results cont'd

Figure 7-7: 6 dB Bandwidth
802.11n, Channel 36, MCS 0

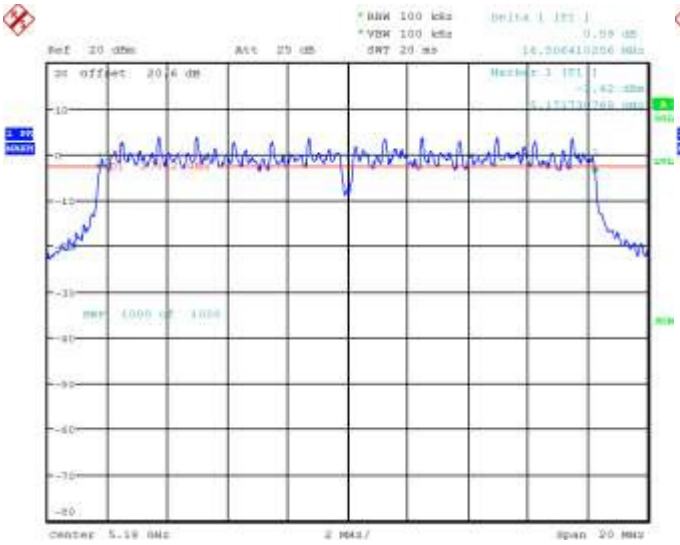


Figure 7-8: 6 dB Bandwidth
802.11n, Channel 100, MCS 0

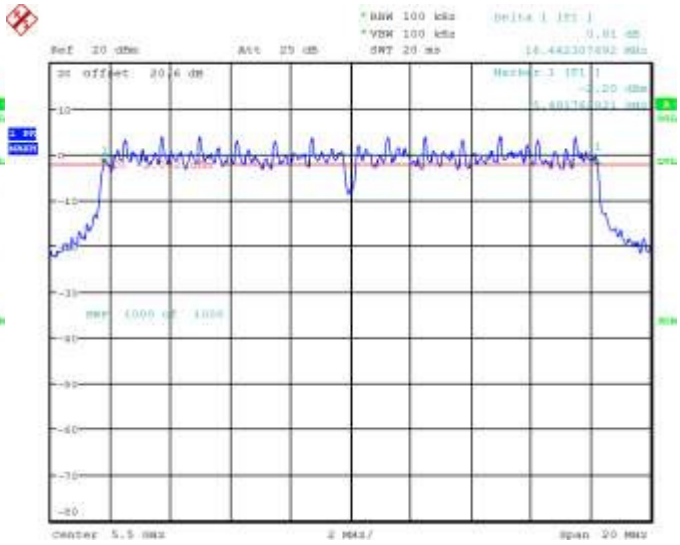
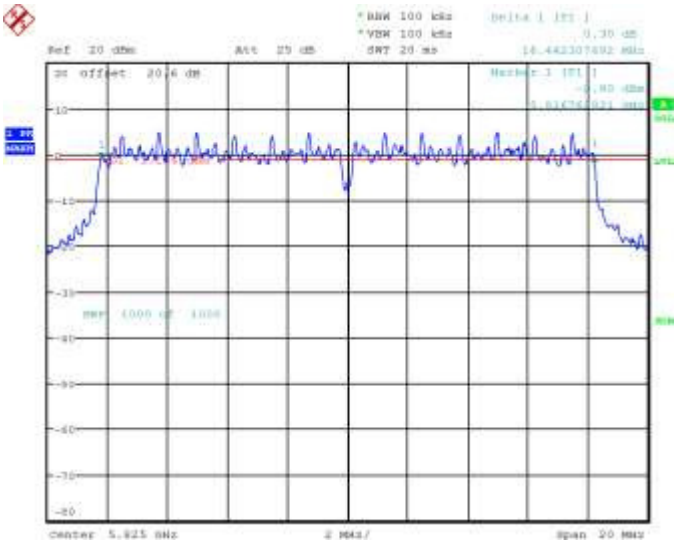


Figure 7-9: 6 dB Bandwidth
802.11n, Channel 165, MCS 0



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802.11a RF Conducted Emission Test Results cont'd

Maximum Conducted Output Power

The EUT met the requirements of the maximum conducted output power of class 2 as per 47 CFR 15.407 and RSS-210. Channels 36, 48, 64, 100, 140 and 165 were measured for 802.11a mode using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 8.9 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Data Rate	Power Limit (mW)	Measured Level (dBm)	Measured Level (mW)
36	6 Mbps	< 250.0	15.98	39.63
	24 Mbps	< 250.0	15.53	35.73
	54 Mbps	< 250.0	15.13	32.58
48	6 Mbps	< 250.0	15.87	38.64
	24 Mbps	< 250.0	15.47	35.24
	54 Mbps	< 250.0	14.96	31.33
64	6 Mbps	< 250.0	17.90	61.66
	24 Mbps	< 250.0	16.83	48.19
	54 Mbps	< 250.0	14.99	31.55
100	6 Mbps	< 250.0	16.49	44.57
	24 Mbps	< 250.0	16.03	40.09
	54 Mbps	< 250.0	15.51	35.56
140	6 Mbps	< 250.0	13.64	23.12
	24 Mbps	< 250.0	13.04	20.14
	54 Mbps	< 250.0	12.56	18.03
165	6 Mbps	< 1000	**18.18**	**65.77**
	24 Mbps	< 1000	17.29	53.58
	54 Mbps	< 1000	15.59	36.22

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802.11n RF Conducted Emission Test Results

Maximum Conducted Output Power

The EUT met the requirements of the maximum conducted output power of class 2 as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 100, 140 and 165 were measured for 802.11n mode using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 8.9 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (mW)
36	5180	< 250.0	15.99	39.72
	24 Mbps	< 250.0	15.50	35.48
	54 Mbps	< 250.0	14.04	25.35
64	5320	< 250.0	**17.23**	**52.84**
	24 Mbps	< 250.0	16.26	42.27
	54 Mbps	< 250.0	13.70	23.44
100	5500	< 250.0	17.01	50.23
	24 Mbps	< 250.0	16.42	43.85
	54 Mbps	< 250.0	14.35	27.23
140	5700	< 250.0	13.12	20.51
	24 Mbps	< 250.0	12.48	17.70
	54 Mbps	< 250.0	12.13	16.33
165	5825	< 1000	14.29	26.85
	24 Mbps	< 1000	13.98	25.00
	54 Mbps	< 1000	13.39	21.83

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802.11a RF Conducted Emission Test Results cont'd

Band Edge Compliance

The EUT met the requirements of the band edge compliance as per 47 CFR 15.407 and RSS-210. Channels 36, 48, 52, 64, 100, 149, 161 and 165 were measured at 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11a mode.

Channel	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
36	6 Mbps	< -20	-44.75	-24.75
	24 Mbps	< -20	-45.21	-25.21
	54 Mbps	< -20	-45.40	-25.40
64	6 Mbps	< -20	-43.75	-23.75
	24 Mbps	< -20	-44.61	-24.61
	54 Mbps	< -20	-45.37	-25.37
100	6 Mbps	< -20	-46.44	-26.44
	24 Mbps	< -20	-45.60	-25.60
	54 Mbps	< -20	-46.47	-26.47
140	6 Mbps	< -20	-43.09	-23.09
	24 Mbps	< -20	-43.06	-23.06
	54 Mbps	< -20	-43.87	-23.87
149	6 Mbps	< -20	-38.50	-18.50
	24 Mbps	< -20	-38.58	-18.58
	54 Mbps	< -20	-40.23	-20.23
165	6 Mbps	< -20	**-31.49**	**-11.49**
	24 Mbps	< -20	-31.97	-11.97
	54 Mbps	< -20	-38.82	-18.82

See figures 7-10 to 7-15 for the plots of the band edge compliance measurements for Channel 36, 64, 100, 149 and 165 at 6 Mbps each for 802.11a mode.

See figures 7-16 to 7-23 for the plots of the band edge compliance measurements for Channel 36, 48, 52, 64, 100, 149, 161 and 165 at 6 Mbps each for 802.11a mode.

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802.11n RF Conducted Emission Test Results

Band Edge Compliance

The EUT met the requirements of the band edge compliance as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 100, 140, 149 and 165 were measured at MCS 0, MCS 4 and MCS 7 each for 802.11n mode.

Channel	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
36	MCS0	< -20	-44.80	-24.80
	MCS4	< -20	-45.36	-25.36
	MCS7	< -20	-45.02	-25.02
64	MCS0	< -20	-44.73	-24.73
	MCS4	< -20	-45.68	-25.68
	MCS7	< -20	-44.27	-24.27
100	MCS0	< -20	-45.70	-25.70
	MCS4	< -20	-44.30	-24.30
	MCS7	< -20	-44.86	-24.86
140	MCS0	< -20	-43.07	-23.07
	MCS4	< -20	-42.39	-22.39
	MCS7	< -20	-42.70	-22.70
149	MCS0	< -20	-36.96	-16.96
	MCS4	< -20	**-36.50**	**-16.50**
	MCS7	< -20	-39.14	-19.14
165	MCS0	< -20	-36.94	-16.94
	MCS4	< -20	-38.53	-18.53
	MCS7	< -20	-39.48	-19.48

See figures 7-16 to 7-21 for the plots of the band edge compliance measurements for Channel 36, 64 and 165 at MCS 0 each for 802.11n mode.

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802.11a RF Conducted Emission Test Results cont'd

Figure 7-10: Band Edge Compliance
802.11a, Channel 36, 6 Mbps

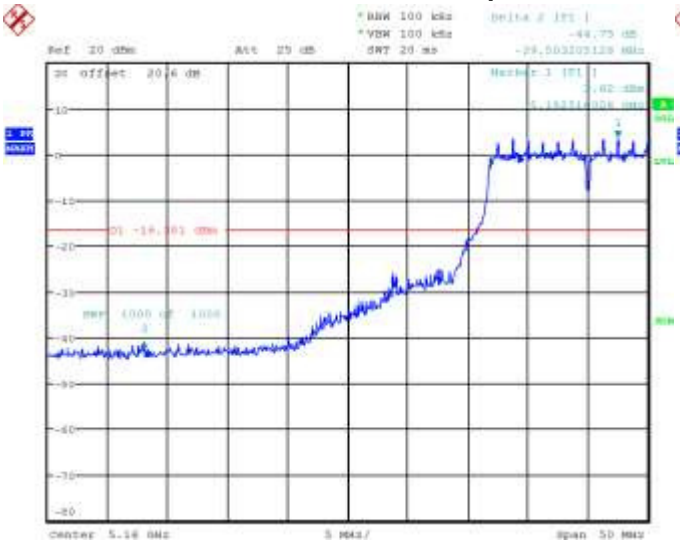


Figure 7-11: Band Edge Compliance
802.11a, Channel 64, 6 Mbps

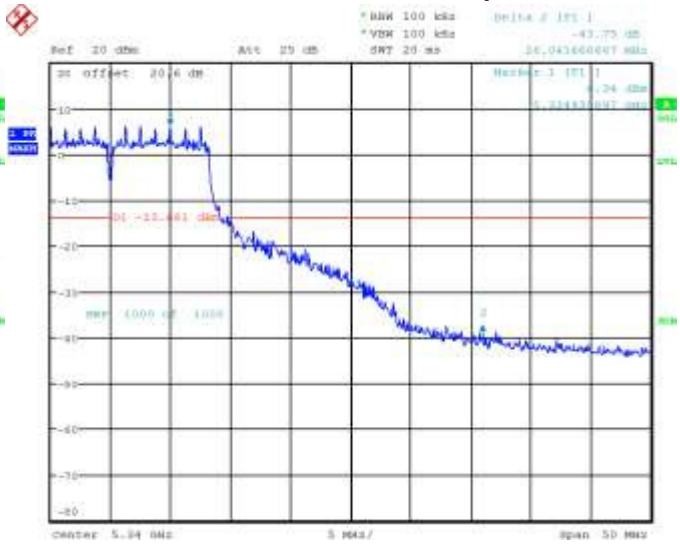


Figure 7-12: Band Edge Compliance
802.11a, Channel 100, 6 Mbps

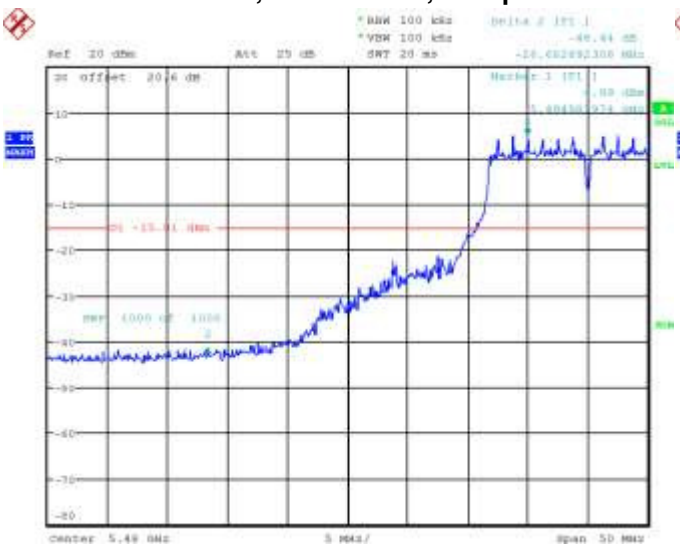
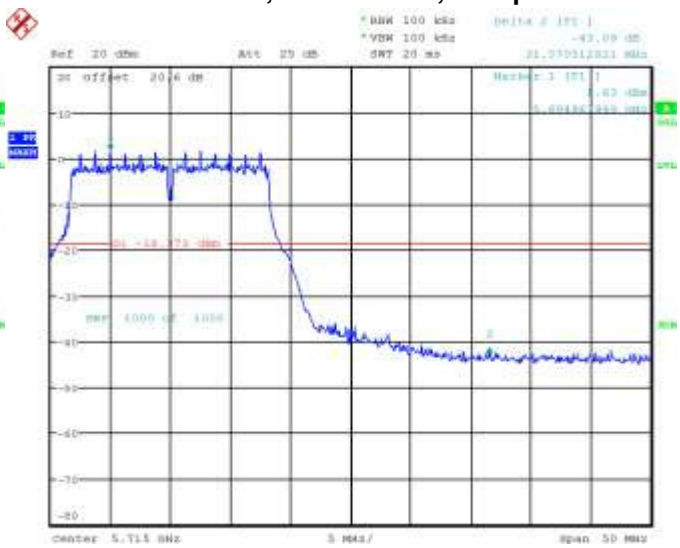


Figure 7-13: Band Edge Compliance
802.11a, Channel 140, 6 Mbps



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802.11a RF Conducted Emission Test Results cont'd

Figure 7-14: Band Edge Compliance
802.11a, Channel 149, 6 Mbps

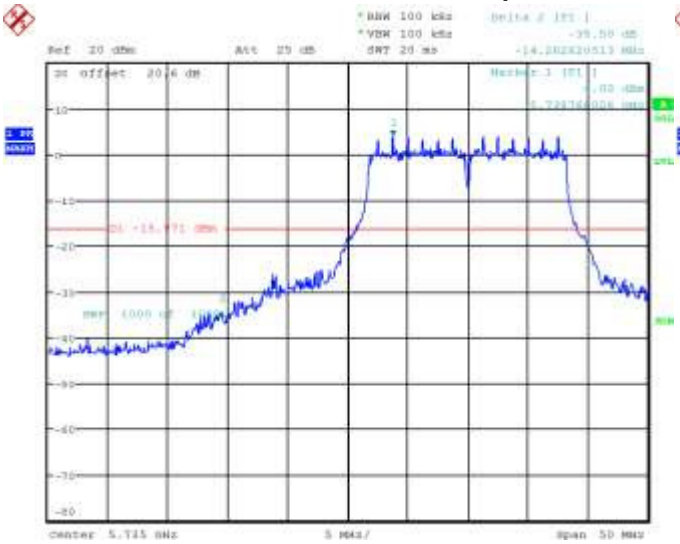
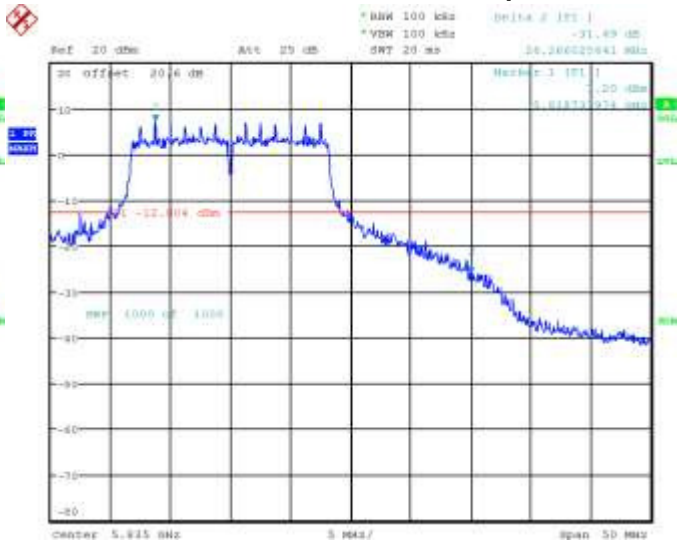


Figure 7-15: Band Edge Compliance
802.11a, Channel 165, 6 Mbps



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802.11n RF Conducted Emission Test Results

Figure 7-16: Band Edge Compliance
802.11n, Channel 36, 6 Mbps

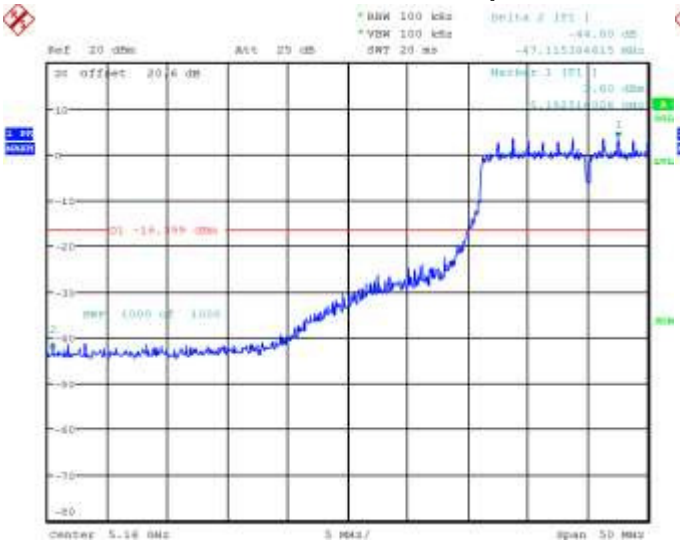


Figure 7-17: Band Edge Compliance
802.11n, Channel 64, 6 Mbps

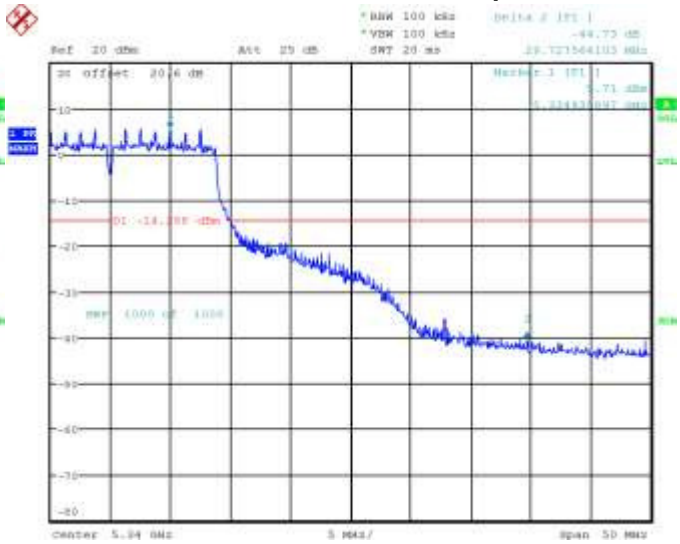


Figure 7-18: Band Edge Compliance
802.11n, Channel 100, 6 Mbps

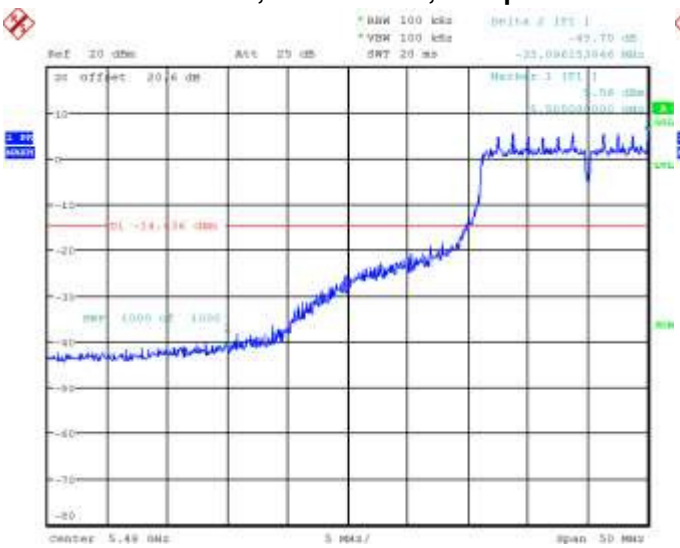
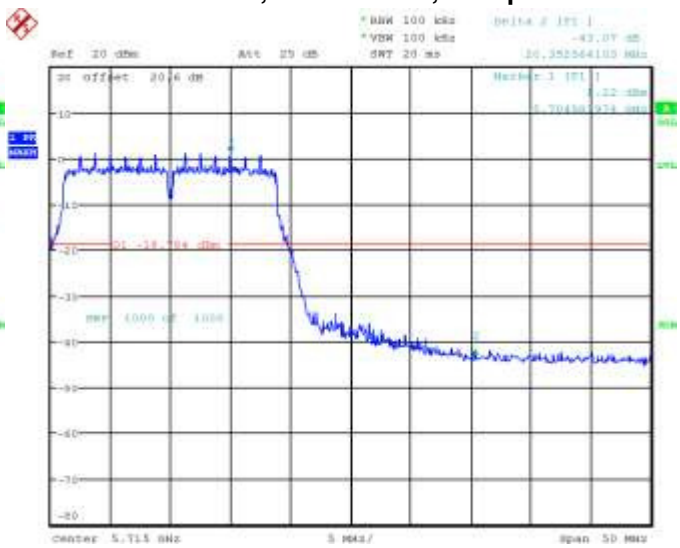


Figure 7-19: Band Edge Compliance
802.11n, Channel 140, 6 Mbps



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802.11n RF Conducted Emission Test Results cont'd

Figure 7-20: Band Edge Compliance
802.11n, Channel 149, 6 Mbps

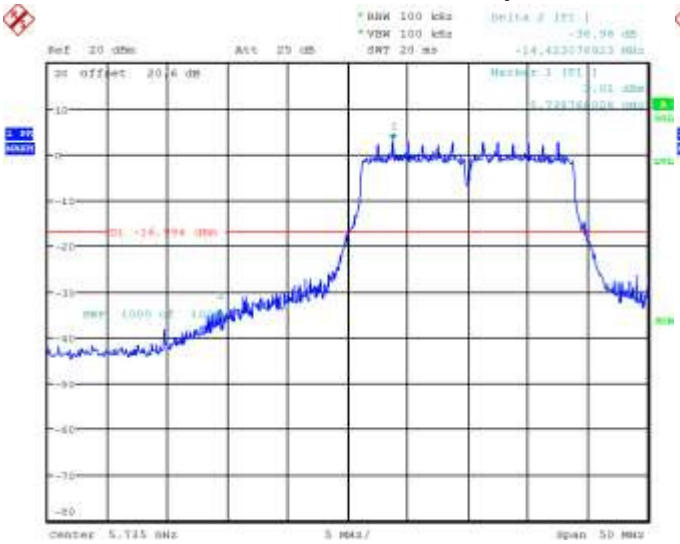
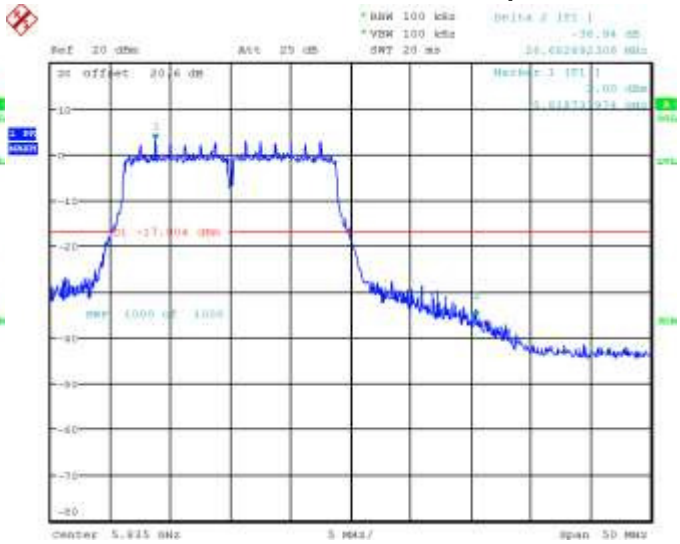


Figure 7-21: Band Edge Compliance
802.11n, Channel 165, 6 Mbps



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802.11a RF Conducted Emission Test Results cont'd

Peak Power Spectral Density

The EUT met the requirements of the peak power spectral density as per 47 CFR 15.407 and RSS-210. Channels 36, 48, 64, 100, 140 and 165 were measured at 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11a mode.

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
36	6 Mbps	< 11.00	2.34	-8.66
	24 Mbps	< 11.00	2.03	-8.97
	54 Mbps	< 11.00	1.75	-9.25
48	6 Mbps	< 11.00	2.59	-8.41
	24 Mbps	< 11.00	2.28	-8.72
	54 Mbps	< 11.00	1.89	-9.11
64	6 Mbps	< 11.00	5.10	-5.90
	24 Mbps	< 11.00	4.47	-6.53
	54 Mbps	< 11.00	2.38	-8.62
100	6 Mbps	< 11.00	3.75	-7.25
	24 Mbps	< 11.00	3.31	-7.69
	54 Mbps	< 11.00	3.07	-7.93
140	6 Mbps	< 11.00	0.70	-10.30
	24 Mbps	< 11.00	0.37	-10.63
	54 Mbps	< 11.00	0.05	-10.95
165	6 Mbps	< 33.00	-8.21	-41.21
	24 Mbps	< 33.00	-8.30	-41.30
	54 Mbps	< 33.00	-10.13	-43.13

See figures 7-22 to 7-27 for the plots of the peak power spectral density for Channel 36, 48, 64, 100, 140, and 165 at 6 Mbps each for 802.11a mode.

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802.11n RF Conducted Emission Test Results

Peak Power Spectral Density

The EUT met the requirements of the peak power spectral density as per 47 CFR 15.407 and RSS-210. Channels 36, 64 and 165 were measured at MCS 0, MCS 4 and MCS 7 each for 802.11n mode.

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
36	6 Mbps	< 11.00	2.01	-8.99
	24 Mbps	< 11.00	1.64	-9.36
	54 Mbps	< 11.00	0.34	-10.66
64	6 Mbps	< 11.00	4.02	-6.98
	24 Mbps	< 11.00	3.47	-7.53
	54 Mbps	< 11.00	1.68	-9.32
165	6 Mbps	< 33.00	-9.84	-42.84
	24 Mbps	< 33.00	-9.74	-42.74
	54 Mbps	< 33.00	-9.58	-42.58

See figures 7-28 to 7-30 for the plots of the peak power spectral density for Channel 36, 64 and 165 at MCS 0 each for 802.11n mode.

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802.11a RF Conducted Emission Test Results cont'd

Figure 7-22: Peak Power Spectral Density 802.11a, Channel 36, 6 Mbps

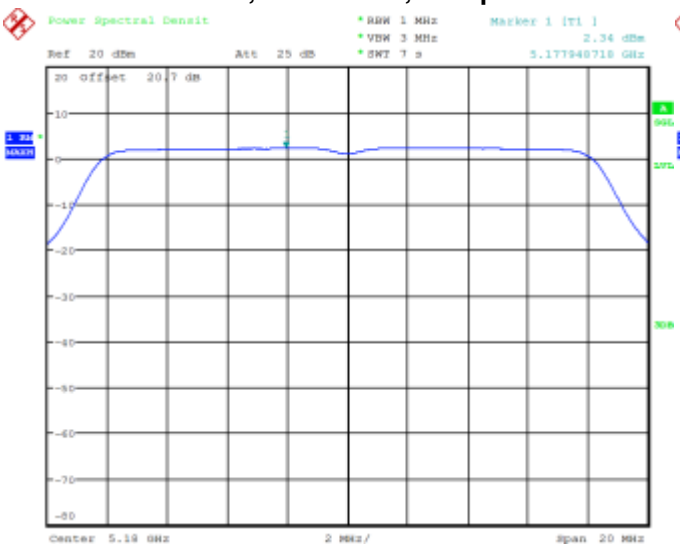


Figure 7-23: Peak Power Spectral Density 802.11a, Channel 48, 6 Mbps

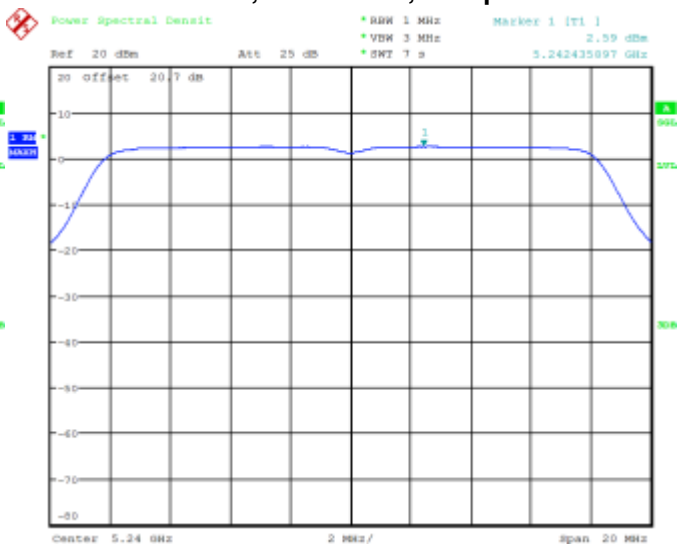


Figure 7-24: Peak Power Spectral Density 802.11a, Channel 64, 6 Mbps

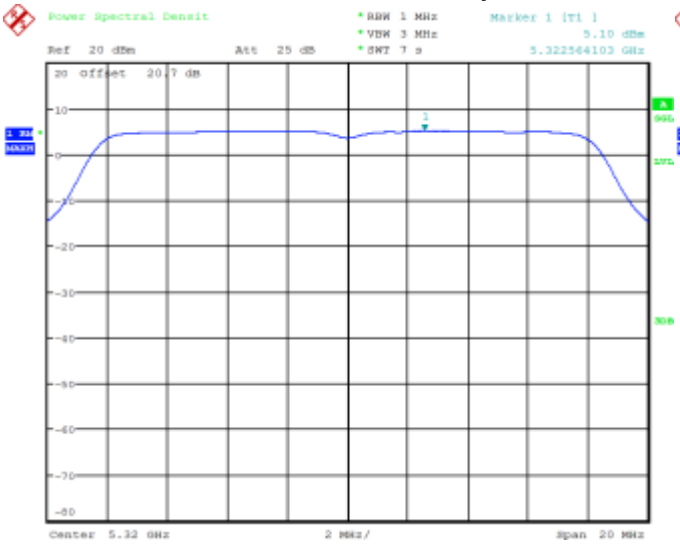
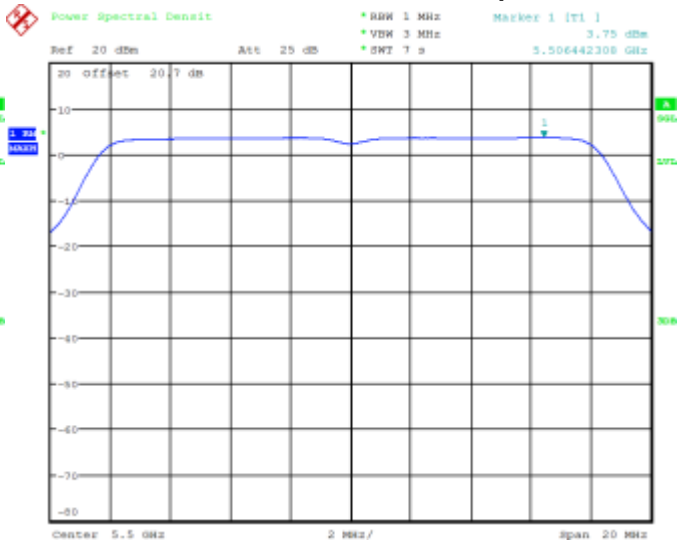


Figure 7-25: Peak Power Spectral Density 802.11a, Channel 100, 6 Mbps



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802.11a RF Conducted Emission Test Results cont'd

Figure 7-26: Peak Power Spectral Density
802.11a, Channel 140, 6 Mbps

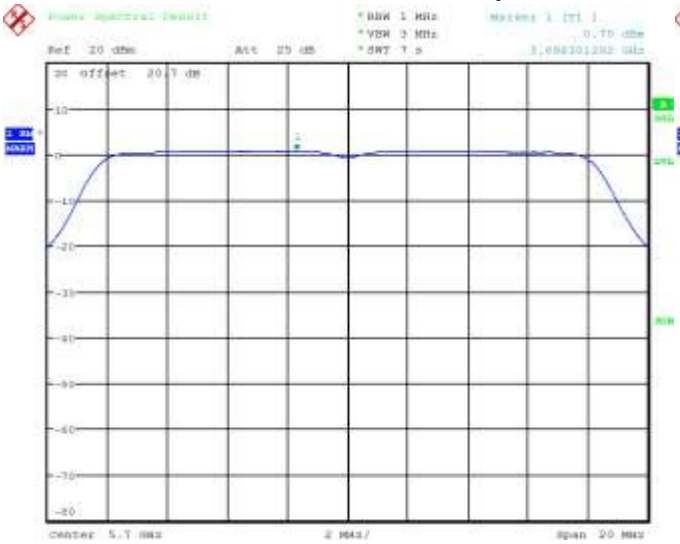
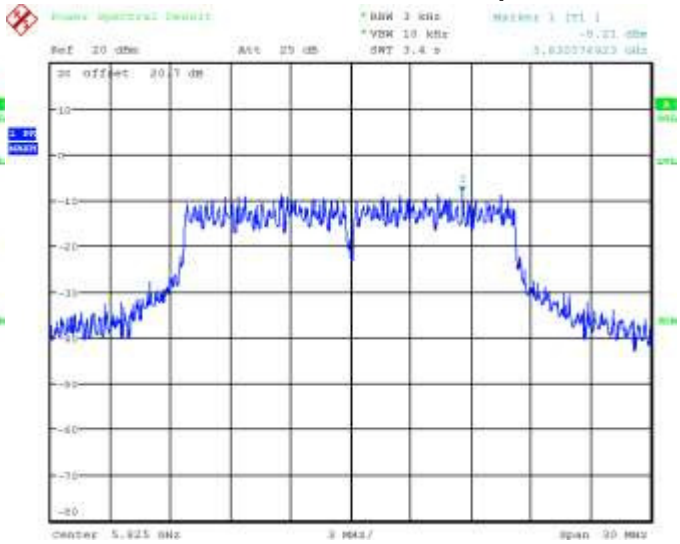


Figure 7-27: Peak Power Spectral Density
802.11a, Channel 165, 6 Mbps



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802.11n RF Conducted Emission Test Results

Figure 7-28: Peak Power Spectral Density
802.11n, Channel 36, MCS 0

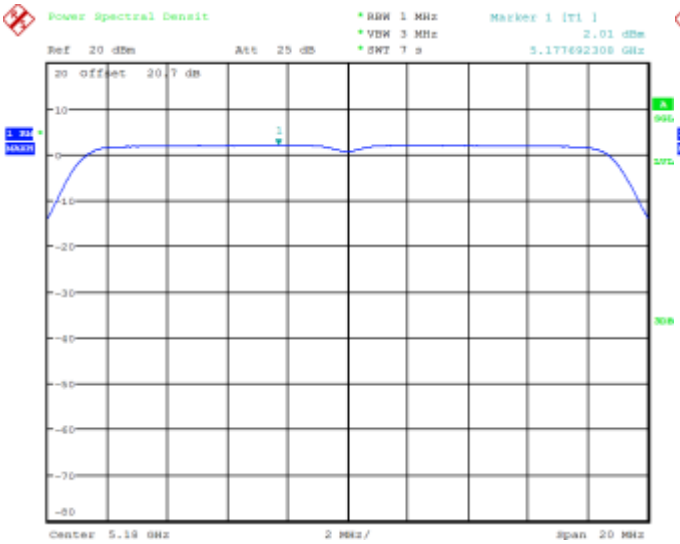


Figure 7-29: Peak Power Spectral Density
802.11n, Channel 64, MCS 0

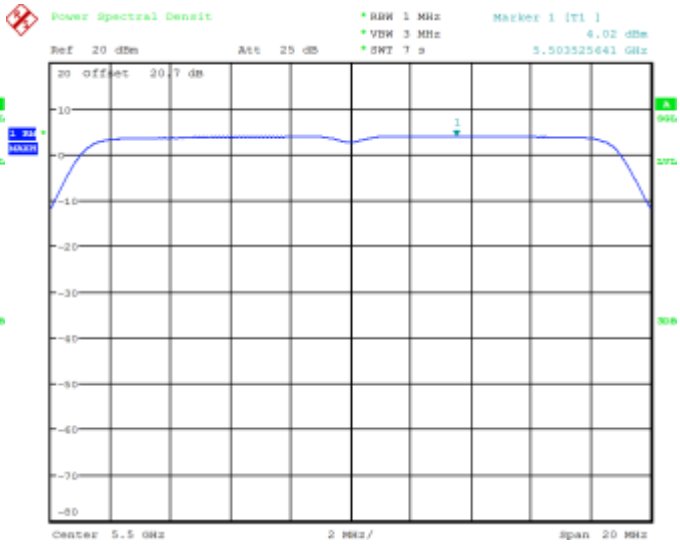
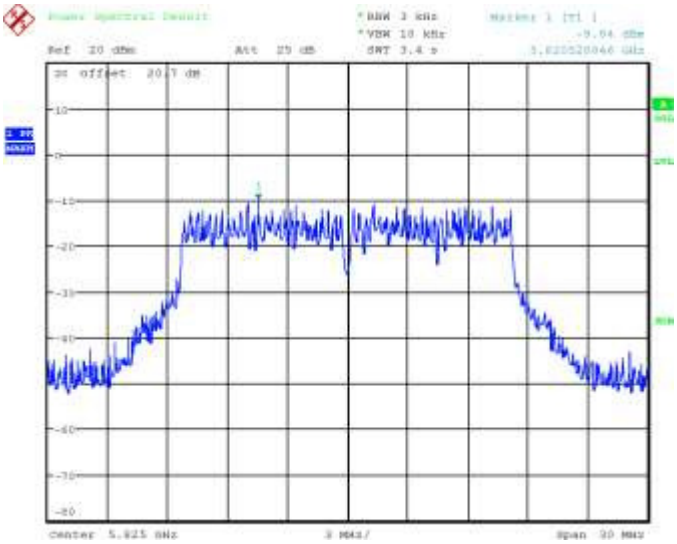


Figure 7-30: Peak Power Spectral Density
802.11n, Channel 165, MCS 0



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802.11a RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 100 and 140 were measured at 6 Mbps, 24Mbps and 54 Mbps each for 802.11a mode. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 29.0 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
36	6 Mbps	17.91	-46.57	-64.48	-20
	24 Mbps	16.81	-46.84	-63.65	-20
	54 Mbps	14.84	-48.06	-62.90	-20
64	6 Mbps	17.73	-51.01	-68.74	-20
	24 Mbps	16.75	-50.45	-67.20	-20
	54 Mbps	14.81	-51.67	-66.48	-20
100	6 Mbps	18.33	-52.11	-70.44	-20
	24 Mbps	17.42	-52.74	-70.16	-20
	54 Mbps	15.28	-51.94	-67.22	-20
140	6 Mbps	17.98	-52.40	-70.38	-20
	24 Mbps	16.93	-52.55	-69.48	-20
	54 Mbps	14.92	-52.13	-67.05	-20

See figures 7-31 to 7-34 for the plots of the spurious RF conducted emissions for Channel 36, 64, 100 and 140 at 6 Mbps each for 802.11a mode.

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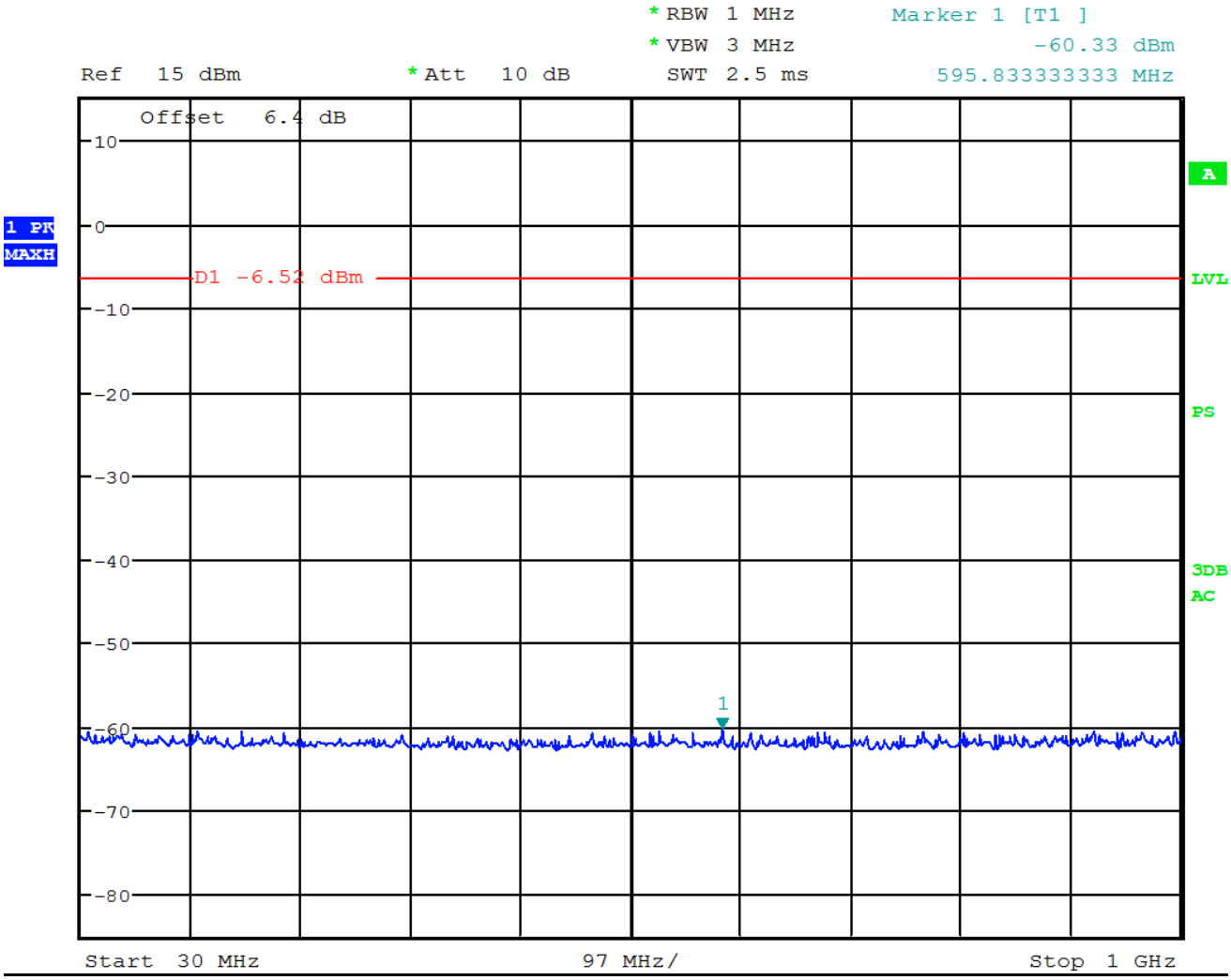
802.11a RF Conducted Emission Test Results cont'd

Figure 7-31a: Spurious RF Conducted Emissions, 802.11a Channel 36, 6 Mbps



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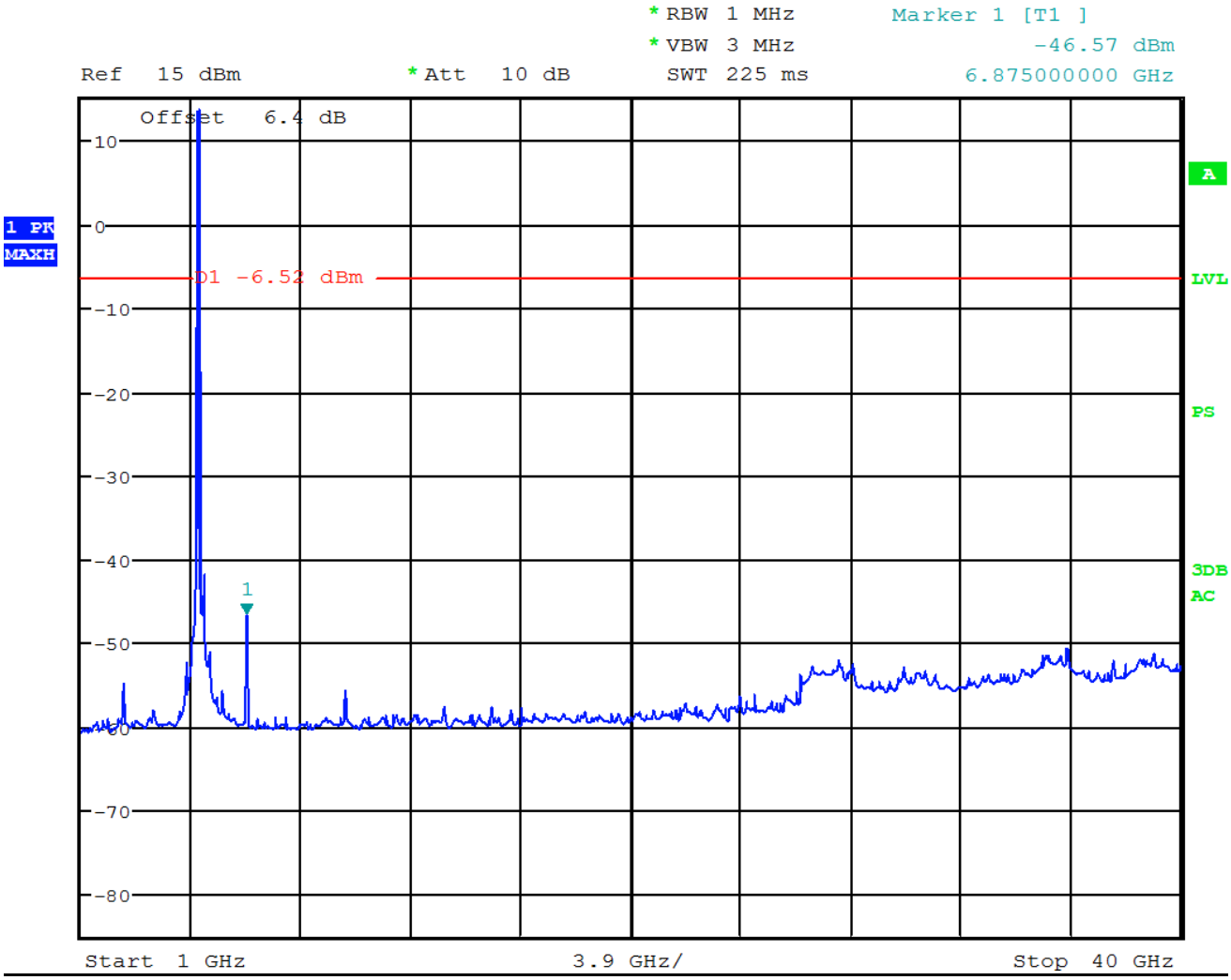
802.11a RF Conducted Emission Test Results cont'd

Figure 7-31b: Spurious RF Conducted Emissions, 802.11a Channel 36, 6 Mbps



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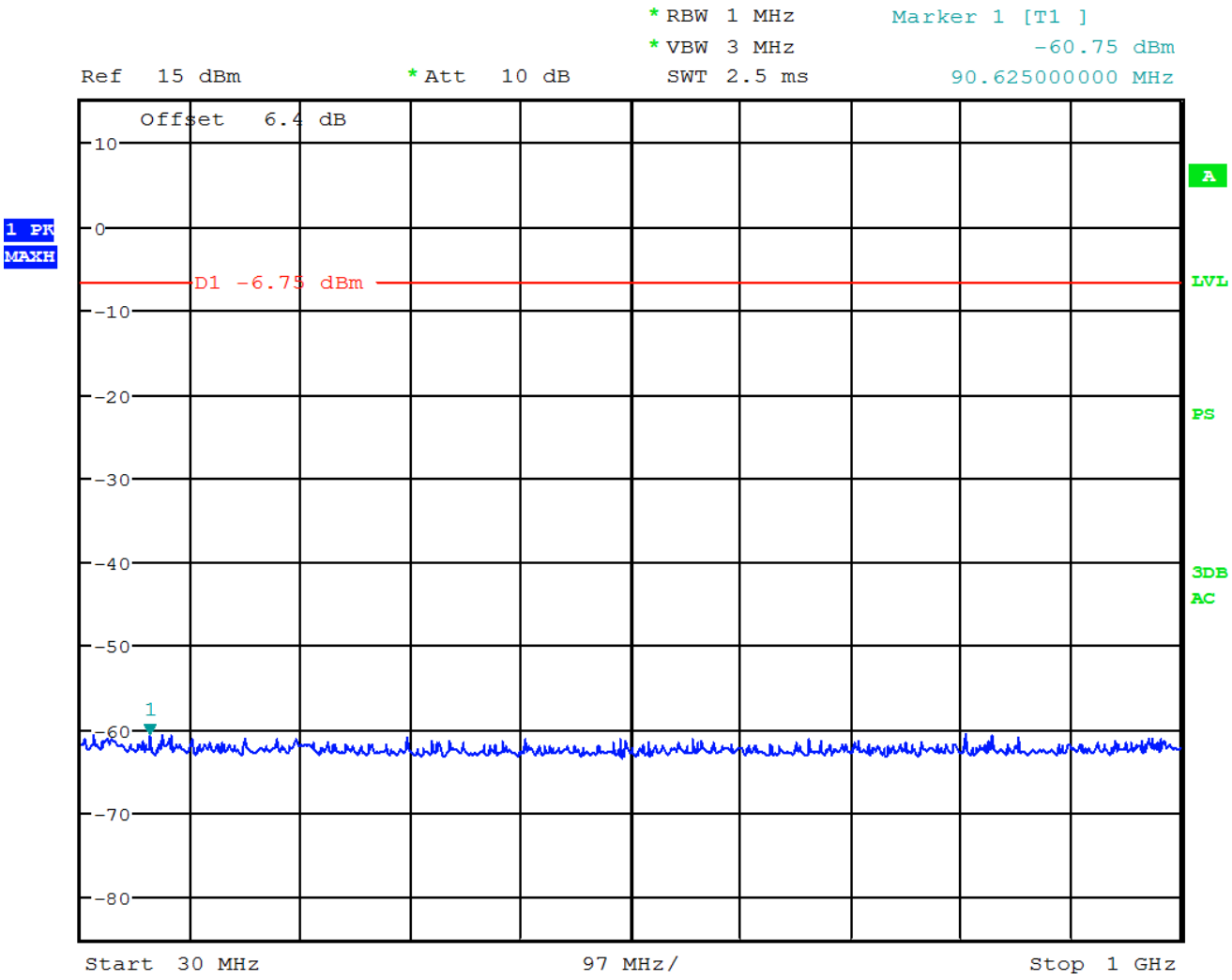
802.11a RF Conducted Emission Test Results cont'd

Figure 7-32a: Spurious RF Conducted Emissions, 802.11a Channel 64, 6 Mbps



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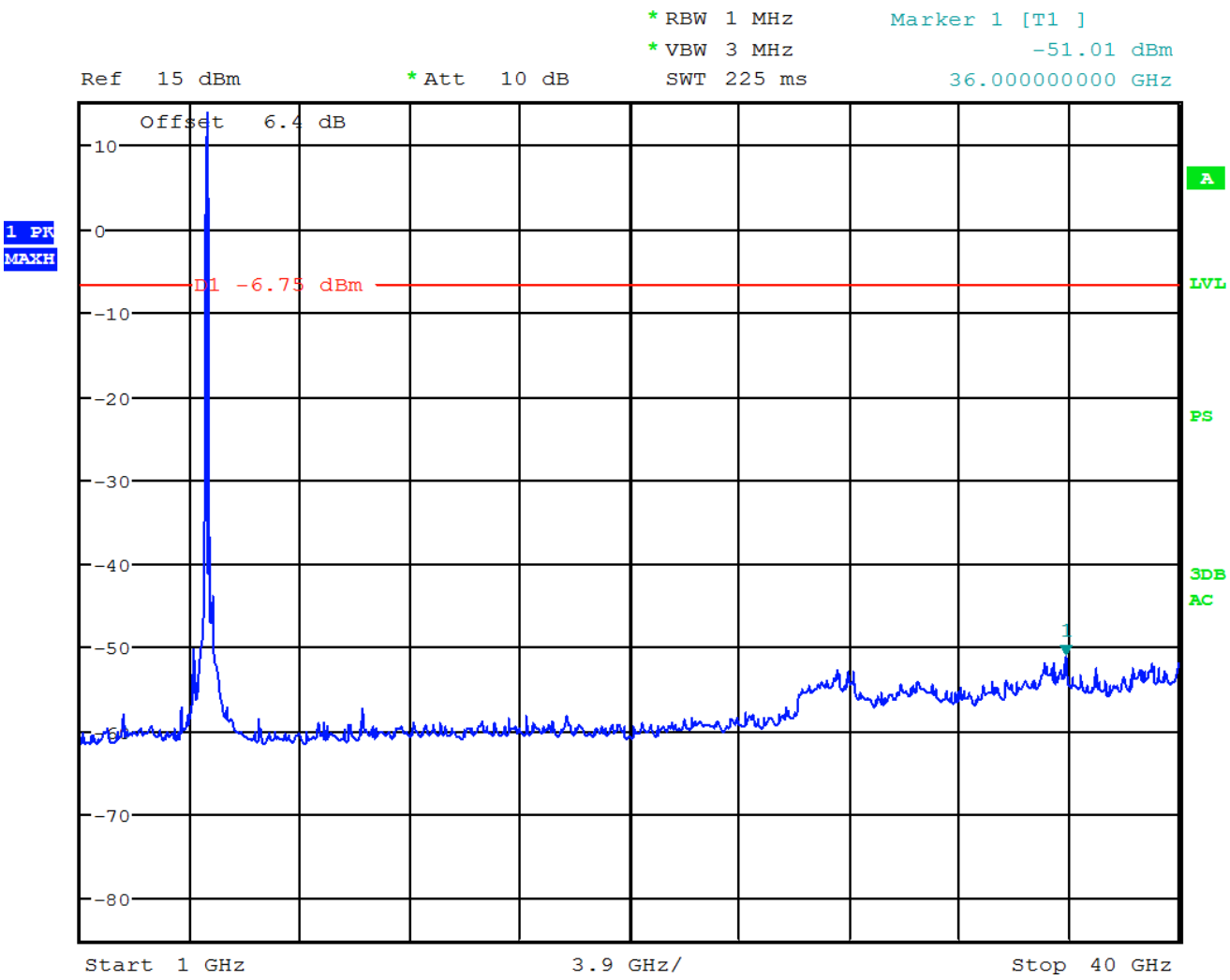
802.11a RF Conducted Emission Test Results cont'd

Figure 7-32b: Spurious RF Conducted Emissions, 802.11a Channel 64, 6 Mbps



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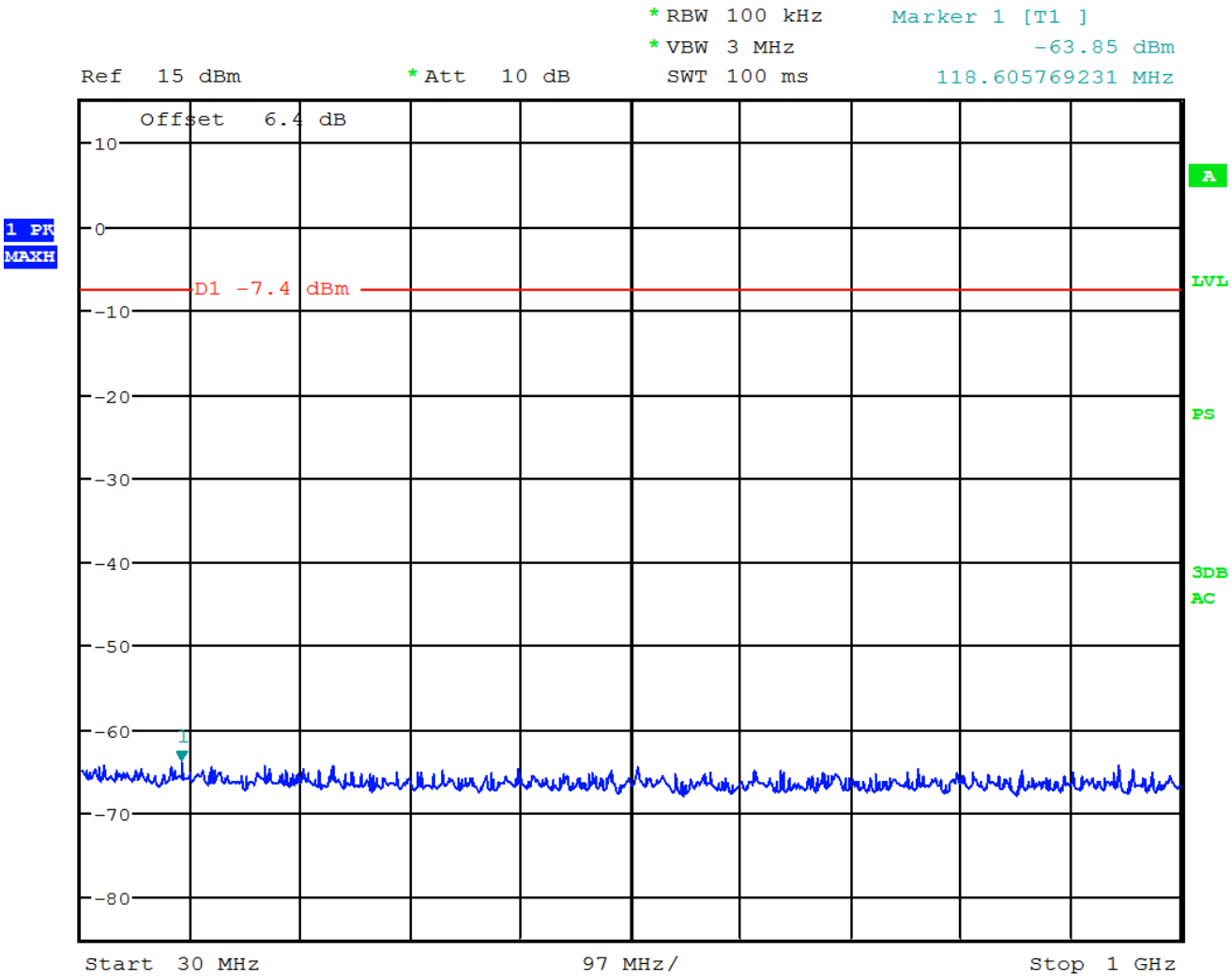
802.11a RF Conducted Emission Test Results cont'd

Figure 7-33a: Spurious RF Conducted Emissions, 802.11a Channel 100, 6 Mbps



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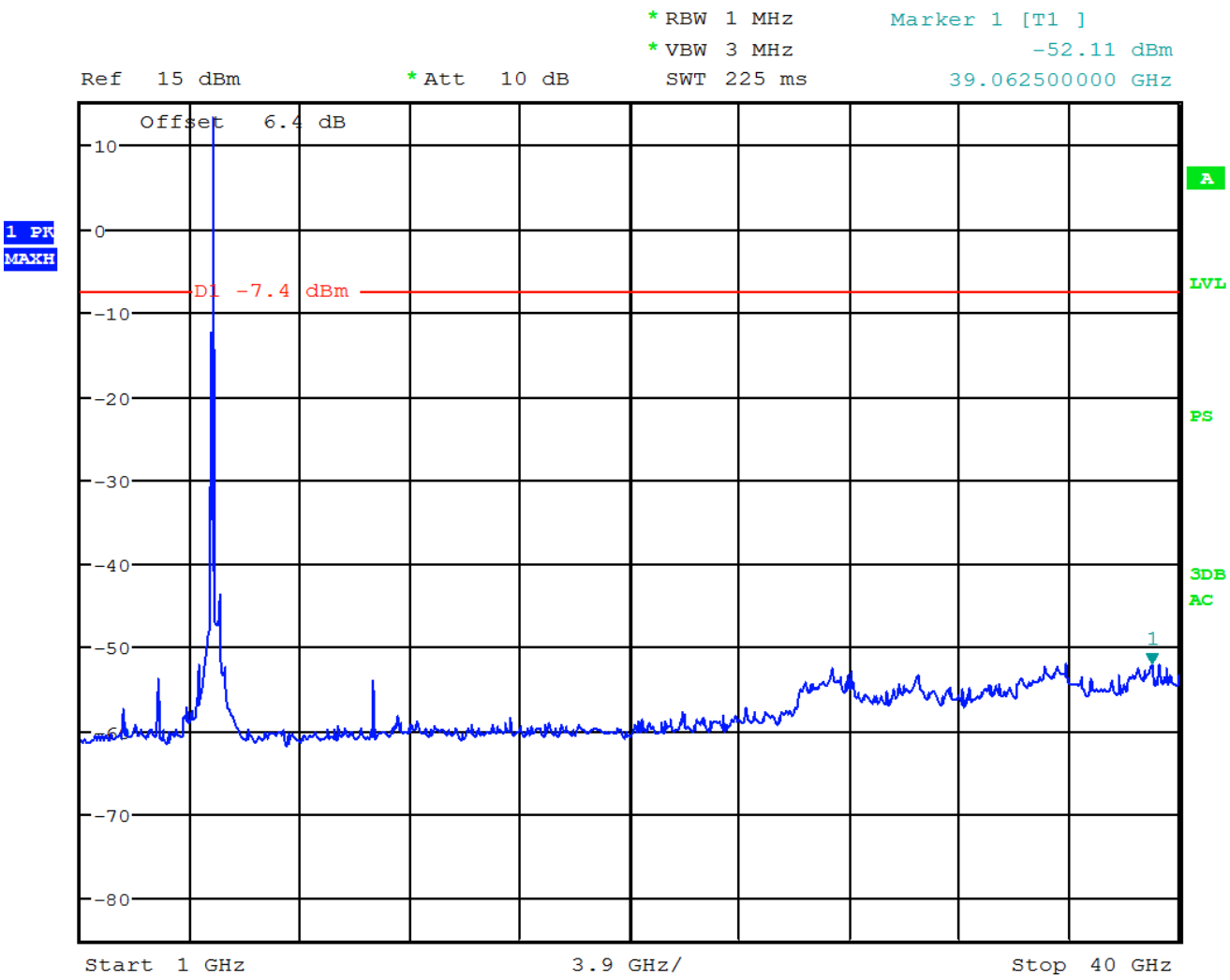
802.11a RF Conducted Emission Test Results cont'd

Figure 7-33b: Spurious RF Conducted Emissions, 802.11a Channel 100, 6 Mbps



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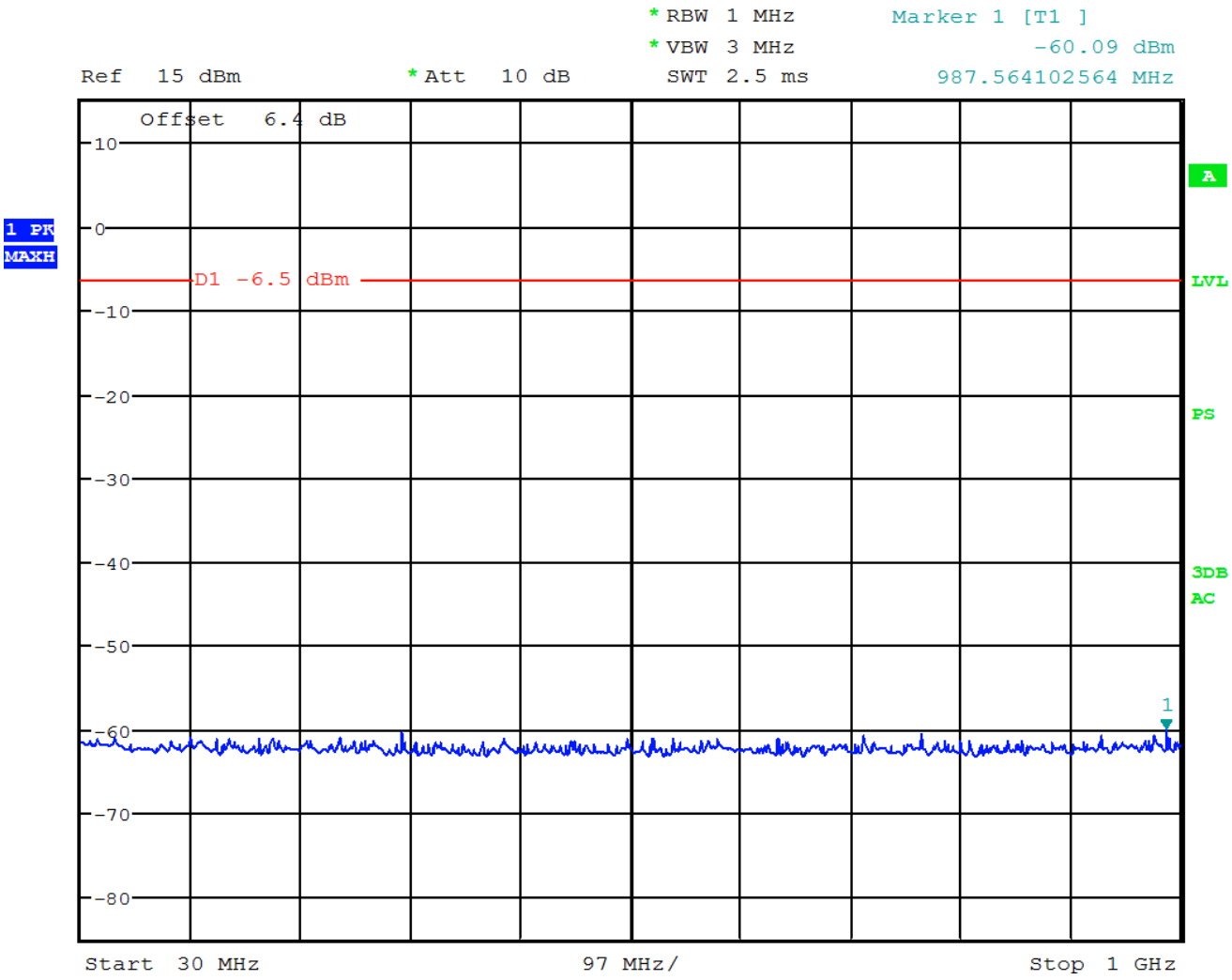
802.11a RF Conducted Emission Test Results cont'd

Figure 7-34a: Spurious RF Conducted Emissions, 802.11a Channel 140, 6 Mbps



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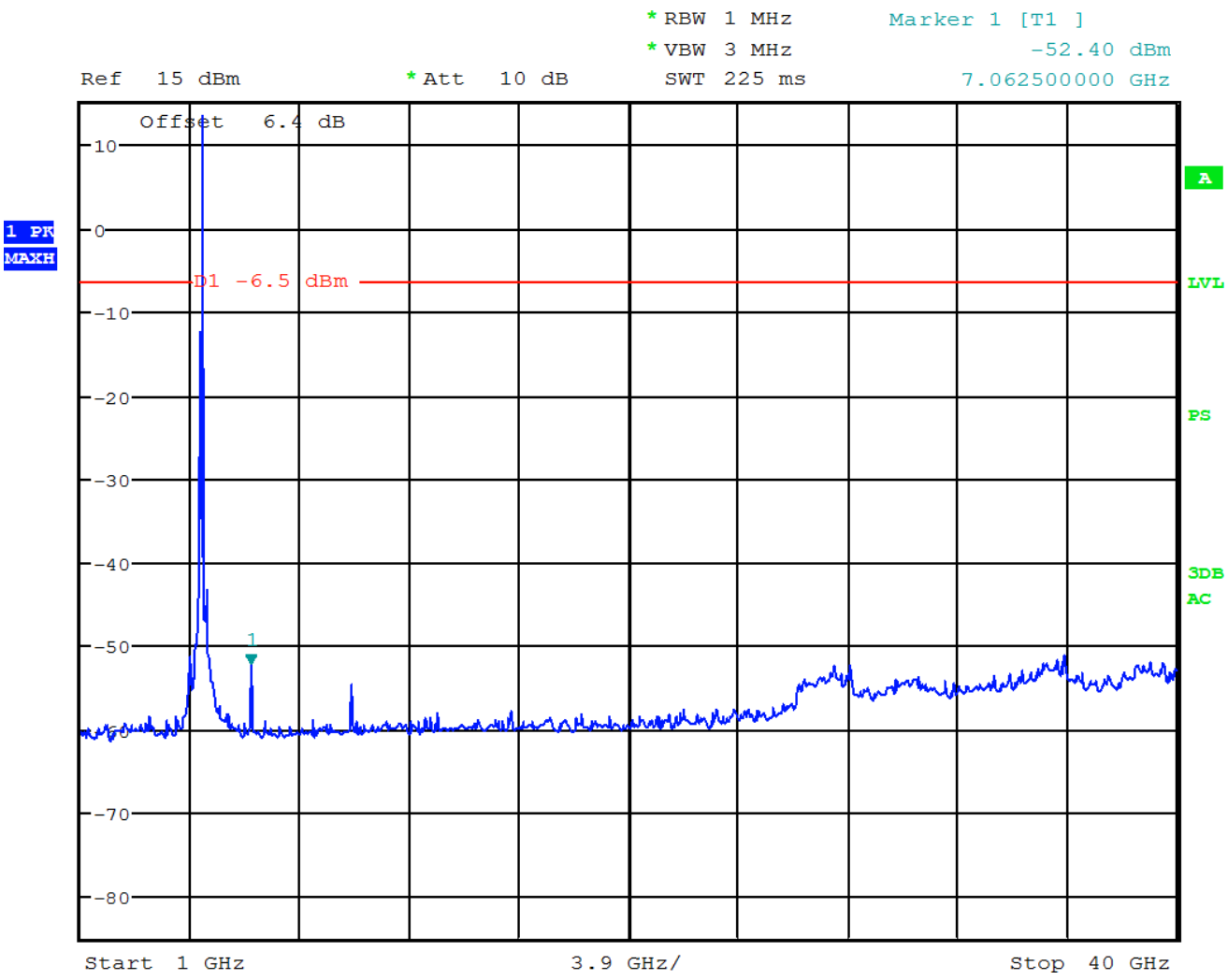
802.11a RF Conducted Emission Test Results cont'd

Figure 7-34b: Spurious RF Conducted Emissions, 802.11a Channel 140, 6 Mbps



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802.11n RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 100 and 140 were measured at MCS0 Mbps, MCS4 Mbps and MCS7 Mbps each for 802.11n mode. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 29.0 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
36	MCS0	17.83	-49.56	-67.39	-20
	MCS4	16.17	-49.75	-65.92	-20
	MCS7	13.71	-50.12	-63.83	-20
64	MCS0	17.58	-57.63	-75.21	-20
	MCS4	16.16	-58.42	-74.58	-20
	MCS7	13.78	-58.86	-72.64	-20
100	MCS0	18.25	-60.49	-78.74	-20
	MCS4	16.76	-60.56	-77.32	-20
	MCS7	14.29	-60.74	-75.03	-20
140	MCS0	17.98	-56.72	-74.70	-20
	MCS4	16.39	-57.12	-73.51	-20
	MCS7	13.93	-56.86	-70.79	-20

See figures 7-35 to 7-38 for the plots of the spurious RF conducted emissions for Channel 36, 64, 100 and 140 at MCSa0 Mbps each for 802.11n mode.

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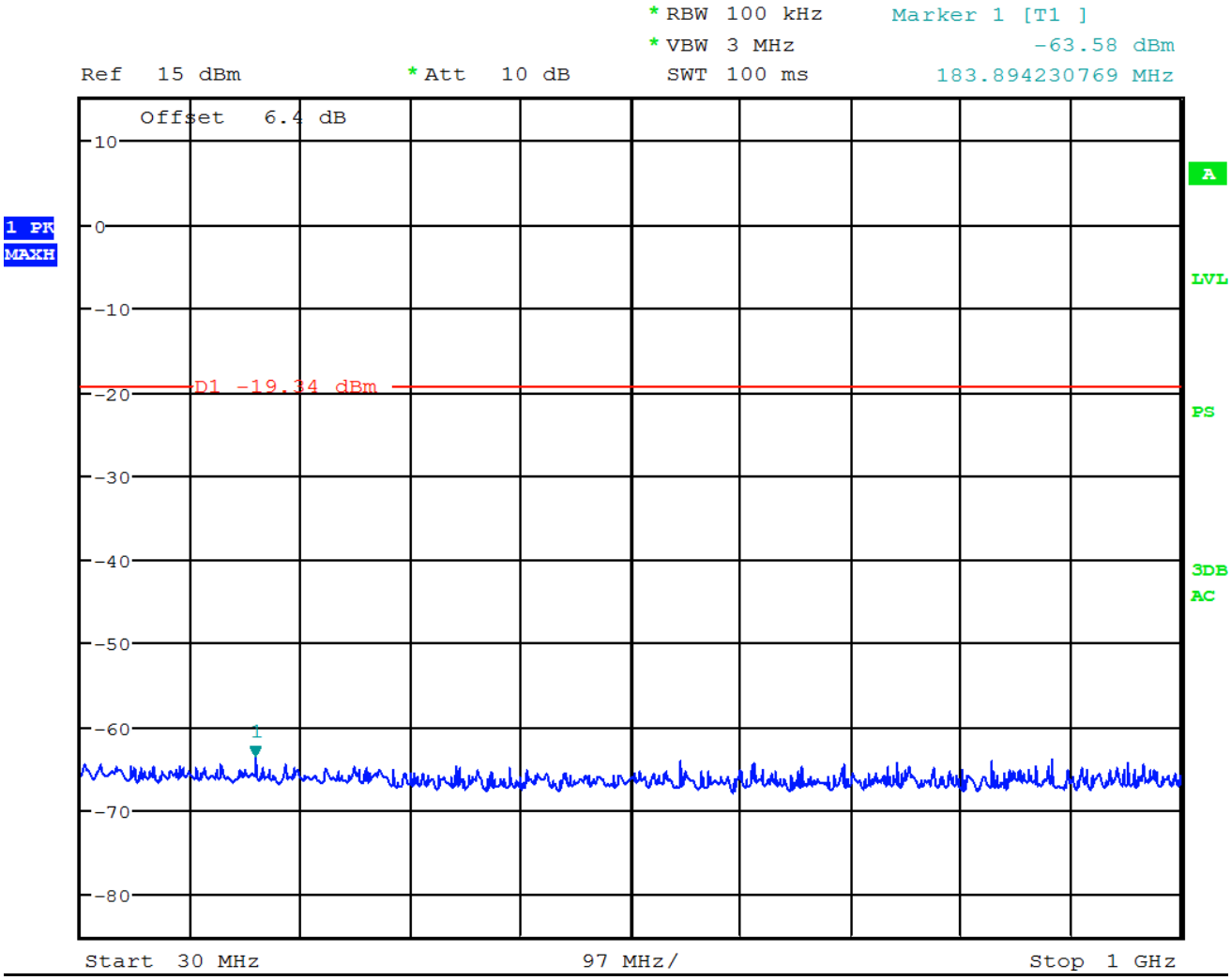
802.11a RF Conducted Emission Test Results cont'd

Figure 7-35a: Spurious RF Conducted Emissions, 802.11n Channel 36, MCS0 Mbps



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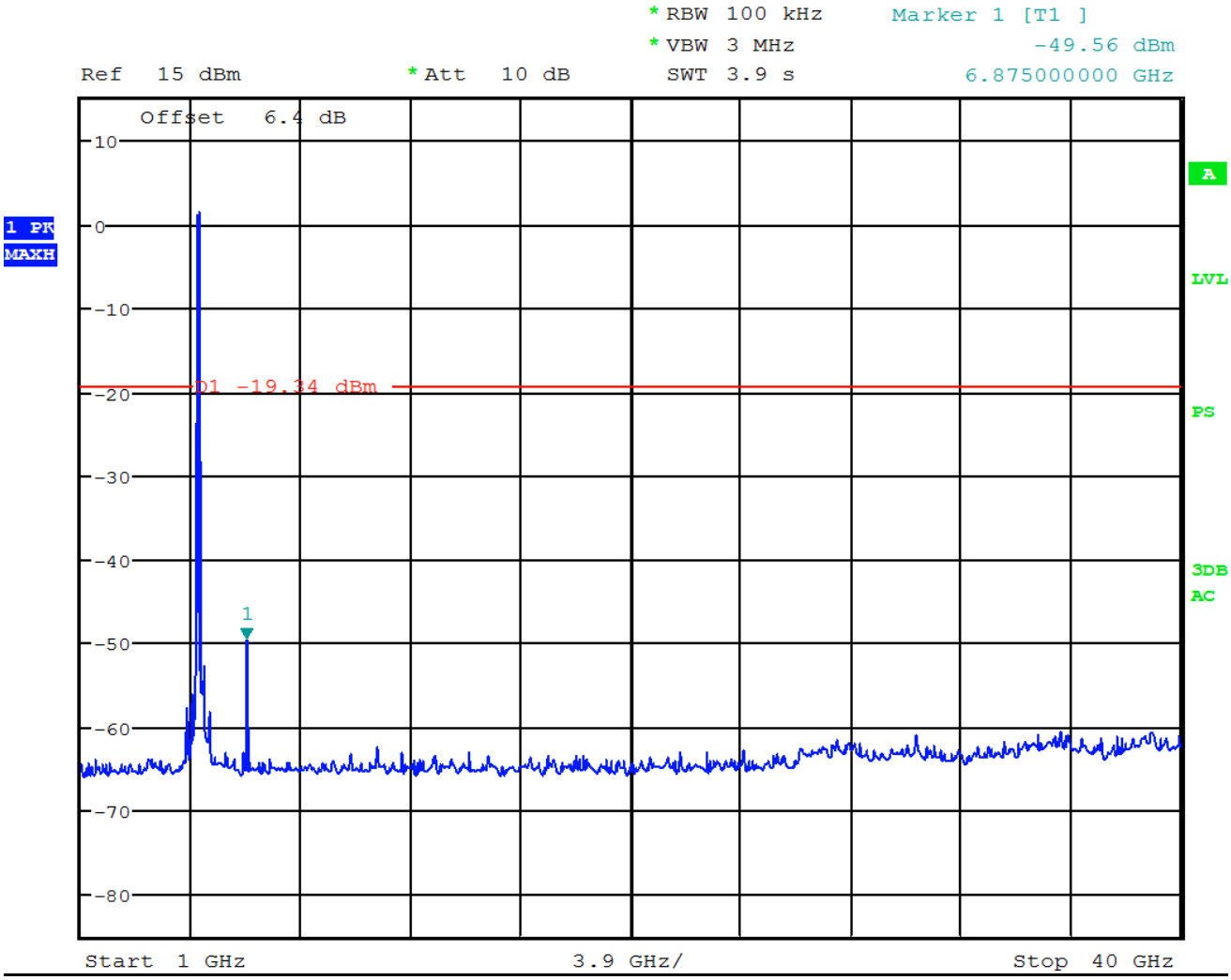
802.11n RF Conducted Emission Test Results cont'd

Figure 7-35b: Spurious RF Conducted Emissions, 802.11n Channel 36, MCS0 Mbps



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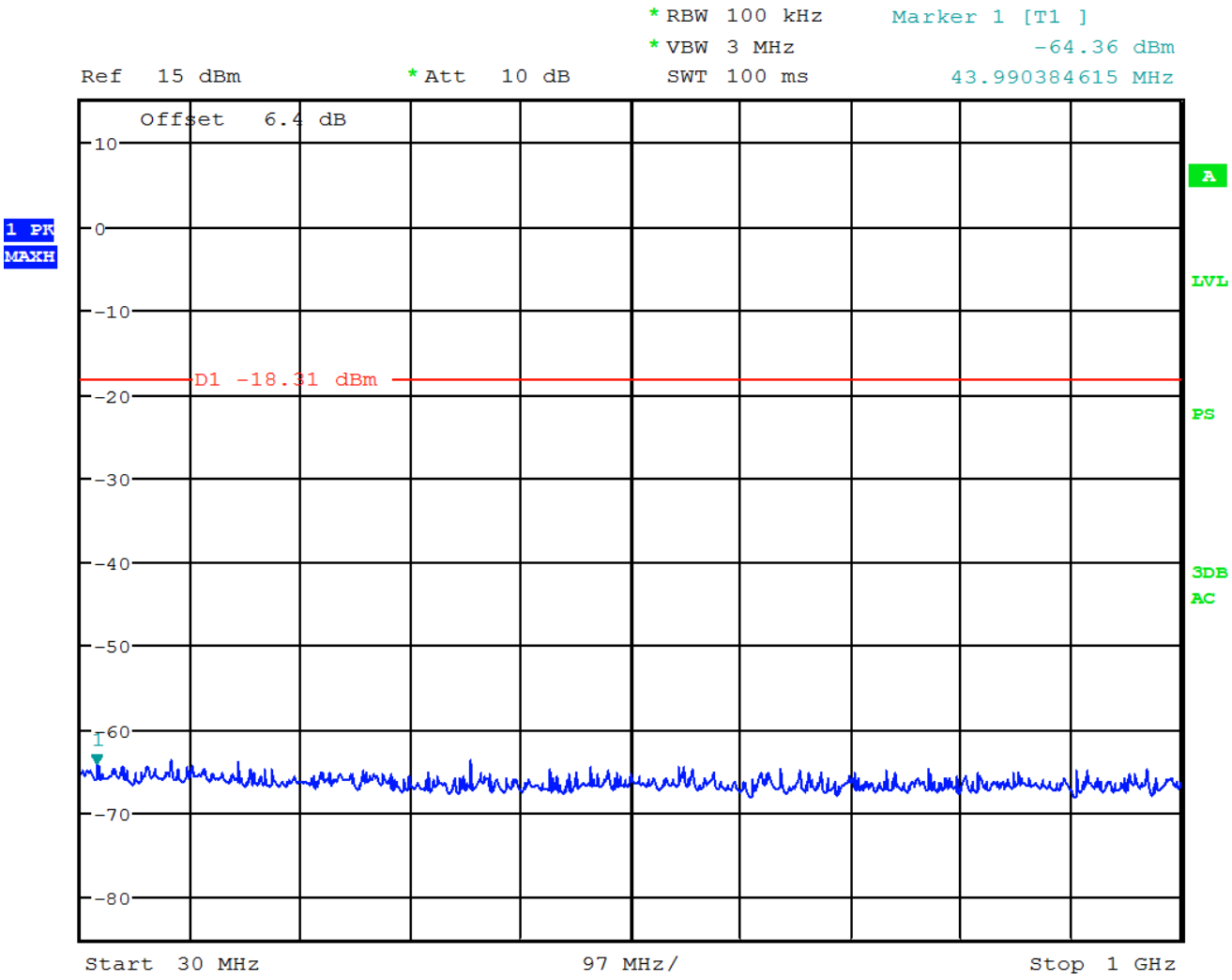
802.11n RF Conducted Emission Test Results cont'd

Figure 7-36a: Spurious RF Conducted Emissions, 802.11n Channel 64, MCS0 Mbps



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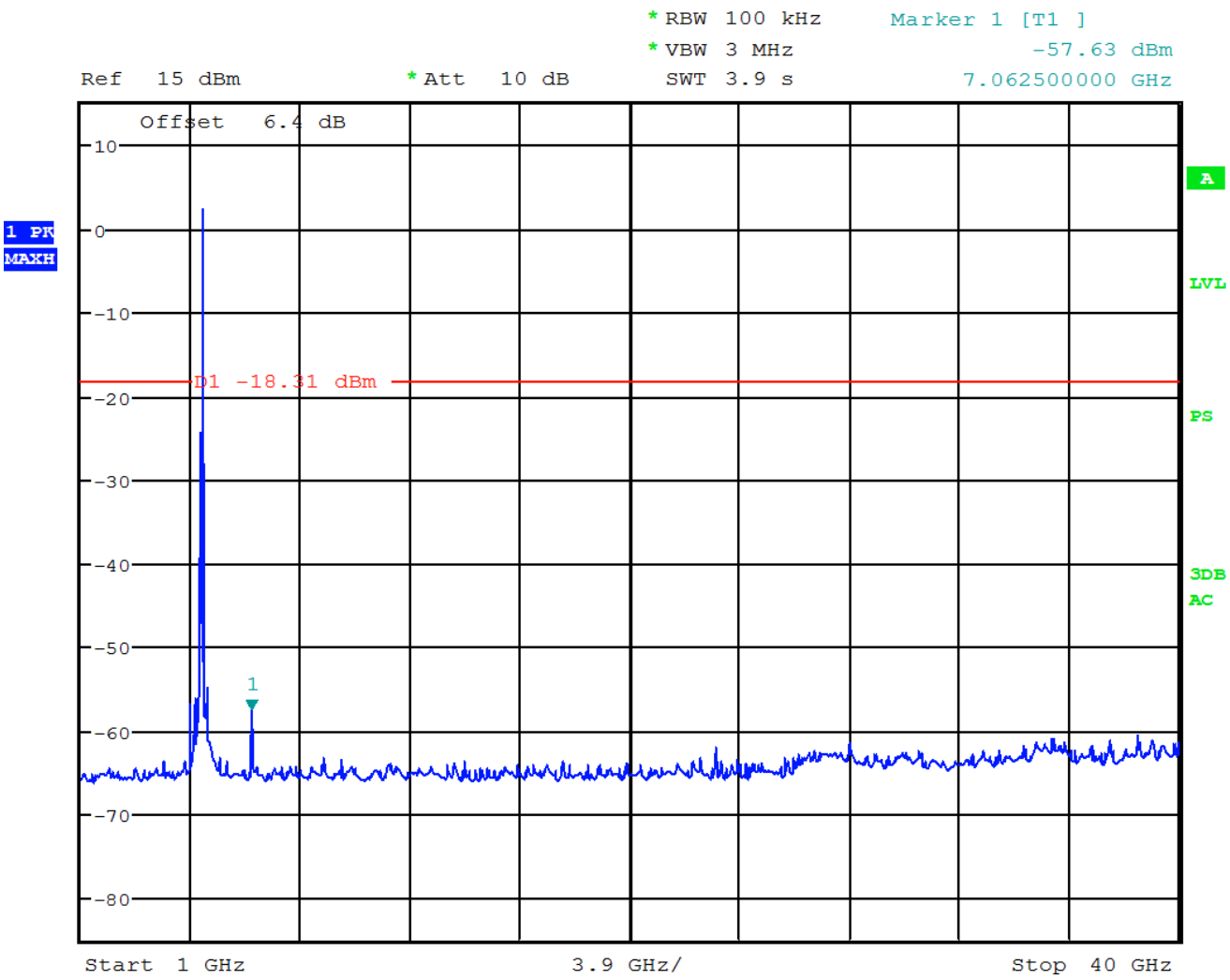
802.11n RF Conducted Emission Test Results cont'd

Figure 7-36b: Spurious RF Conducted Emissions, 802.11n Channel 64, MCS0 Mbps



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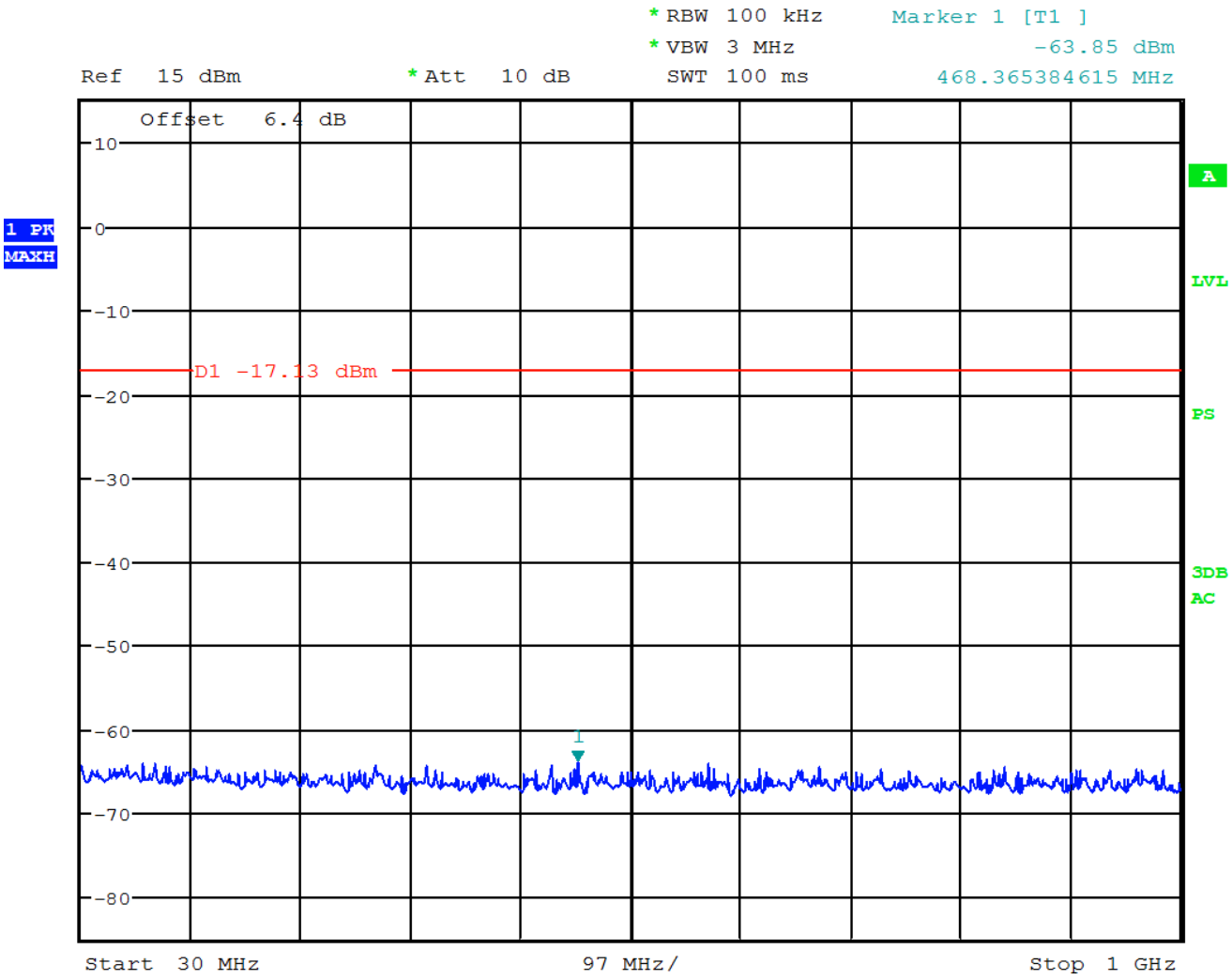
802.11n RF Conducted Emission Test Results cont'd

Figure 7-37a: Spurious RF Conducted Emissions, 802.11n Channel 100, MCS0 Mbps



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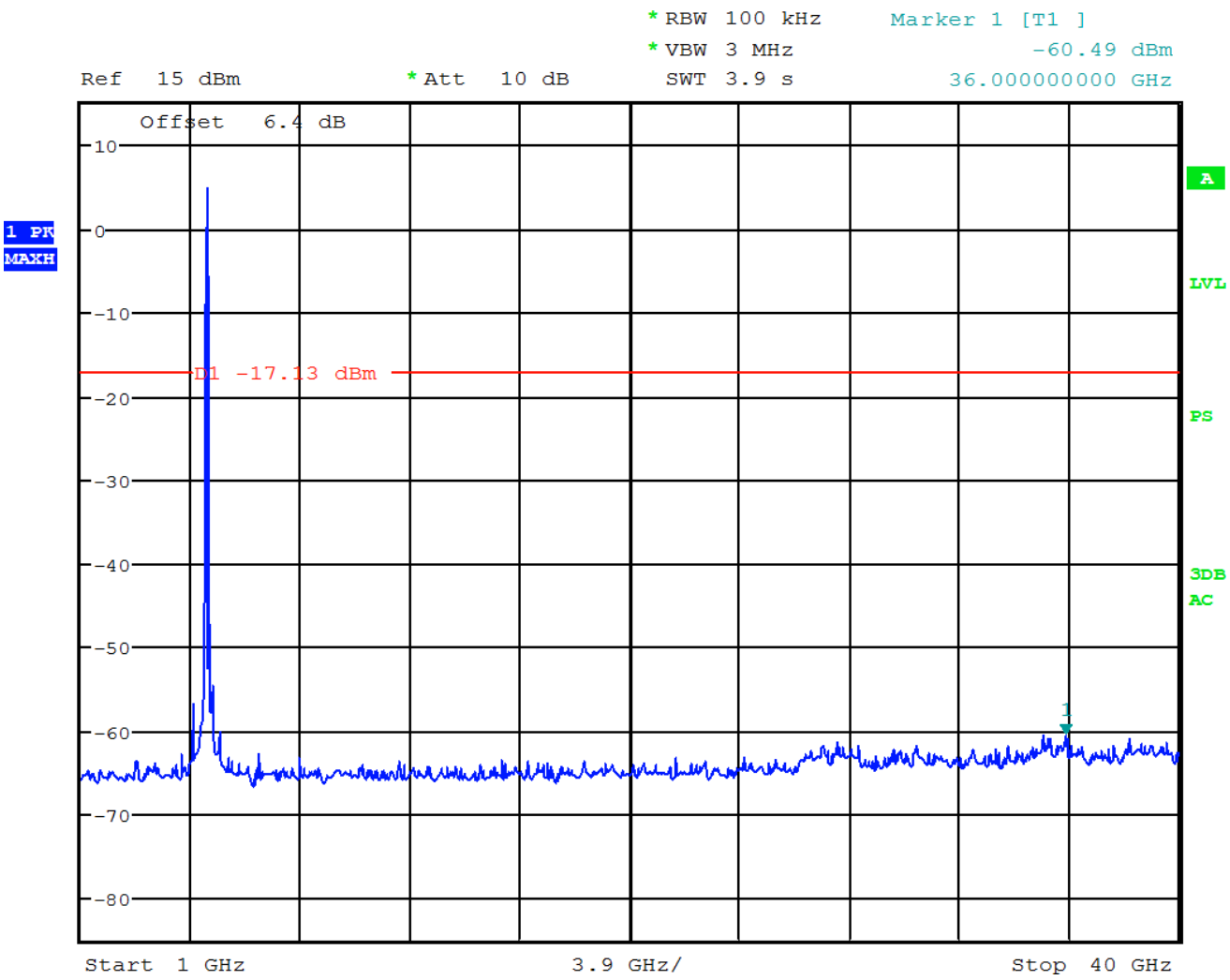
802.11n RF Conducted Emission Test Results cont'd

Figure 7-37: Spurious RF Conducted Emissions, 802.11n Channel 100, MCS0 Mbps



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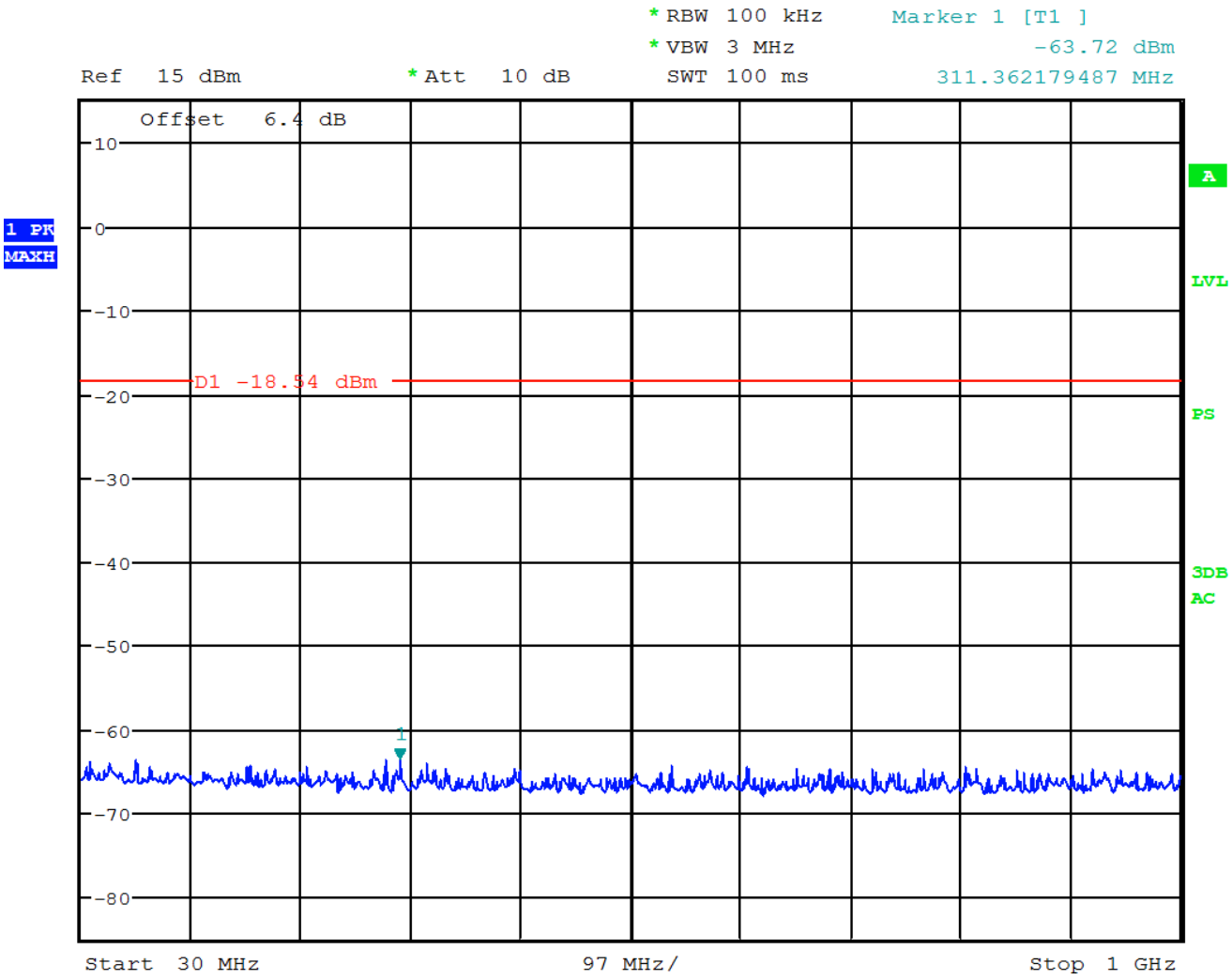
802.11n RF Conducted Emission Test Results cont'd

Figure 7-38a: Spurious RF Conducted Emissions, 802.11n Channel 140, MCS0 Mbps



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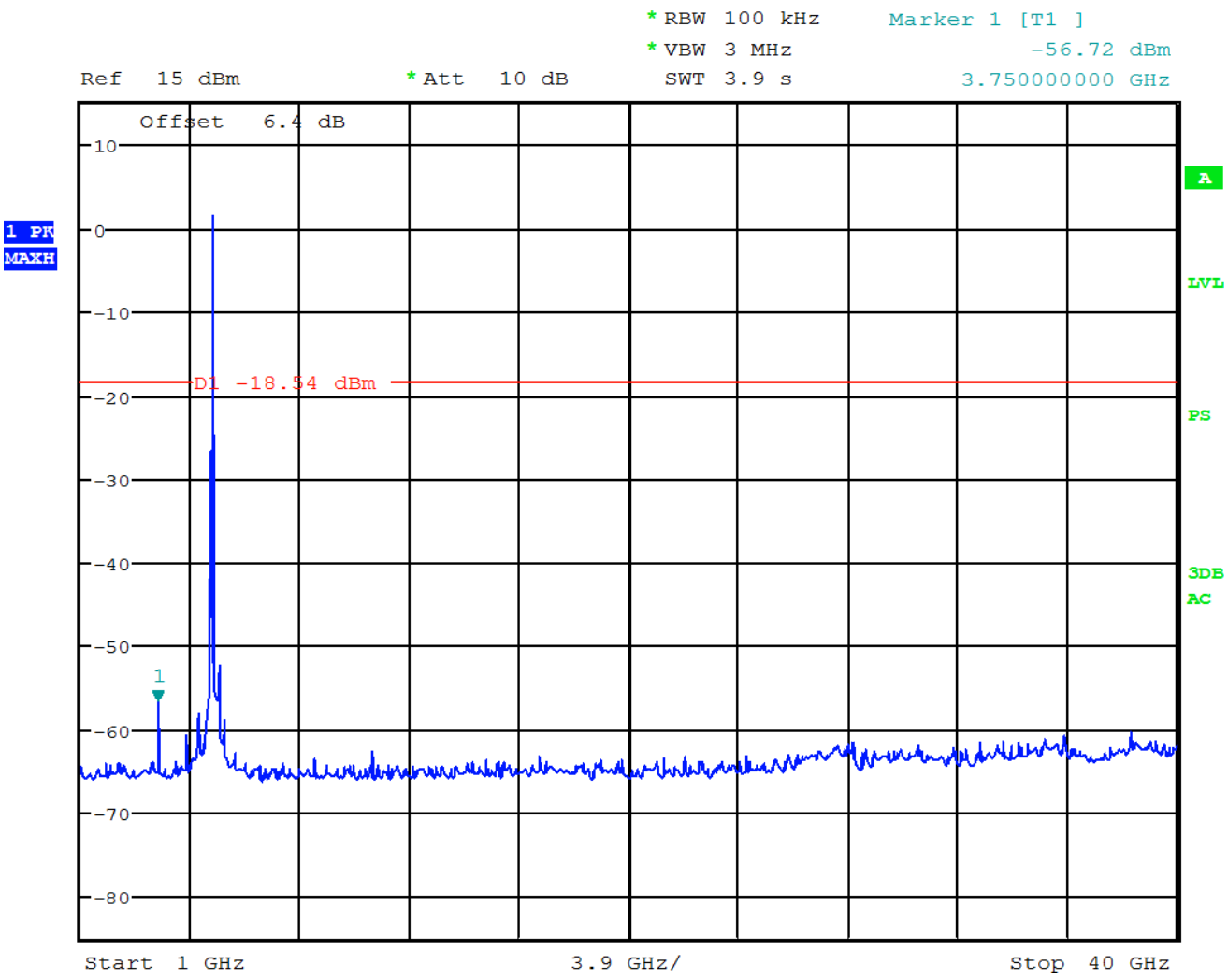
802.11n RF Conducted Emission Test Results cont'd

Figure 7-38b: Spurious RF Conducted Emissions, 802.11a Channel 140, MCS0 Mbps



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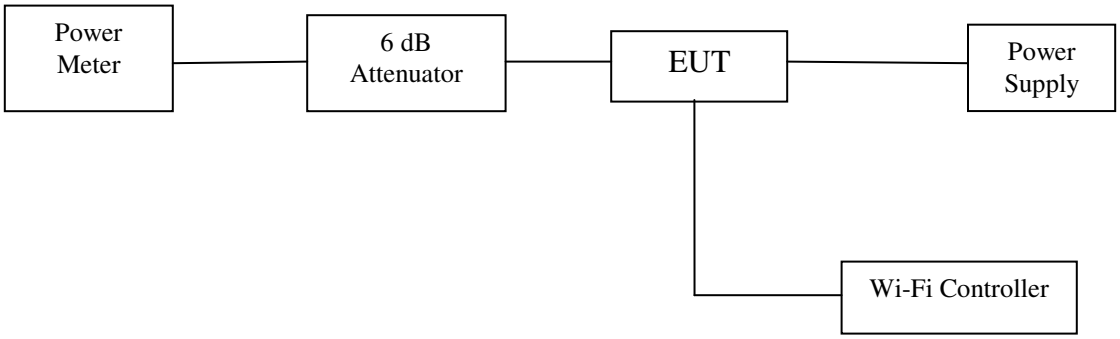
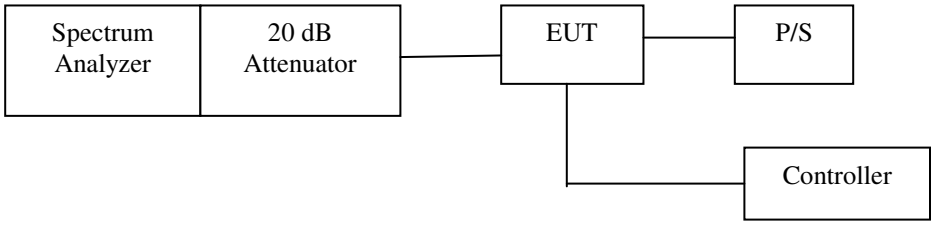
APPENDIX 8 – 802.11ac CONDUCTED EMISSIONS TEST DATA/PLOTS

802.11ac RF Conducted Emission Test Results

Test Setup Diagram





A reference offset of 8.9 dB was applied to the spectrum analyzer and 7.4 dB to the Power Meter reference level for the attenuators and coaxial cable loss in the test circuit.

Date of test: May 8 – June 10, 2014
The measurements were performed by Chuan Pao Tran.

The environmental test conditions were: Temperature: 23.5 ºC
Relative Humidity: 30.4 %

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802.11ac RF Conducted Emission Test Results cont'd

Following tests were performed on the model RGY181LW.

6 dB Bandwidth

The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(a) (2) and RSS-210. For bandwidth 20 MHz, channels 36, 64, 140 and 149 were measured at 0 Mbps, 4 Mbps, and 9 Mbps each; for bandwidth 40 MHz, channels 38, 62, 142 and 151 were measured at 0 Mbps, 4 Mbps, and 9 Mbps each; for bandwidth 80 MHz, channels 42, 58, 138 and 155 were measured at 0 Mbps, 4 Mbps, and 9 Mbps each

20MHz Bandwidth

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
36	MCS0	≥ 500	17.66
	MCS4	≥ 500	**17.79**
	MCS9	≥ 500	15.29
64	MCS0	≥ 500	17.63
	MCS4	≥ 500	**17.79**
	MCS9	≥ 500	15.29
140	MCS0	≥ 500	17.66
	MCS4	≥ 500	17.76
	MCS9	≥ 500	15.29
149	MCS0	≥ 500	17.66
	MCS4	≥ 500	**17.79**
	MCS9	≥ 500	15.29

See figures 8-1 to 8-4 for the plots of the 6 dB bandwidth measurements for Channel 36, 64, 140 and 149 at MCS0 Mbps each for 802.11ac mode

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802.11ac RF Conducted Emission Test Results cont'd

40MHz Bandwidth

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
38	MCS0	≥ 500	36.54
	MCS4	≥ 500	36.54
	MCS9	≥ 500	36.54
62	MCS0	≥ 500	36.47
	MCS4	≥ 500	36.54
	MCS9	≥ 500	36.54
142	MCS0	≥ 500	36.41
	MCS4	≥ 500	**36.60**
	MCS9	≥ 500	**36.60**
151	MCS0	≥ 500	36.47
	MCS4	≥ 500	36.54
	MCS9	≥ 500	36.54

See figures 8-5 to 8-8 for the plots of the 6 dB bandwidth measurements for Channel 38, 62, 142 and 151 at MCS 0 each for 802.11ac mode.

80MHz Bandwidth

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
42	MCS0	≥ 500	76.28
	MCS4	≥ 500	**76.54**
	MCS9	≥ 500	76.28
58	MCS0	≥ 500	76.28
	MCS4	≥ 500	**76.54**
	MCS9	≥ 500	76.41
138	MCS0	≥ 500	76.41
	MCS4	≥ 500	**76.54**
	MCS9	≥ 500	**76.54**
155	MCS0	≥ 500	76.28
	MCS4	≥ 500	**76.54**
	MCS9	≥ 500	**76.54**

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See figures 8-9 to 8-12 for the plots of the 6 dB bandwidth measurements for Channel 42, 58, 138 and 155 at MCS 0 each for 802.11n mode.

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802.11a RF Conducted Emission Test Results cont'd

Figure 8-1: 6 dB Bandwidth
802.11ac, BW20, Channel 36, MCS0 Mbps

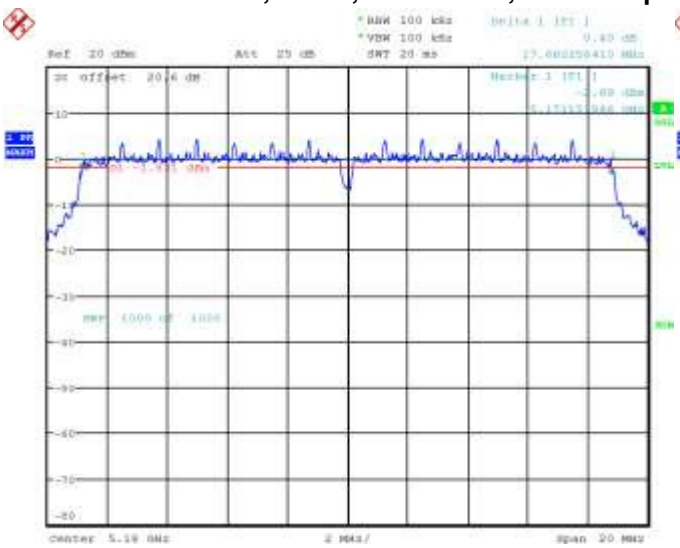


Figure 8-2: 6 dB Bandwidth
802.11ac, BW20 Channel 48, MCS0 Mbps

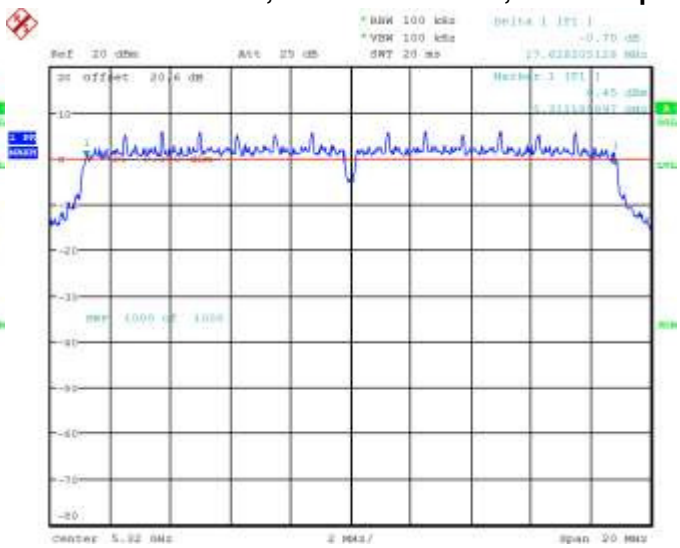


Figure 8-3: 6 dB Bandwidth
802.11ac, BW20, Channel 64, 6 Mbps

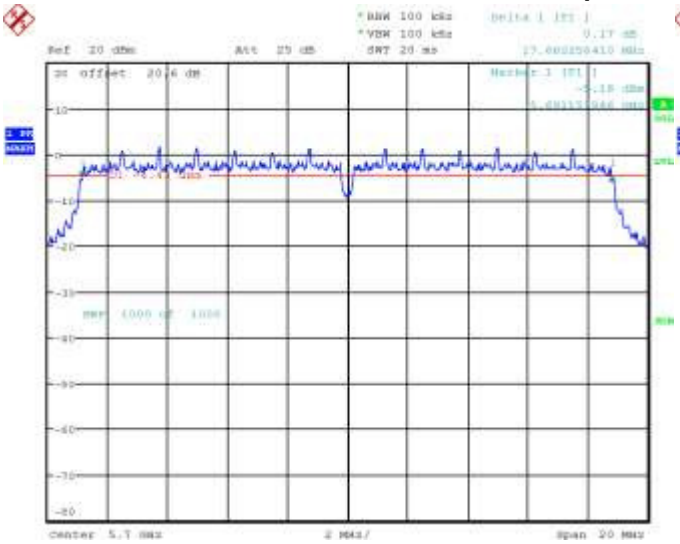
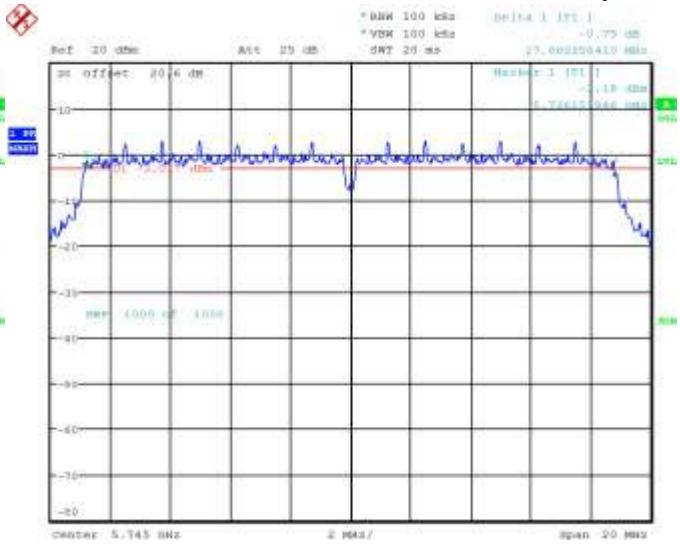


Figure 8-4: 6 dB Bandwidth
802.11ac, BW20, Channel 100, 6 Mbps



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802.11ac RF Conducted Emission Test Results cont'd

Figure 8-5: 6 dB Bandwidth
802.11ac, BW40, Channel 38, MCS0 Mbps

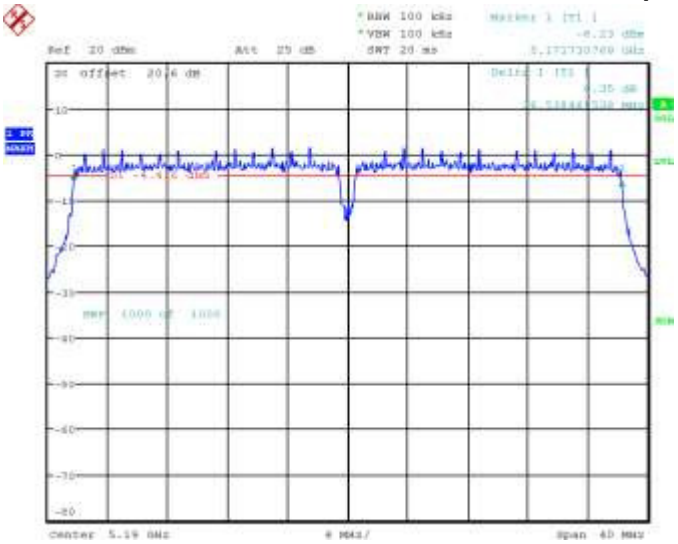


Figure 8-6: 6 dB Bandwidth
802.11ac, BW40, Channel 62, MCS0 Mbps

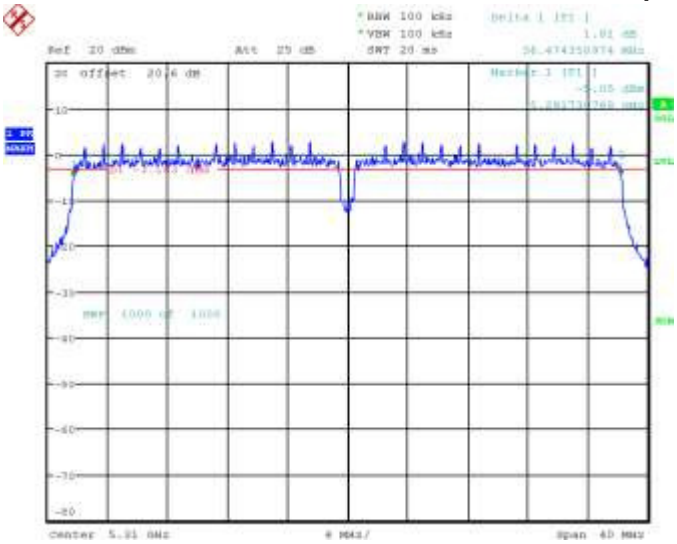


Figure 8-7: 6 dB Bandwidth
802.11ac, BW40, Channel 142, MCS0 Mbps

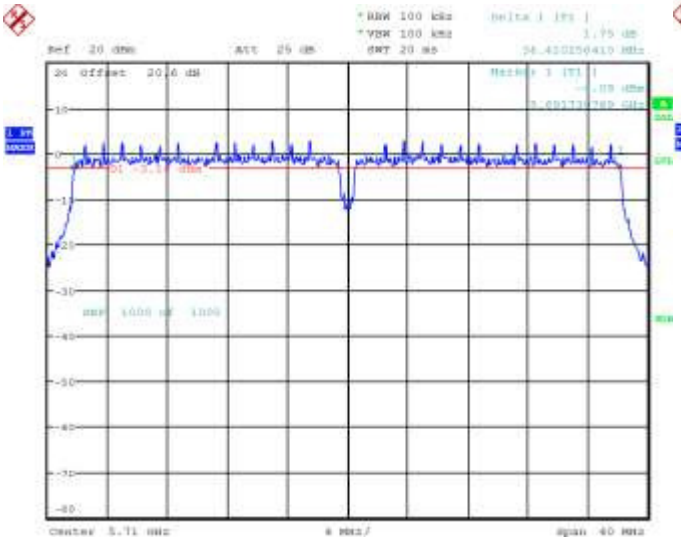
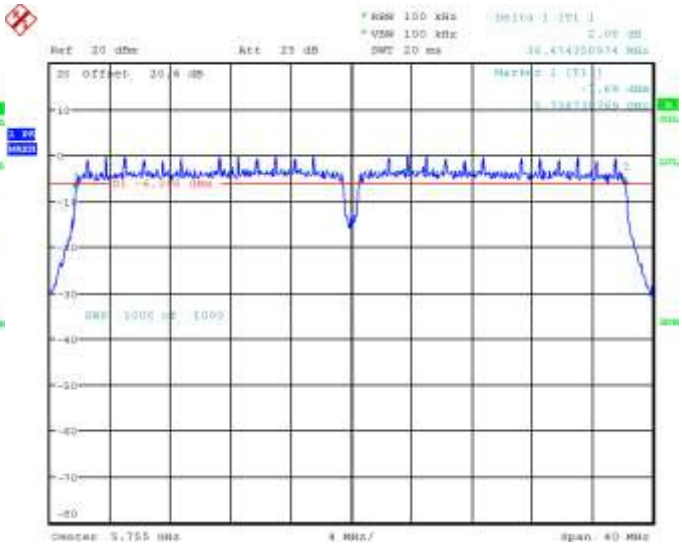


Figure 8-8: 6 dB Bandwidth
802.11ac, BW40, Channel 151, MCS0 Mbps



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802.11ac RF Conducted Emission Test Results cont'd

Figure 8-9: 6 dB Bandwidth
802.11ac, BW80, Channel 42, MCS0 Mbps

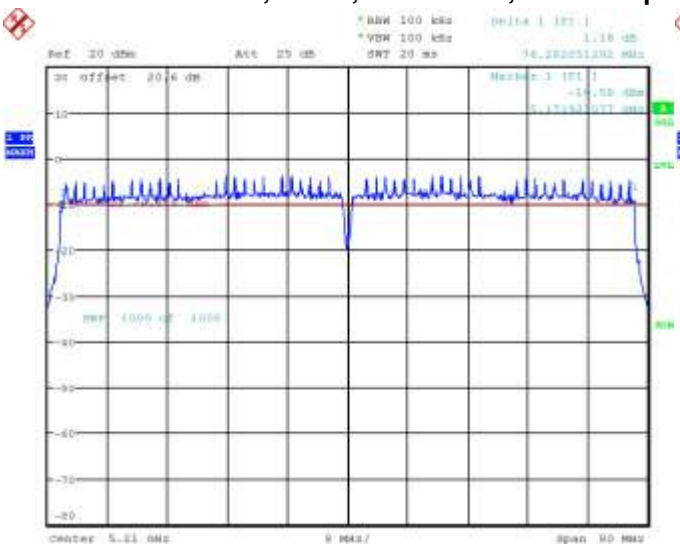


Figure 8-10: 6 dB Bandwidth
802.11ac, BW80, Channel 58, MCS0 Mbps

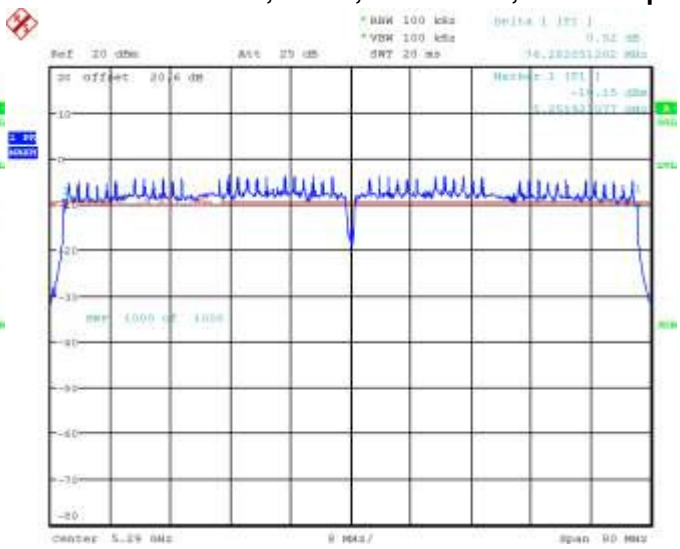


Figure 8-11: 6 dB Bandwidth
802.11ac, BW80, Channel 138, MCS0 Mbps

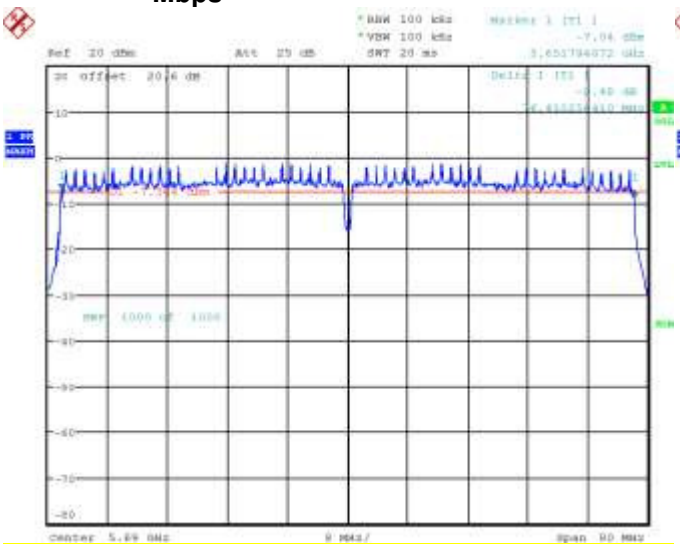
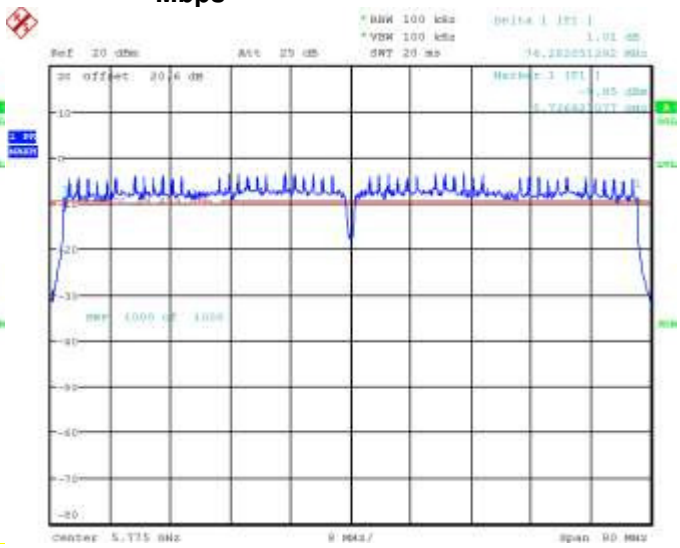


Figure 8-12: 6 dB Bandwidth
802.11ac, BW80, Channel 155, MCS0 Mbps



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802.11ac RF Conducted Emission Test Results cont'd

Maximum Conducted Output Power

The EUT met the requirements of the maximum conducted output power of class 2 as per 47 CFR 15.407 and RSS-210. Channels 36, 48, 64, 100, 140 and 165 were measured for 802.11ac mode, bandwidth 20MHz, using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 8.9 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

20 MHz Bandwidth

Channel	BW(MHz)	Data Rate	Power Limit (mW)	Measured Level (dBm)	Measured Level (mW)
36	20	MCS0	< 250.0	16.26	42.27
		MCS4	< 250.0	15.99	39.72
		MCS9	< 250.0	6.40	4.37
64	20	MCS0	< 250.0	**17.34**	**54.20**
		MCS4	< 250.0	16.90	48.98
		MCS9	< 250.0	6.12	4.09
100	20	MCS0	< 250.0	17.21	52.60
		MCS4	< 250.0	17.03	50.47
		MCS9	< 250.0	6.57	4.54
140	20	MCS0	< 250.0	13.23	21.04
		MCS4	< 250.0	13.28	21.28
		MCS9	< 250.0	6.21	4.18
149	20	MCS0	< 1000	14.92	31.05
		MCS4	< 1000	14.87	30.69
		MCS9	< 1000	6.93	4.93

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802.11ac RF Conducted Emission Test Results

Channels 38, 62, 102, 142 and 151 were measured for 802.11ac mode, bandwidth 40MHz, using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 8.9 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

40 MHz Bandwidth

Channel	BW(MHz)	Data Rate	Power Limit (mW)	Measured Level (dBm)	Measured Level (mW)
38	40	MCS0	< 250.0	16.26	42.27
		MCS4	< 250.0	16.16	41.30
		MCS9	< 250.0	10.79	11.99
62	40	MCS0	< 250.0	17.25	53.09
		MCS4	< 250.0	15.94	39.26
		MCS9	< 250.0	10.56	11.38
102	40	MCS0	< 250.0	**17.66**	**58.34**
		MCS4	< 250.0	16.64	46.13
		MCS9	< 250.0	11.07	12.79
142	40	MCS0	< 250.0	17.42	55.21
		MCS4	< 250.0	16.24	42.07
		MCS9	< 250.0	10.56	11.38
151	40	MCS0	< 1000	15.13	32.58
		MCS4	< 1000	14.96	31.33
		MCS9	< 1000	11.25	13.34

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802.11ac RF Conducted Emission Test Results

Channels 42, 58, 105, 138 and 151 were measured for 802.11ac mode, bandwidth 80MHz, using an Agilent power meter; model N1911A with model N1921A power sensor. A reference offset of 8.9 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

80 MHz Bandwidth

Channel	BW(MHz)	Data Rate	Power Limit (mW)	Measured Level (dBm)	Measured Level (mW)
42	80	MCS0	< 250.0	13.66	23.23
		MCS4	< 250.0	12.51	17.82
		MCS9	< 250.0	8.09	6.44
58	80	MCS0	< 250.0	13.58	22.80
		MCS4	< 250.0	12.28	16.90
		MCS9	< 250.0	8.13	6.50
105	80	MCS0	< 250.0	13.95	24.83
		MCS4	< 250.0	12.89	19.45
		MCS9	< 250.0	8.19	6.59
138	80	MCS0	< 250.0	**16.05**	**40.27**
		MCS4	< 250.0	14.07	25.53
		MCS9	< 250.0	8.02	6.34
151	80	MCS0	< 1000	14.11	25.76
		MCS4	< 1000	12.81	19.10
		MCS9	< 1000	8.35	6.84

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802.11ac RF Conducted Emission Test Results cont'd

Band Edge Compliance

The EUT met the requirements of the band edge compliance as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 100, 140, 149, and 165 were measured at MCS0 Mbps, MCS4 Mbps, and MCS9 Mbps each for bandwidth 20MHz, 802.11ac mode.

20MHz Bandwidth

Channel	Bandwidt(MHz)	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
36	20	MCS0	< -20	-44.66	-24.66
		MCS4	< -20	-46.72	-26.72
		MCS9	< -20	-42.13	-22.13
64	20	MCS0	< -20	-42.12	-22.12
		MCS4	< -20	-45.98	-25.98
		MCS9	< -20	-42.13	-22.13
100	20	MCS0	< -20	-44.07	-24.07
		MCS4	< -20	-46.00	-26.00
		MCS9	< -20	-42.54	-22.54
140	20	MCS0	< -20	-41.60	-21.60
		MCS4	< -20	-42.80	-22.80
		MCS9	< -20	-42.21	-22.21
149	20	MCS0	< -20	**-28.71**	**-8.71**
		MCS4	< -20	-33.04	-13.04
		MCS9	< -20	-41.90	-21.90
165	20	MCS0	< -20	-29.45	-9.45
		MCS4	< -20	-33.83	-13.83
		MCS9	< -20	-41.62	-21.62

See figures 8-13 to 8-18 for the plots of the band edge compliance measurements for Channel 36, 64, 100, 149 and 165 at MCS0 Mbps each for 802.11ac mode.

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802.11ac RF Conducted Emission Test Results cont'd

Figure 8-13: Band Edge Compliance
802.11ac, Channel 36, MCS0 Mbps

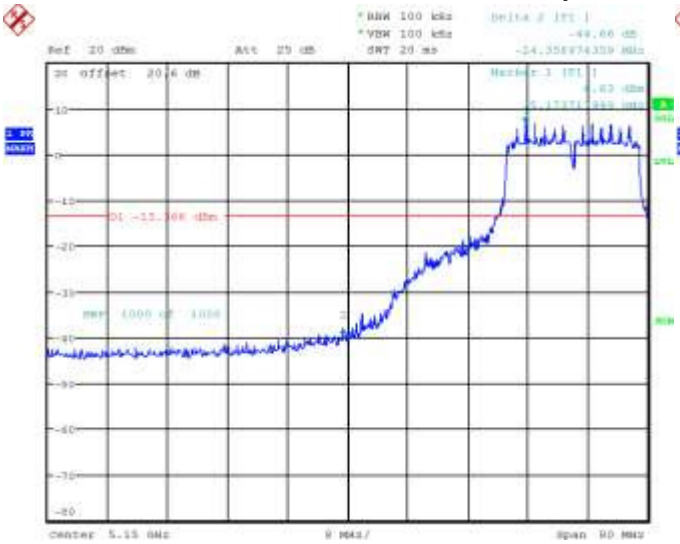


Figure 8-14: Band Edge Compliance
802.11ac, Channel 64, MCS0 Mbps

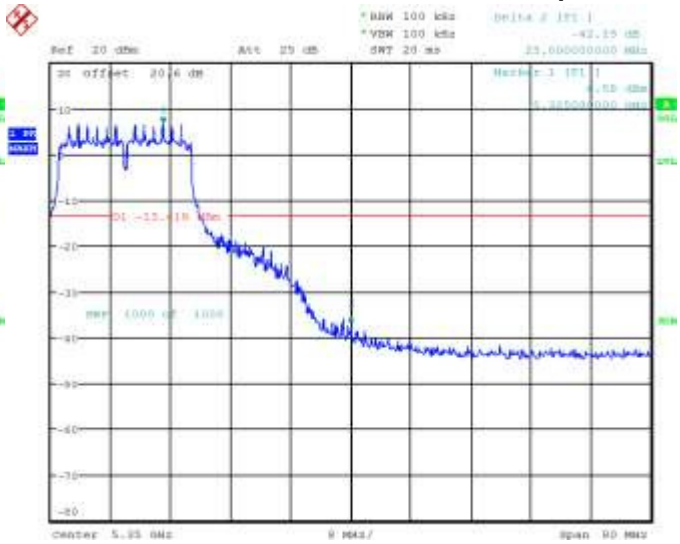


Figure 8-15: Band Edge Compliance
802.11ac, Channel 100, MCS0 Mbps

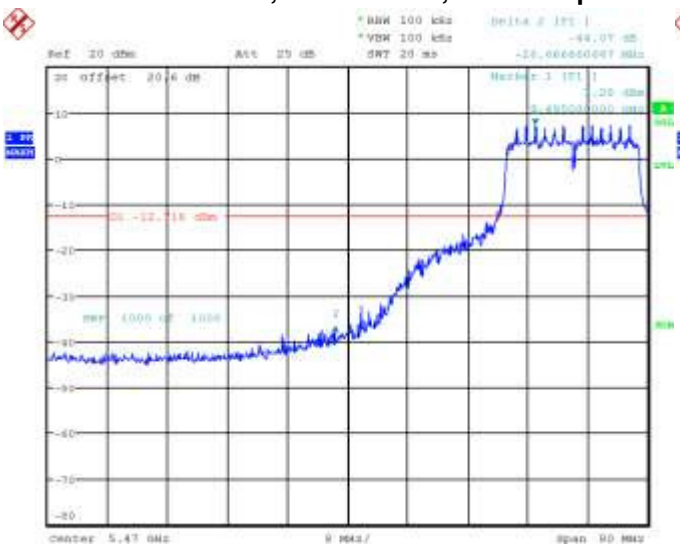
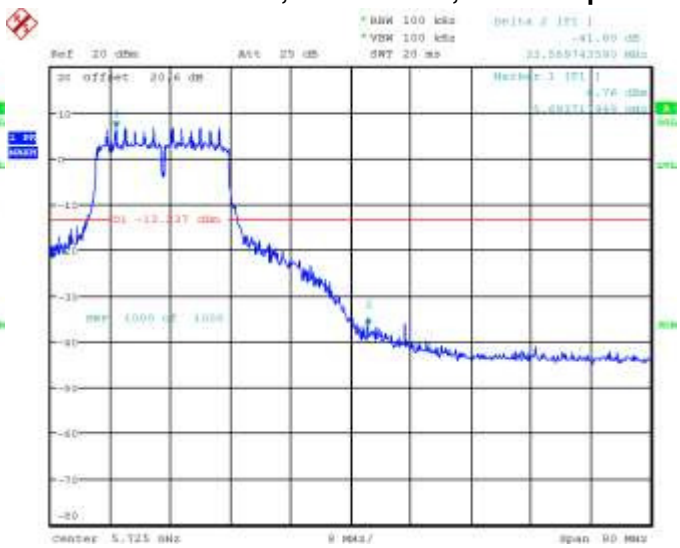


Figure 8-16: Band Edge Compliance
802.11ac, Channel 140, MCS0 Mbps



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802.11a RF Conducted Emission Test Results cont'd

Figure 8-17: Band Edge Compliance
802.11ac, Channel 149, MCS0 Mbps

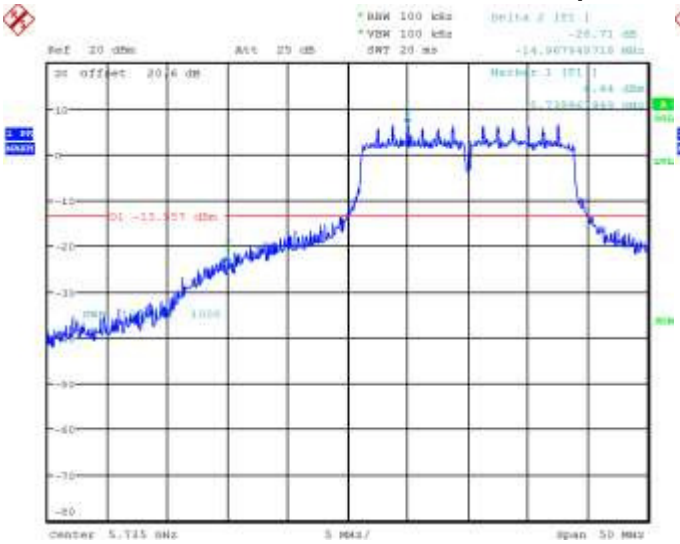
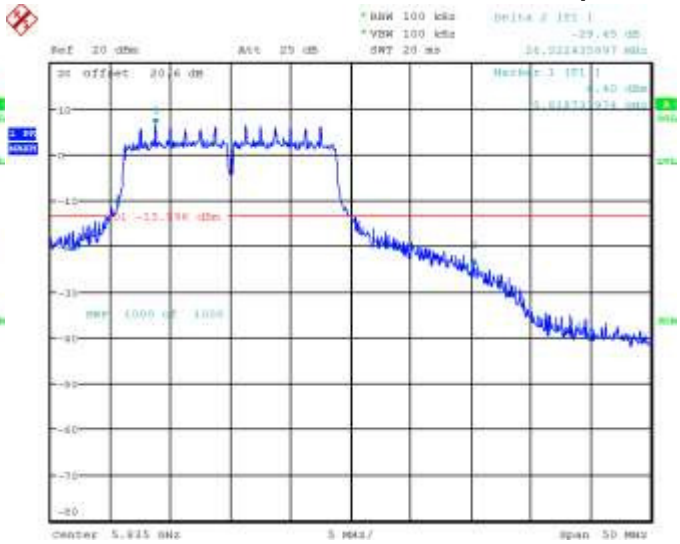


Figure 8-18: Band Edge Compliance
802.11ac, Channel 165, MCS0 Mbps



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802.11ac RF Conducted Emission Test Results cont'd

Channels 38, 62, 102, 142, 151, and 159 were measured at MCS0 Mbps, MCS4 Mbps, and MCS9 Mbps each for bandwidth 40MHz, 802.11ac mode.

40MHz Bandwidth

Channel	Bandwidt(MHz)	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
38	40	MCS0	< -20	-32.98	-12.98
		MCS4	< -20	-37.60	-17.60
		MCS9	< -20	-39.48	-19.48
62	40	MCS0	< -20	-32.38	-12.38
		MCS4	< -20	-37.42	-17.42
		MCS9	< -20	-39.32	-19.32
102	40	MCS0	< -20	-30.90	-10.90
		MCS4	< -20	-36.90	-16.90
		MCS9	< -20	-40.51	-20.51
142	40	MCS0	< -20	**-27.44**	**-7.44**
		MCS4	< -20	-32.00	-12.00
		MCS9	< -20	-36.60	-16.60
151	40	MCS0	< -20	-30.96	-41.96
		MCS4	< -20	-35.53	-46.53
		MCS9	< -20	-38.85	-49.85
159	40	MCS0	< -20	-31.81	-42.81
		MCS4	< -20	-35.87	-46.87
		MCS9	< -20	-39.07	-50.07

See figures 8-19 to 8-24 for the plots of the band edge compliance measurements for Channel 38, 62, 102, 142, 151, and 159 at MCS0 Mbps each for 802.11ac mode.

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802.11ac RF Conducted Emission Test Results cont'd

Figure 8-19: Band Edge Compliance
802.11ac, Channel 38, MCS0 Mbps

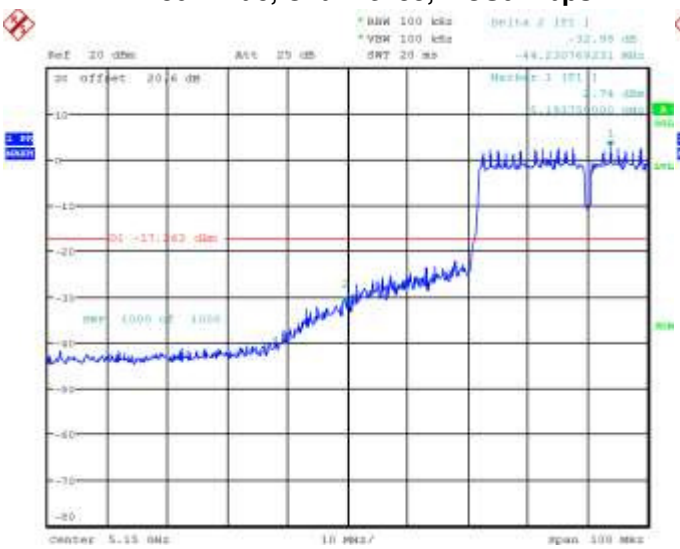


Figure 8-20: Band Edge Compliance
802.11ac, Channel 62, MCS0 Mbps

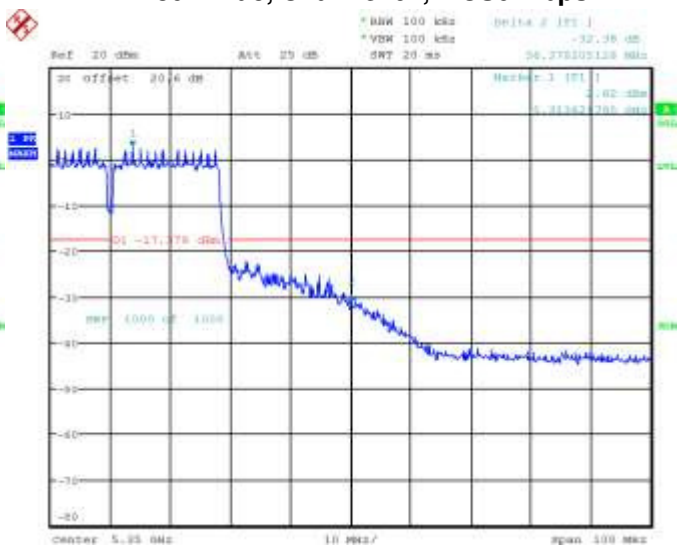


Figure 8-21: Band Edge Compliance
802.11ac, Channel 102, MCS0 Mbps

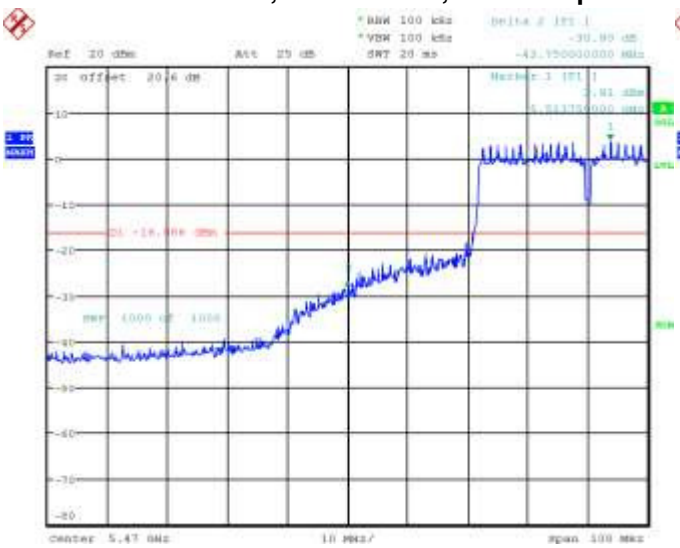
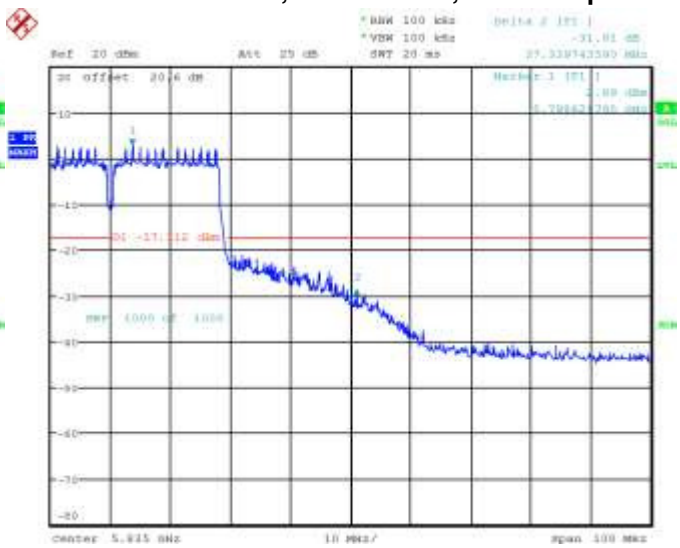


Figure 8-22: Band Edge Compliance
802.11ac, Channel 142, MCS0 Mbps



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802.11a RF Conducted Emission Test Results cont'd

Figure 8-23: Band Edge Compliance
802.11ac, Channel 151, MCS0 Mbps

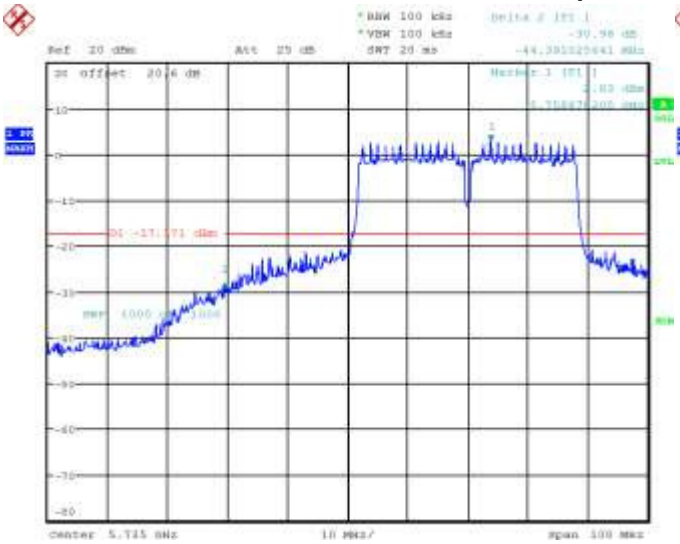
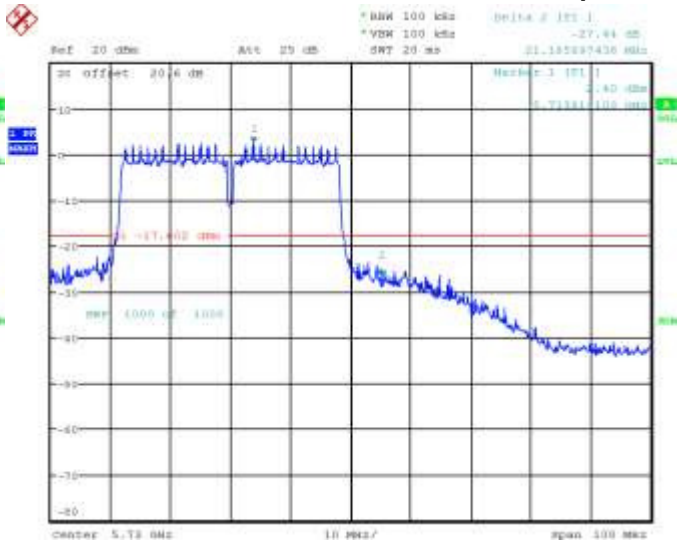


Figure 8-24: Band Edge Compliance
802.11ac, Channel 159, MCS0 Mbps



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802.11ac RF Conducted Emission Test Results cont'd

Channels 42, 58, 105, 138, 155, and 155 were measured at MCS0 Mbps, MCS4 Mbps, and MCS9 Mbps each for bandwidth 80MHz, 802.11ac mode.

80MHz Bandwidth

Channel	Bandwidt(MHz)	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
42	80	MCS0	< -20	-28.31	-8.31
		MCS4	< -20	-34.83	-14.83
		MCS9	< -20	-35.85	-15.85
58	80	MCS0	< -20	-30.31	-10.31
		MCS4	< -20	-36.15	-16.15
		MCS9	< -20	-35.56	-15.56
105	80	MCS0	< -20	-27.48	-7.48
		MCS4	< -20	-34.62	-14.62
		MCS9	< -20	-35.62	-15.62
138	80	MCS0	< -20	-28.47	-8.47
		MCS4	< -20	-35.03	-15.03
		MCS9	< -20	-34.68	-14.68
155 (Low Edge)	80	MCS0	< -20	**-26.28**	**-6.28**
		MCS4	< -20	-32.13	-12.13
		MCS9	< -20	-34.18	-14.18
155 (High Edge)	80	MCS0	< -20	-29.18	-9.18
		MCS4	< -20	-35.60	-15.60
		MCS9	< -20	-35.38	-15.38

See figures 8-25 to 8-30 for the plots of the band edge compliance measurements for Channel 42, 58, 105, 138 and 155 at MCS0 Mbps each for 802.11ac mode.

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802.11ac RF Conducted Emission Test Results cont'd

Figure 8-25: Band Edge Compliance
802.11ac, Channel 38, MCS0 Mbps

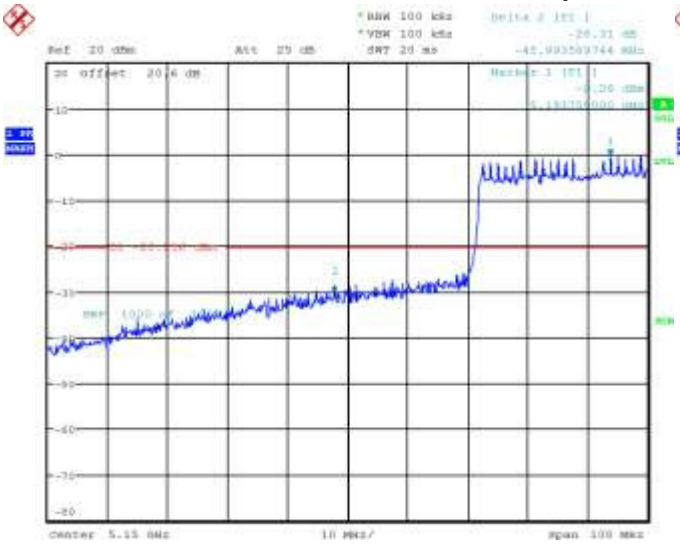


Figure 8-26: Band Edge Compliance
802.11ac, Channel 62, MCS0 Mbps

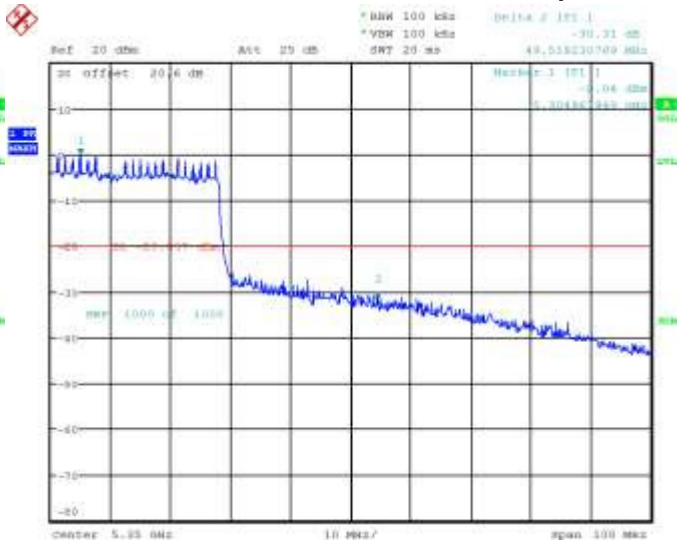


Figure 8-27: Band Edge Compliance
802.11ac, Channel 102, MCS0 Mbps

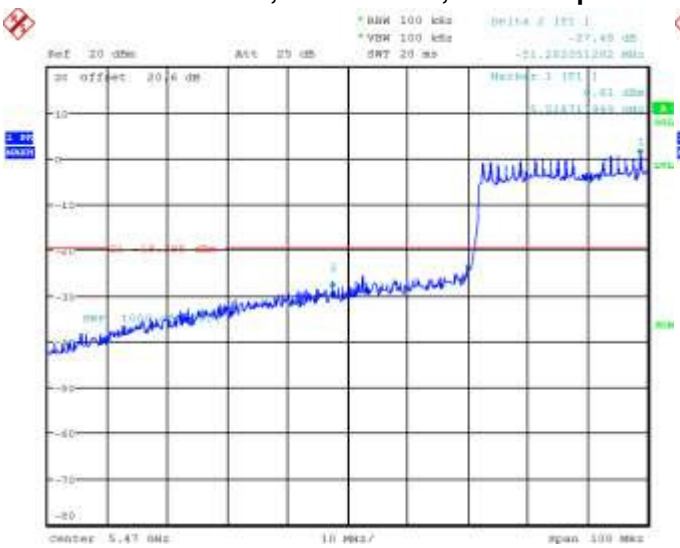
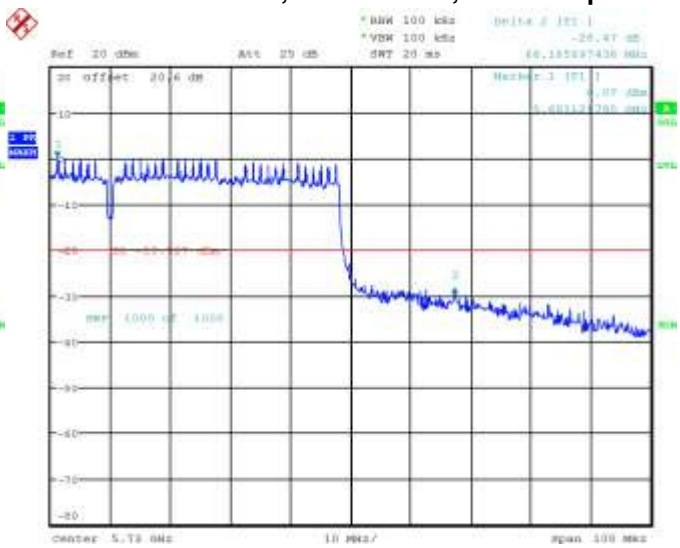


Figure 8-28: Band Edge Compliance
802.11ac, Channel 142, MCS0 Mbps



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802.11ac RF Conducted Emission Test Results cont'd

Figure 8-29: Band Edge Compliance
802.11ac, Channel 151, MCS0 Mbps

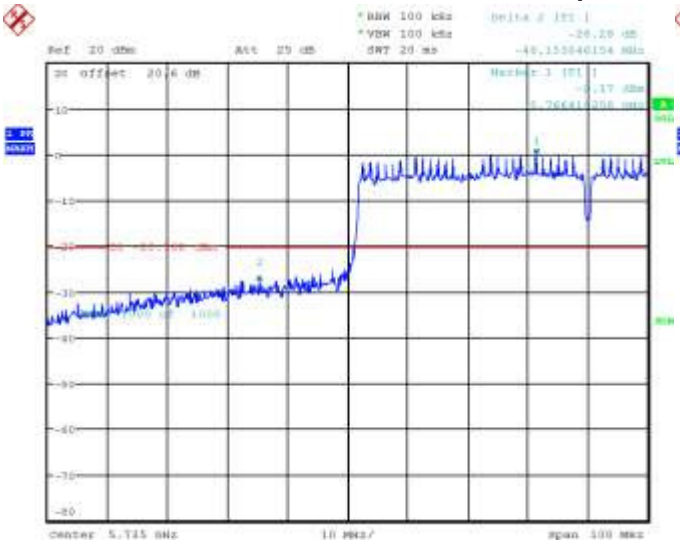
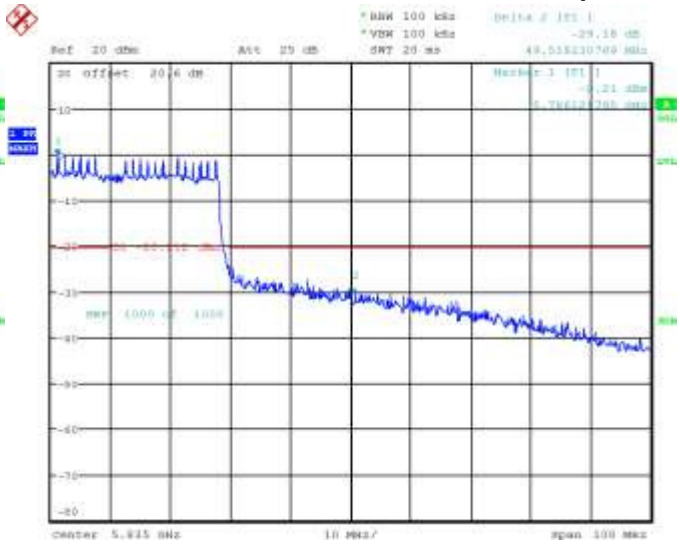


Figure 8-30: Band Edge Compliance
802.11ac, Channel 159, MCS0 Mbps



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802.11ac RF Conducted Emission Test Results cont'd

Peak Power Spectral Density

The EUT met the requirements of the peak power spectral density as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 140 and 149 were measured at MCS0 Mbps, MCS4 Mbps, and MCS9 Mbps each for 802.11ac mode, bandwidth 20MHz.

Bandwidth 20MHz

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
36	MCS0	< 11.00	2.57	-8.43
	MCS4	< 11.00	-0.66	-11.66
	MCS9	< 11.00	-3.34	-14.34
64	MCS0	**< 11.00**	**3.95**	**-7.05**
	MCS4	< 11.00	0.51	-10.49
	MCS9	< 11.00	-3.58	-14.58
140	MCS0	< 11.00	-1.35	-12.35
	MCS4	< 11.00	-4.67	-15.67
	MCS9	< 11.00	-4.51	-15.51
149	MCS0	< 11.00	-12.76	-23.76
	MCS4	< 11.00	-12.53	-23.53
	MCS9	< 11.00	-14.25	-25.25

See figures 8-31 to 8-34 for the plots of the peak power spectral density for Channel 36, 64, 140 and 149 at MCS0 Mbps each for 802.11ac mode, 20MHz bandwidth.

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802.11ac RF Conducted Emission Test Results cont'd

Figure 8-31: Peak Power Spectral Density 802.11ac, Channel 36, MCS0 Mbps

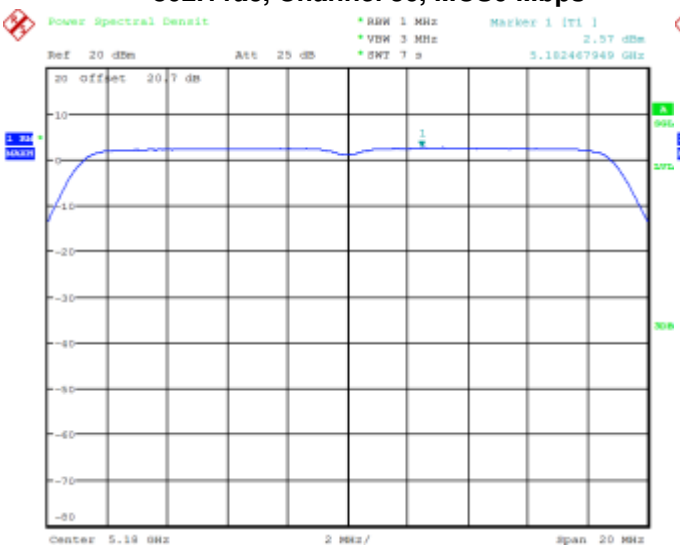


Figure 8-32: Peak Power Spectral Density 802.11ac, Channel 64, MCS0 Mbps

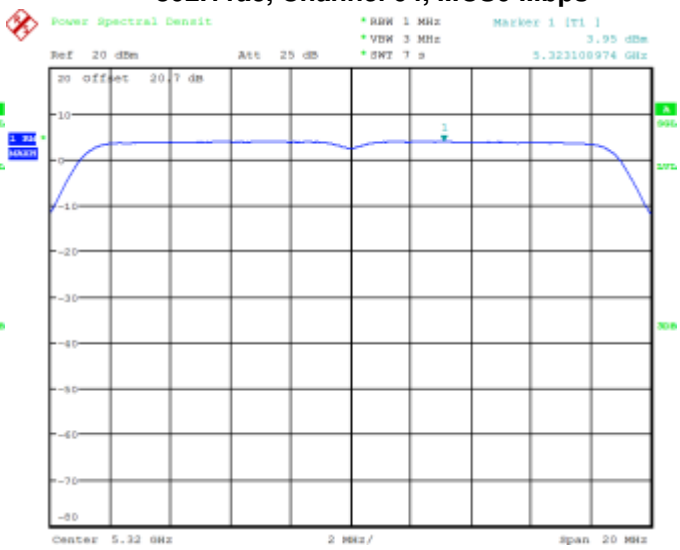


Figure 8-33: Peak Power Spectral Density 802.11ac, Channel 140, MCS0 Mbps

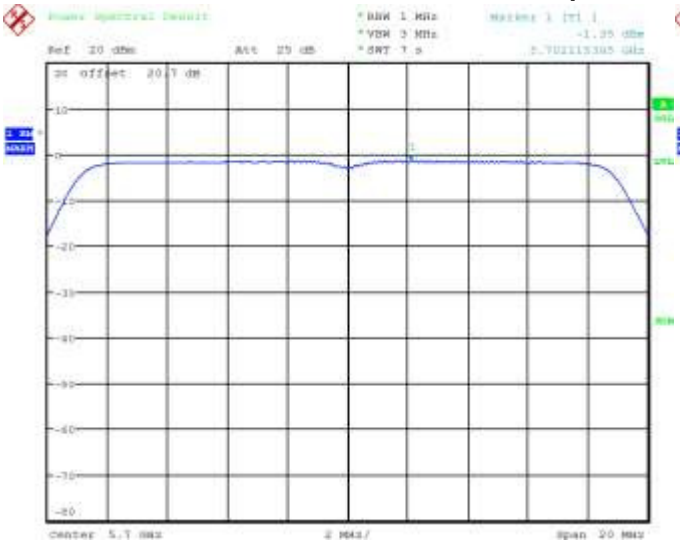
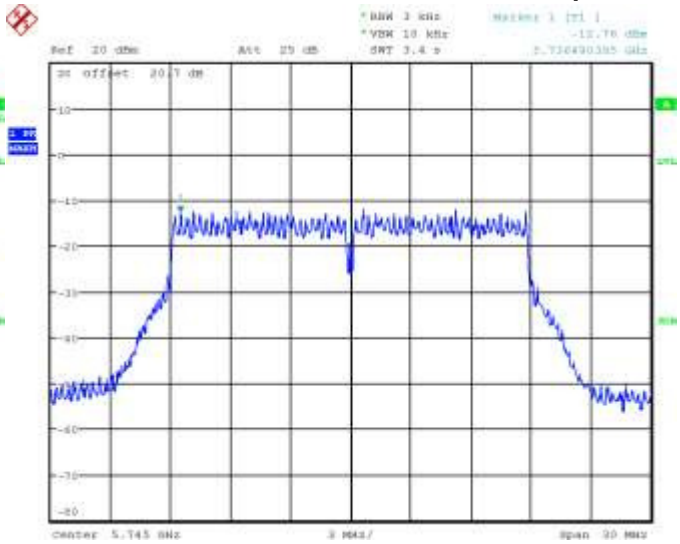


Figure 8-34: Peak Power Spectral Density 802.11ac, Channel 149, MCS0 Mbps



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802.11ac RF Conducted Emission Test Results cont'd

Channels 38, 62, 142 and 151 were measured at MCS0 Mbps, MCS4 Mbps, and MCS9 Mbps each for 802.11ac mode, bandwidth 40MHz.

Bandwidth 40MHz

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
38	MCS0	< 11.00	-0.80	-11.80
	MCS4	< 11.00	-4.65	-15.65
	MCS9	< 11.00	-10.17	-21.17
62	MCS0	**< 11.00**	**0.30**	**-10.70**
	MCS4	< 11.00	-4.56	-15.56
	MCS9	< 11.00	-10.22	-21.22
142	MCS0	< 11.00	-1.10	-12.10
	MCS4	< 11.00	-6.25	-17.25
	MCS9	< 11.00	-12.06	-23.06
151	MCS0	< 11.00	-14.76	-25.76
	MCS4	< 11.00	-16.25	-27.25
	MCS9	< 11.00	-20.00	-31.00

See figures 8-35 to 8-38 for the plots of the peak power spectral density for channel 38, 62, 142 and 151 at MCS0 Mbps each for 802.11ac mode, 40MHz bandwidth.

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802.11ac RF Conducted Emission Test Results cont'd

Figure 8-35: Peak Power Spectral Density 802.11ac, Channel 38, MCS0 Mbps

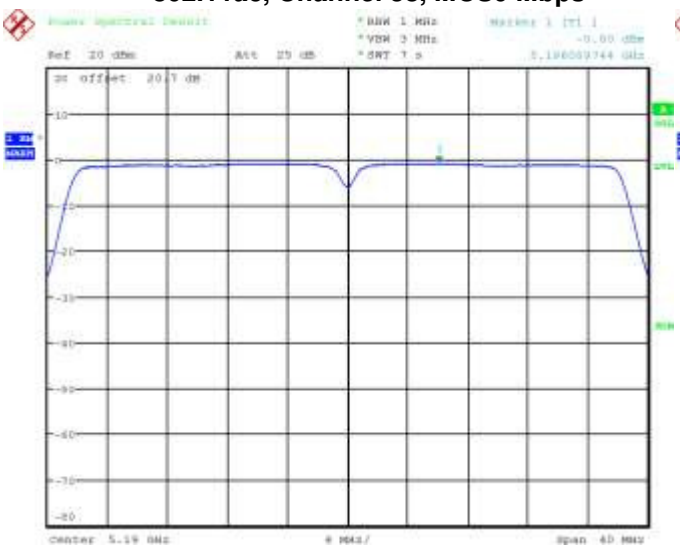


Figure 8-36: Peak Power Spectral Density 802.11ac, Channel 62, MCS0 Mbps

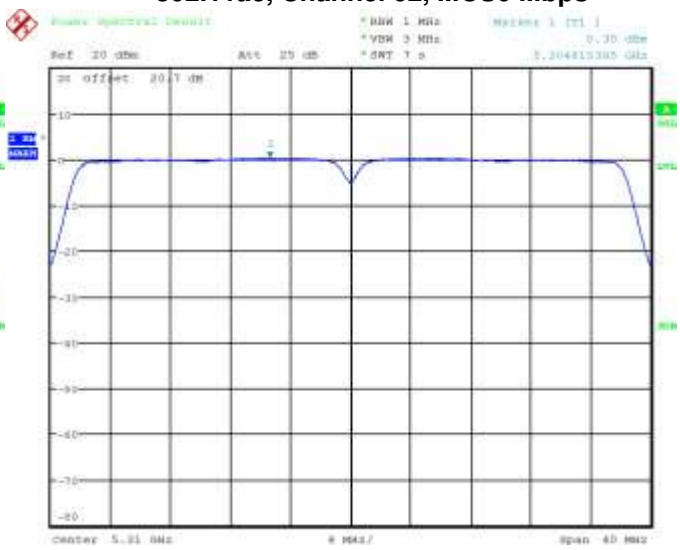


Figure 8-37: Peak Power Spectral Density 802.11ac, Channel 142, MCS0 Mbps

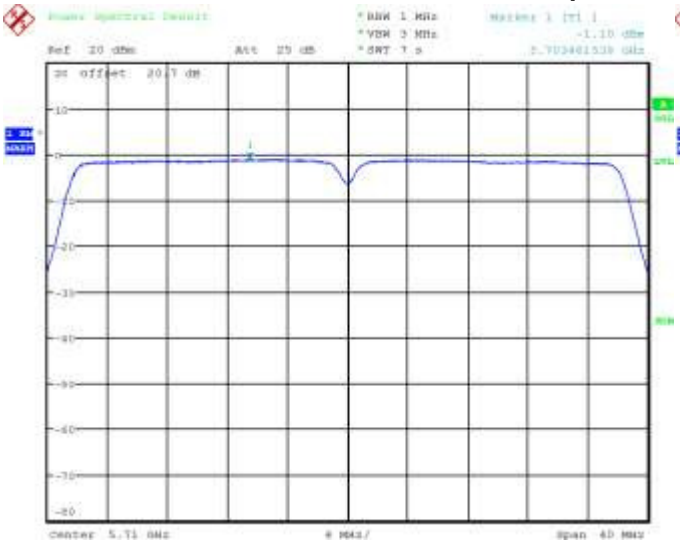
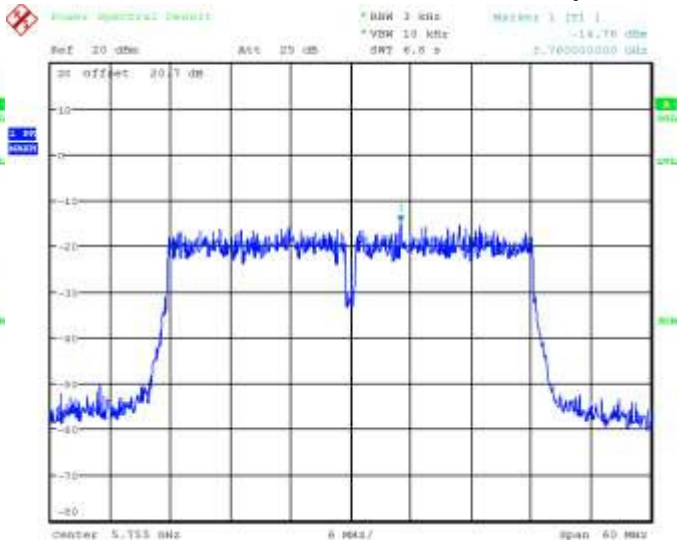


Figure 8-38: Peak Power Spectral Density 802.11ac, Channel 151, MCS0 Mbps



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802.11ac RF Conducted Emission Test Results cont'd

Channels 42, 58, 138 and 155 were measured at MCS0 Mbps, MCS4 Mbps, and MCS9 Mbps each for 802.11ac mode, bandwidth 80MHz.

Bandwidth 80MHz

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
42	MCS0	< 11.00	-7.57	-18.57
	MCS4	< 11.00	-11.34	-22.34
	MCS9	< 11.00	-14.77	-25.77
58	MCS0	**< 11.00**	**-7.45**	**-18.45**
	MCS4	< 11.00	-11.27	-22.27
	MCS9	< 11.00	-14.54	-25.54
138	MCS0	< 11.00	-5.08	-16.08
	MCS4	< 11.00	-9.68	-20.68
	MCS9	< 11.00	-14.70	-25.70
155	MCS0	< 11.00	-18.88	-29.88
	MCS4	< 11.00	-21.13	-32.13
	MCS9	< 11.00	-23.01	-34.01

See figures 8-39 to 8-42 for the plots of the peak power spectral density for channel 42, 58, 138 and 155 at MCS0 Mbps each for 802.11ac mode, 80MHz bandwidth.

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802.11ac RF Conducted Emission Test Results cont'd

Figure 8-39: Peak Power Spectral Density 802.11ac, Channel 42, MCS0 Mbps

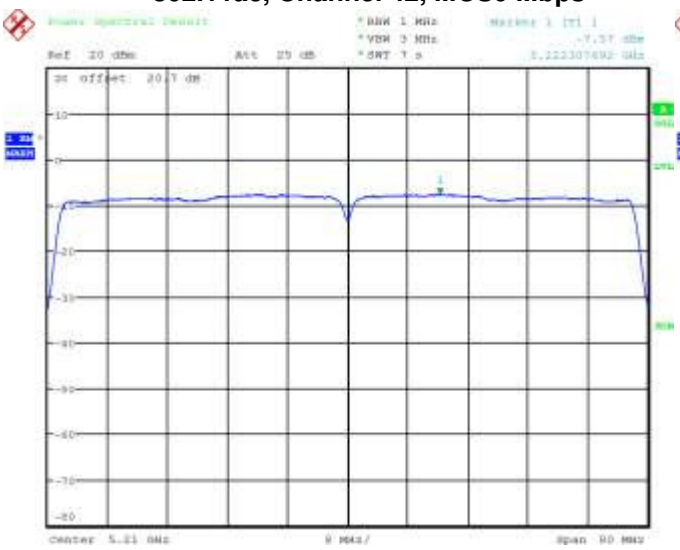


Figure 8-40: Peak Power Spectral Density 802.11ac, Channel 58, MCS0 Mbps

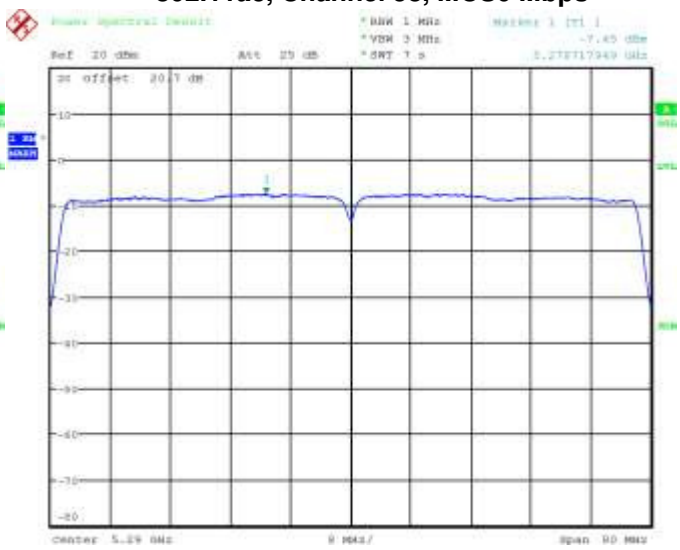


Figure 8-41: Peak Power Spectral Density 802.11ac, Channel 138, MCS0 Mbps

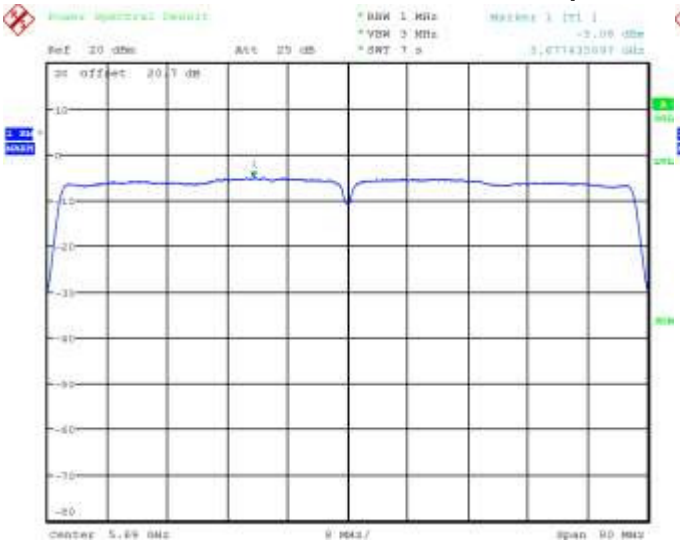
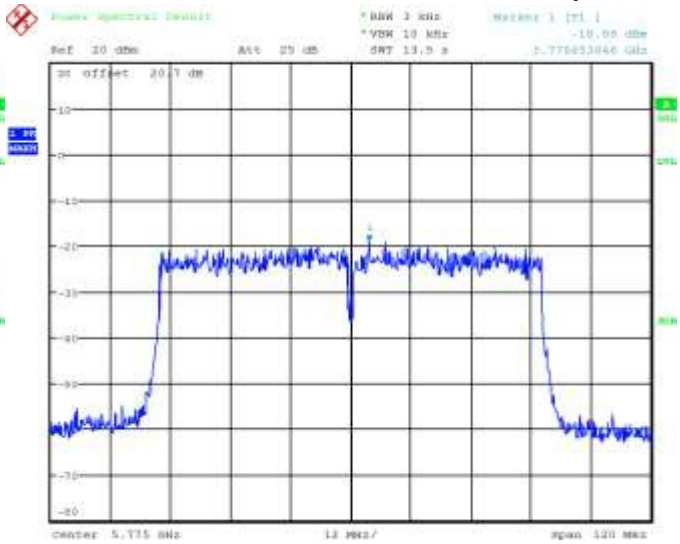


Figure 8-42: Peak Power Spectral Density 802.11ac, Channel 155, MCS0 Mbps



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802.11ac RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 140 and 149 were measured at MCS0 Mbps, MCS4 Mbps and MCS9 Mbps each for 802.11ac mode, 20MHz bandwidth. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 29.0 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

20MHZ Bandwidth

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
36	MCS0	16.26	-47.22	-63.48	-20
	MCS4	15.99	-48.76	-64.75	-20
	MCS9	**6.40**	**-47.81**	**-54.21**	-20
64	MCS0	17.34	-50.49	-67.83	-20
	MCS4	16.90	-51.62	-68.52	-20
	MCS9	6.12	-50.96	-57.08	-20
140	MCS0	13.23	-52.14	-65.37	-20
	MCS4	13.28	-52.32	-65.60	-20
	MCS9	6.21	-51.86	-58.07	-20
149	MCS0	14.92	-50.34	-65.26	-20
	MCS4	14.87	-50.56	-65.43	-20
	MCS9	6.93	-51.14	-58.07	-20

See figures 8-43 to 8-46 for the plots of the spurious RF conducted emissions for Channel 36, 64, 140 and 149 at MCS0 Mbps each for 802.11ac mode.

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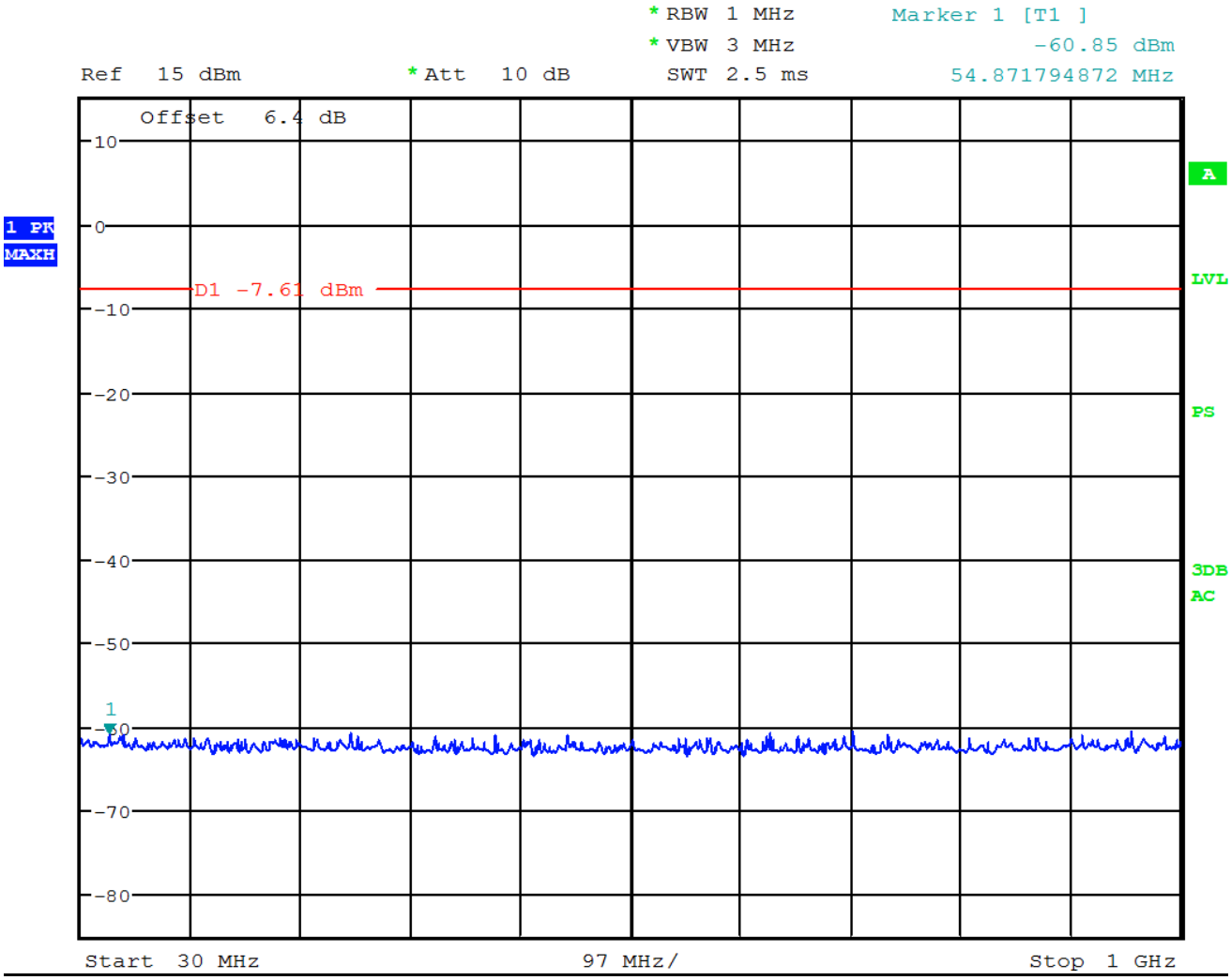
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-43a: Spurious RF Conducted Emissions, 802.11ac Channel 36, MCS0 Mbps



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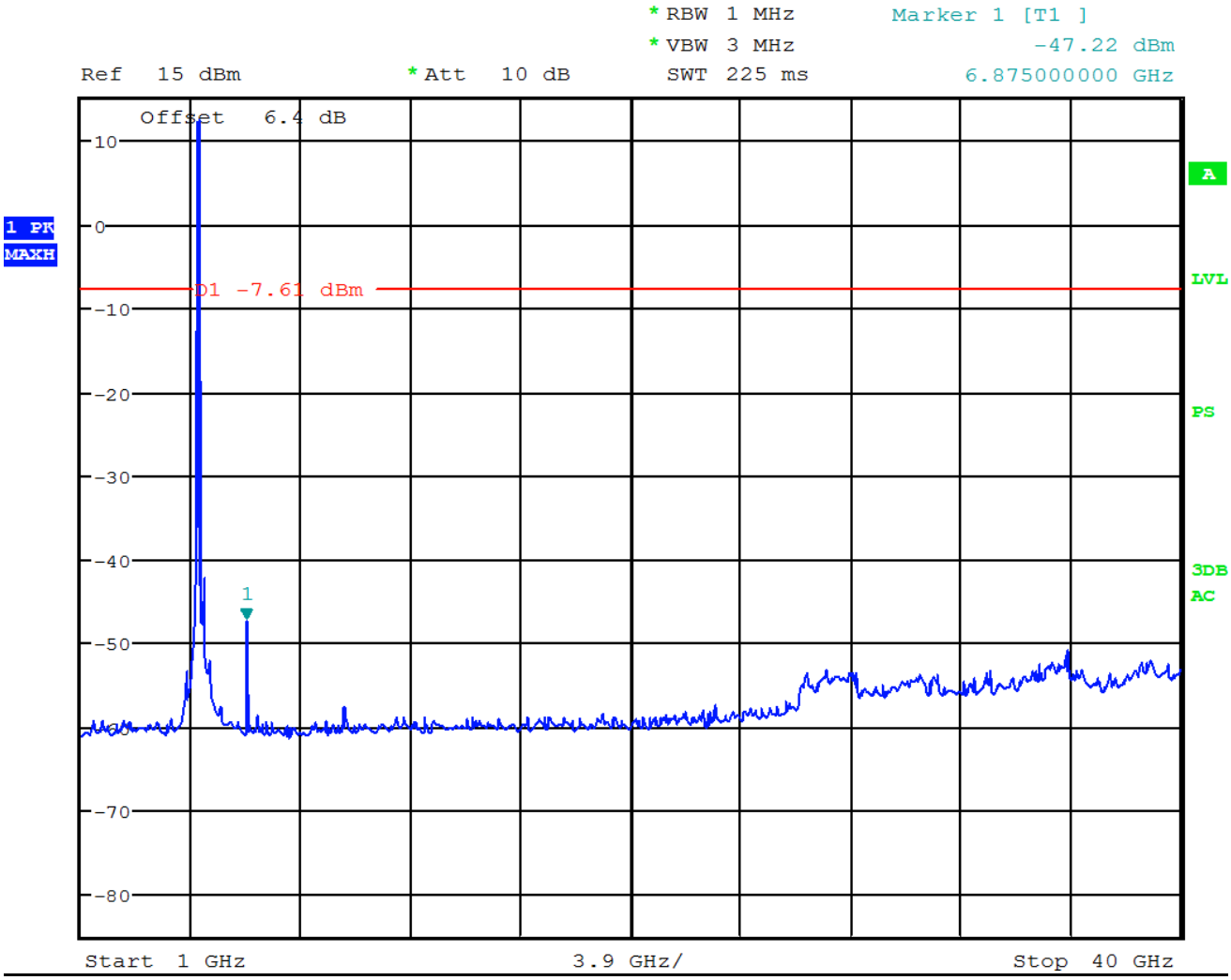
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-43b: Spurious RF Conducted Emissions, 802.11ac Channel 36, MCS0



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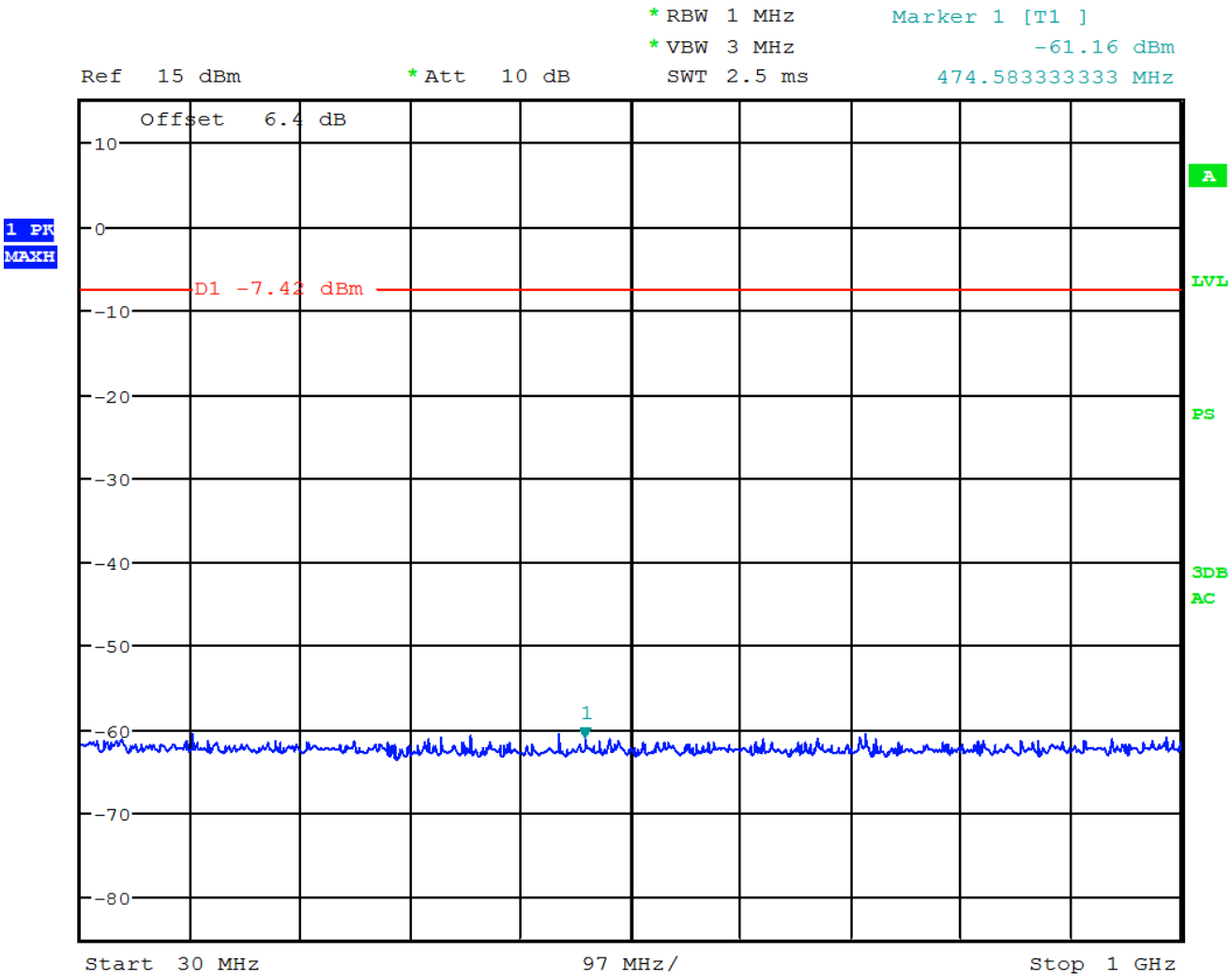
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-44a: Spurious RF Conducted Emissions, 802.11ac Channel 64, MCS0



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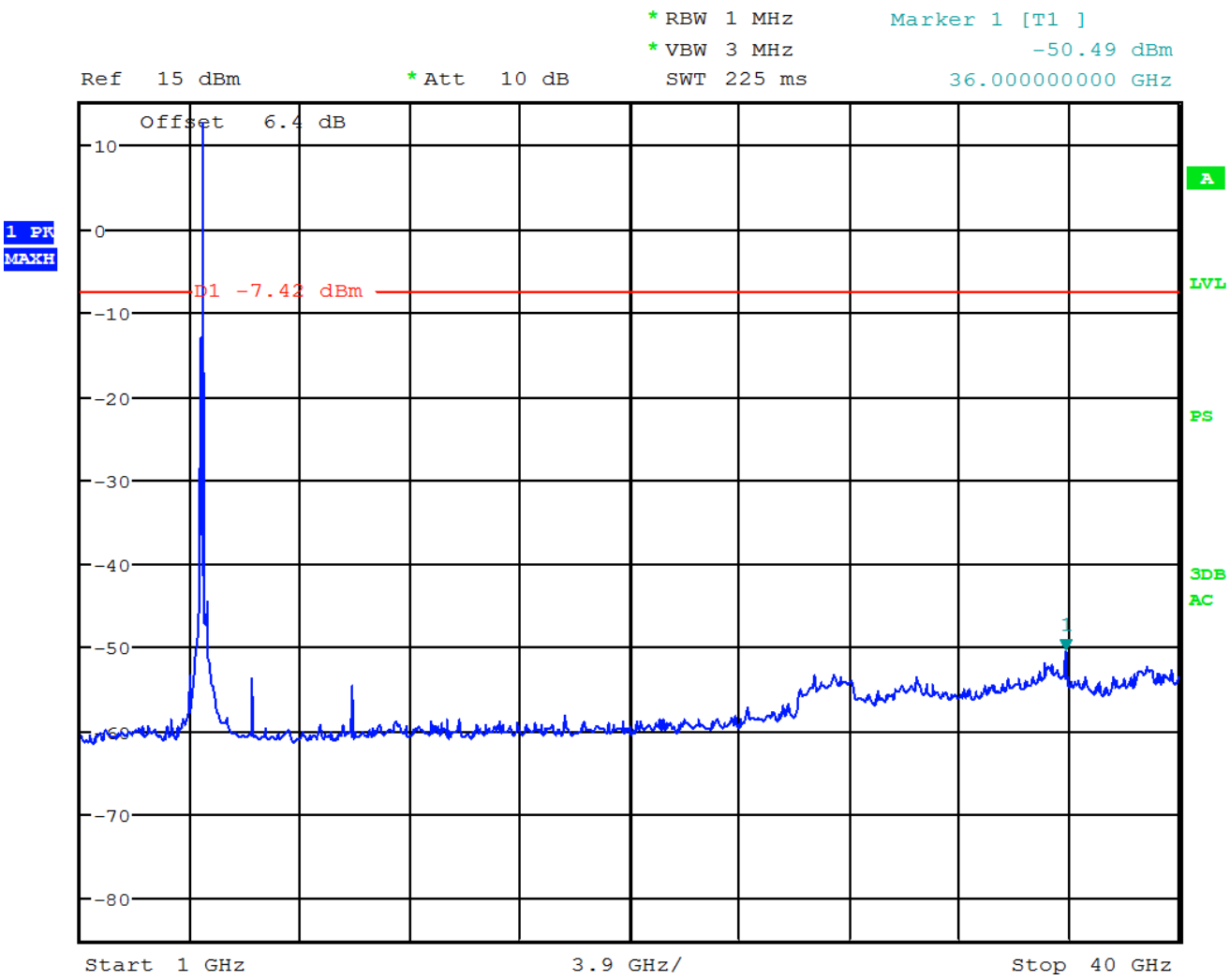
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-44b: Spurious RF Conducted Emissions, 802.11ac Channel 64, MCS0



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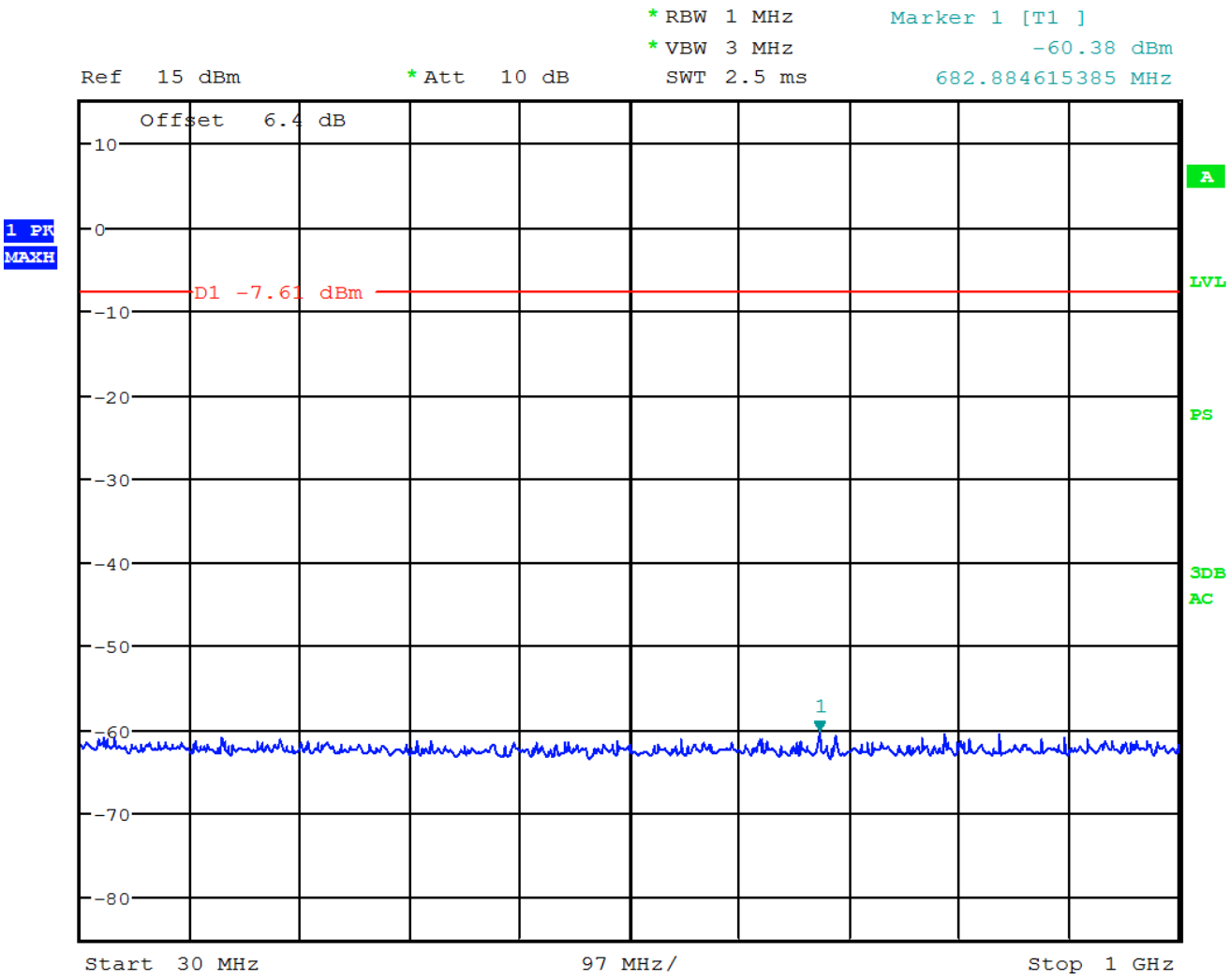
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-45a: Spurious RF Conducted Emissions, 802.11ac Channel 140, MCS0



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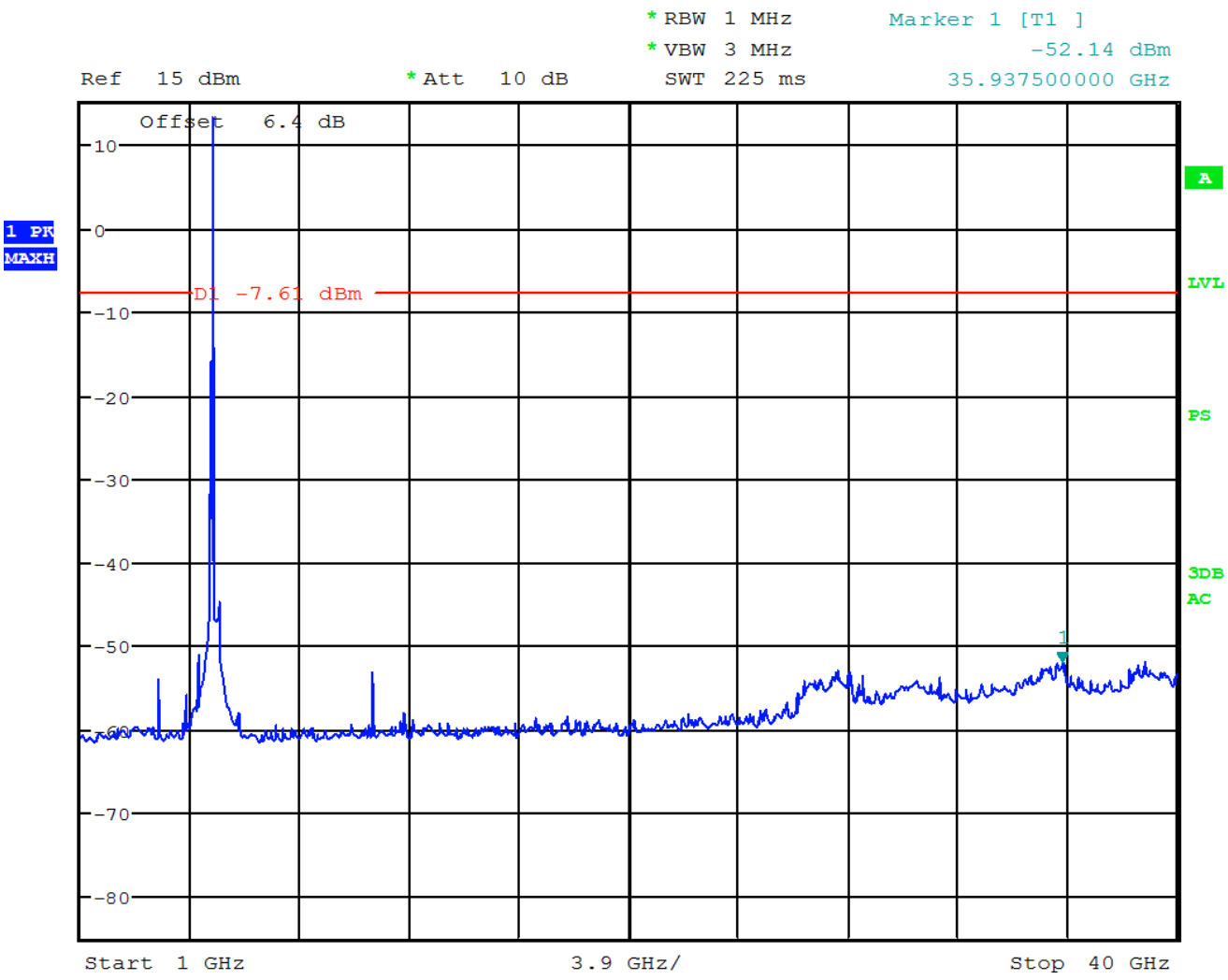
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-45b: Spurious RF Conducted Emissions, 802.11ac Channel 140, MCS0



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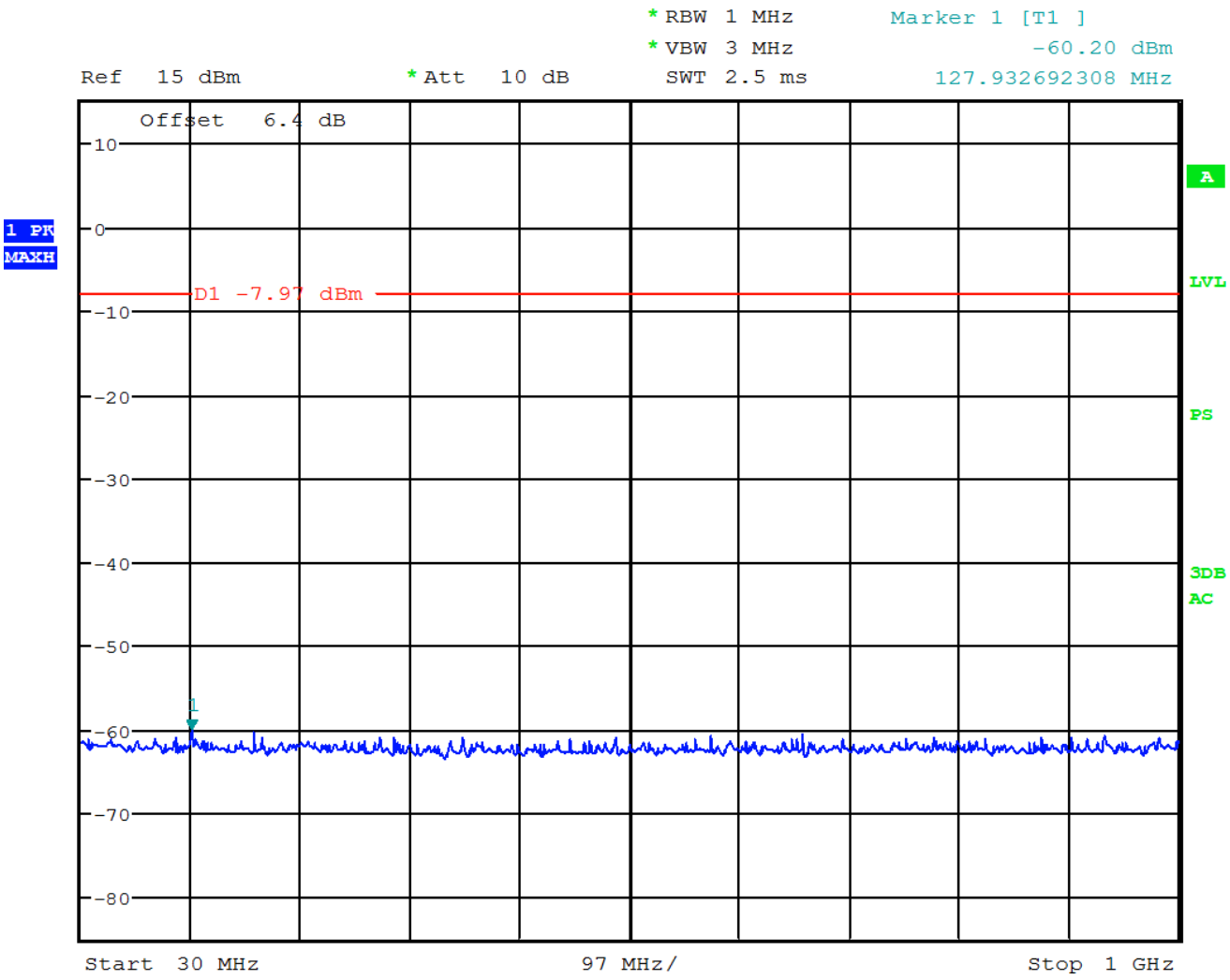
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-46a: Spurious RF Conducted Emissions, 802.11ac Channel 149, MCS0



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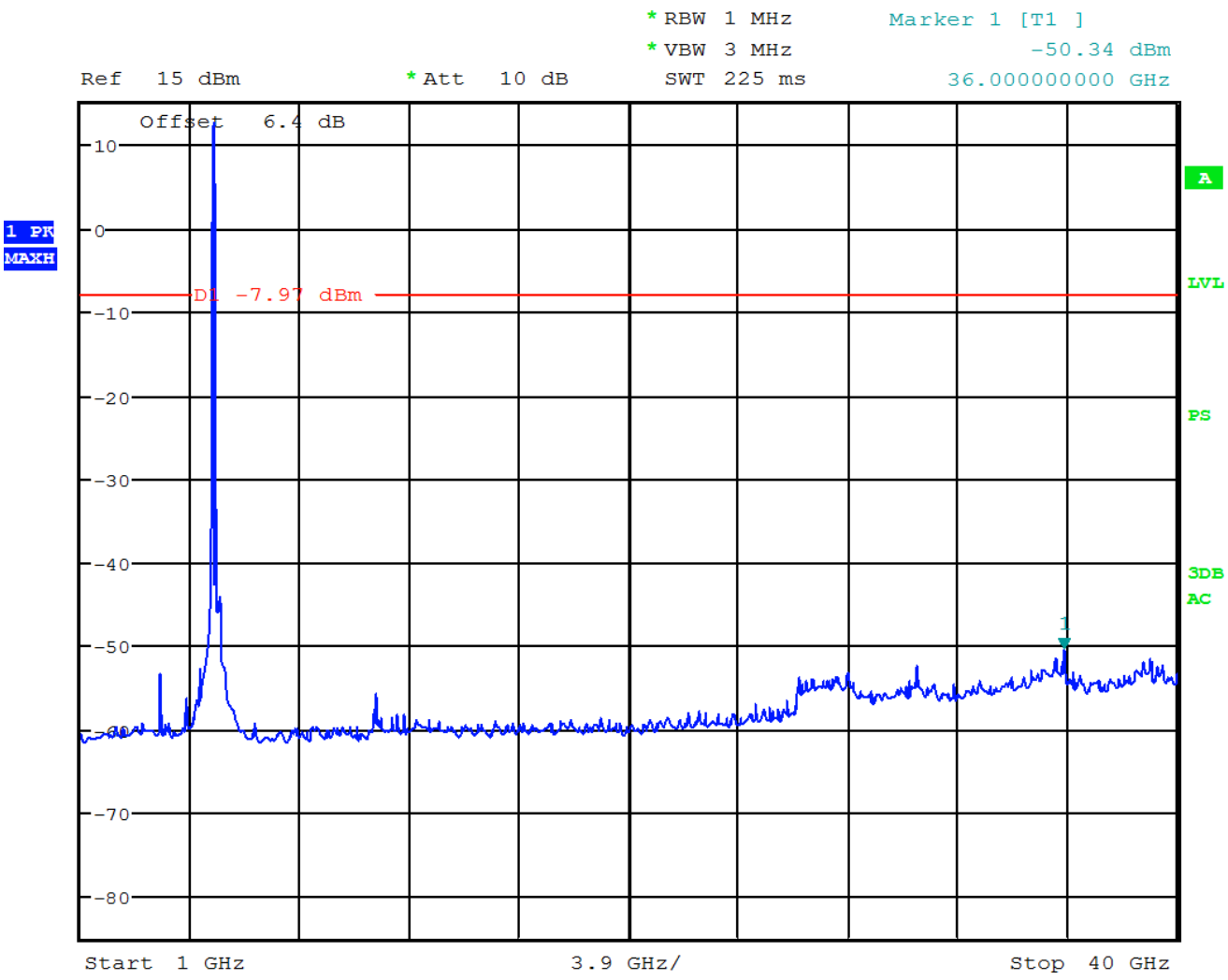
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-46b: Spurious RF Conducted Emissions, 802.11ac Channel 149, MCS0



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802.11ac RF Conducted Emission Test Results cont'd

Channels 38, 62, 142 and 151 were measured at MCS0 Mbps, MCS4 Mbps and MCS9 Mbps each for 802.11ac mode, 40MHz bandwidth. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 29.0 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

40MHZ Bandwidth

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
38	MCS0	16.26	-49.04	-65.30	-20
	MCS4	16.16	-49.56	-65.72	-20
	MCS9	10.79	-48.75	-59.54	-20
62	MCS0	17.25	-51.15	-68.40	-20
	MCS4	15.94	-51.56	-67.50	-20
	MCS9	10.56	-51.5	-62.06	-20
142	MCS0	17.42	-51.77	-69.19	-20
	MCS4	16.24	-50.89	-67.13	-20
	MCS9	10.56	-51.11	-61.67	-20
151	MCS0	15.13	-51.58	-66.71	-20
	MCS4	14.96	-51.67	-66.63	-20
	MCS9	11.25	-51.51	-62.76	-20

See figures 8-47 to 8-50 for the plots of the spurious RF conducted emissions for Channel 38, 62, 142 and 151 at MCS0 Mbps each for 802.11ac mode, bandwidth 40MHz.

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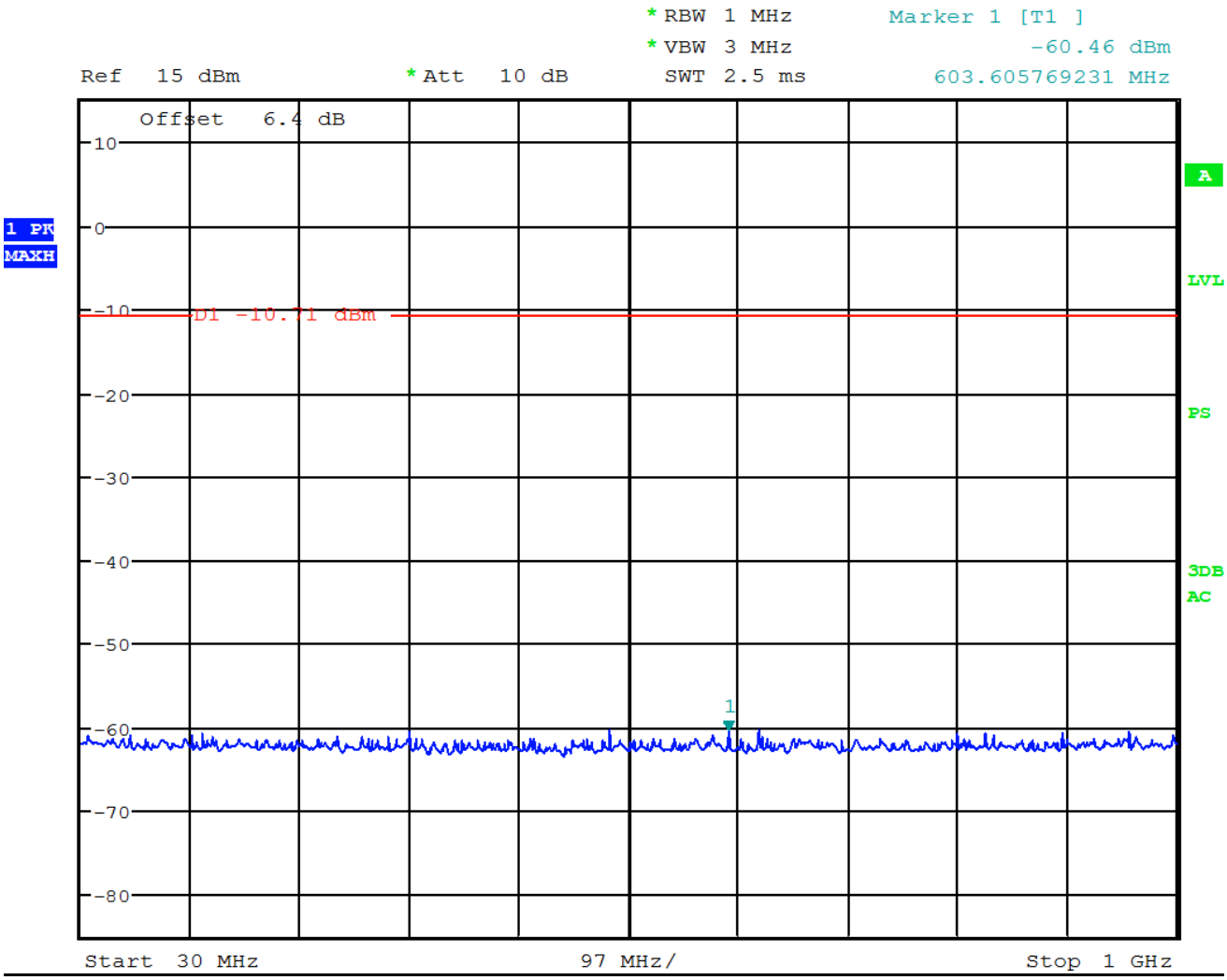
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-47a: Spurious RF Conducted Emissions, 802.11ac Channel 38, MCS0



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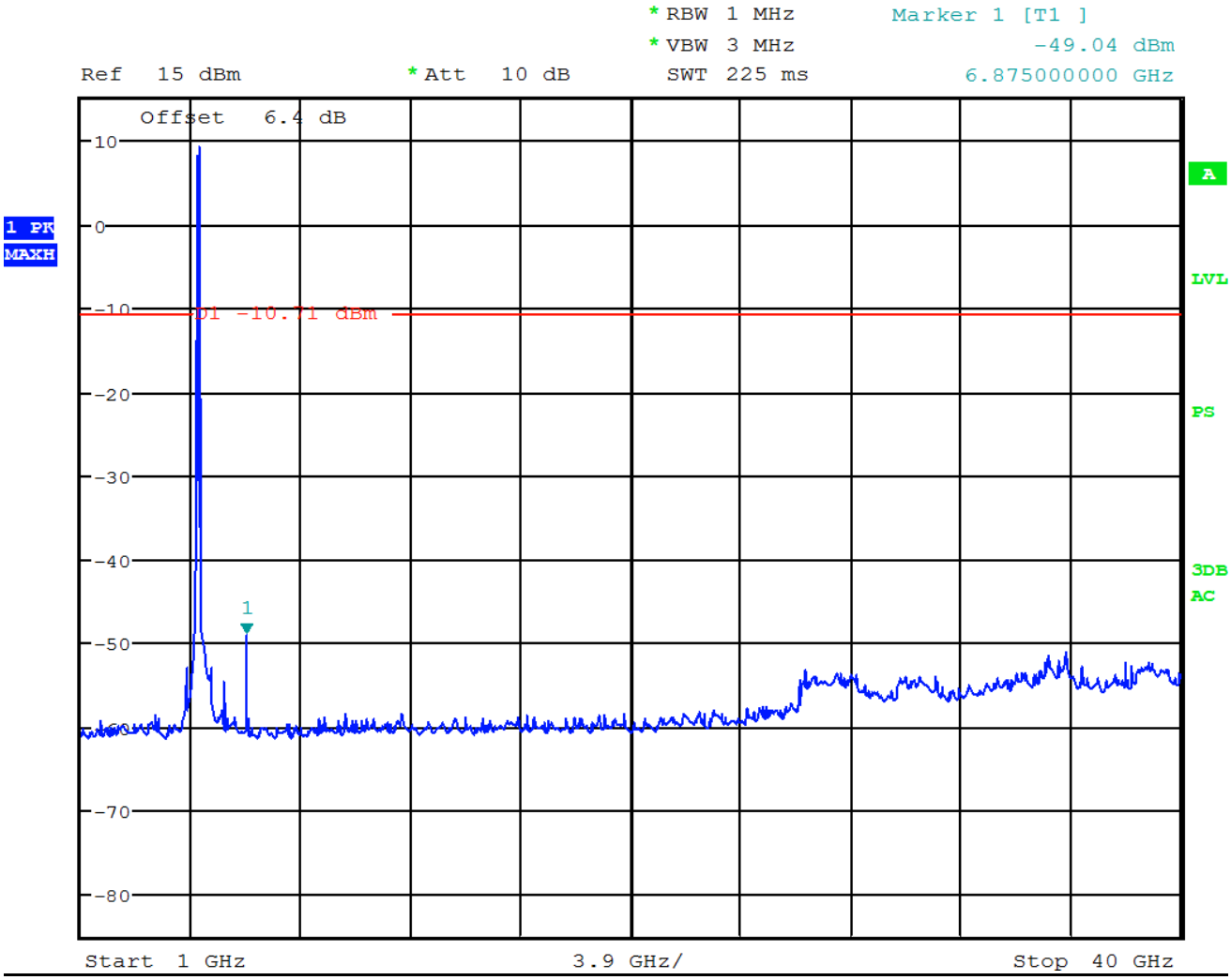
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-47b: Spurious RF Conducted Emissions, 802.11ac Channel 38, MCS0



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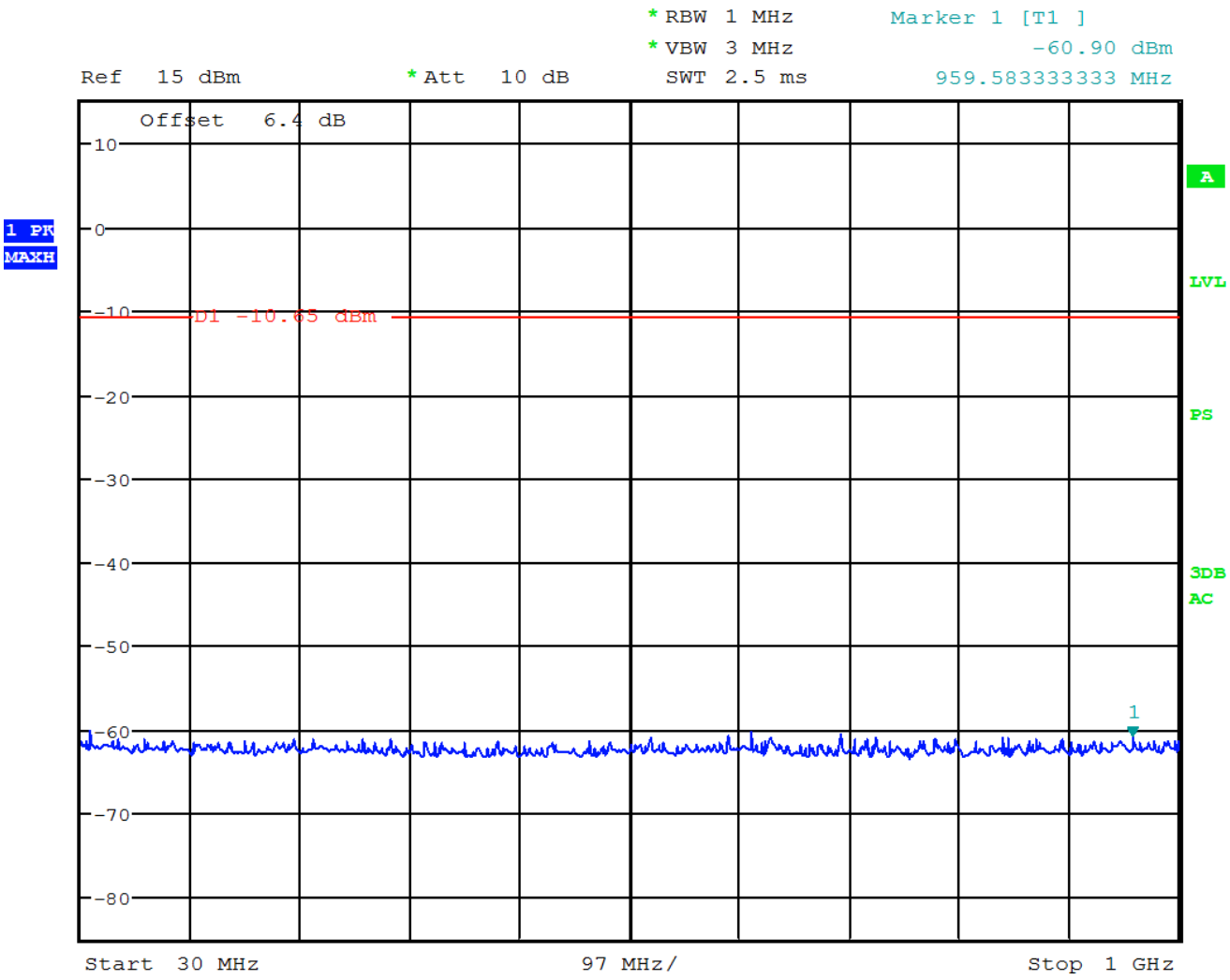
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-48a: Spurious RF Conducted Emissions, 802.11ac Channel 62, MCS0



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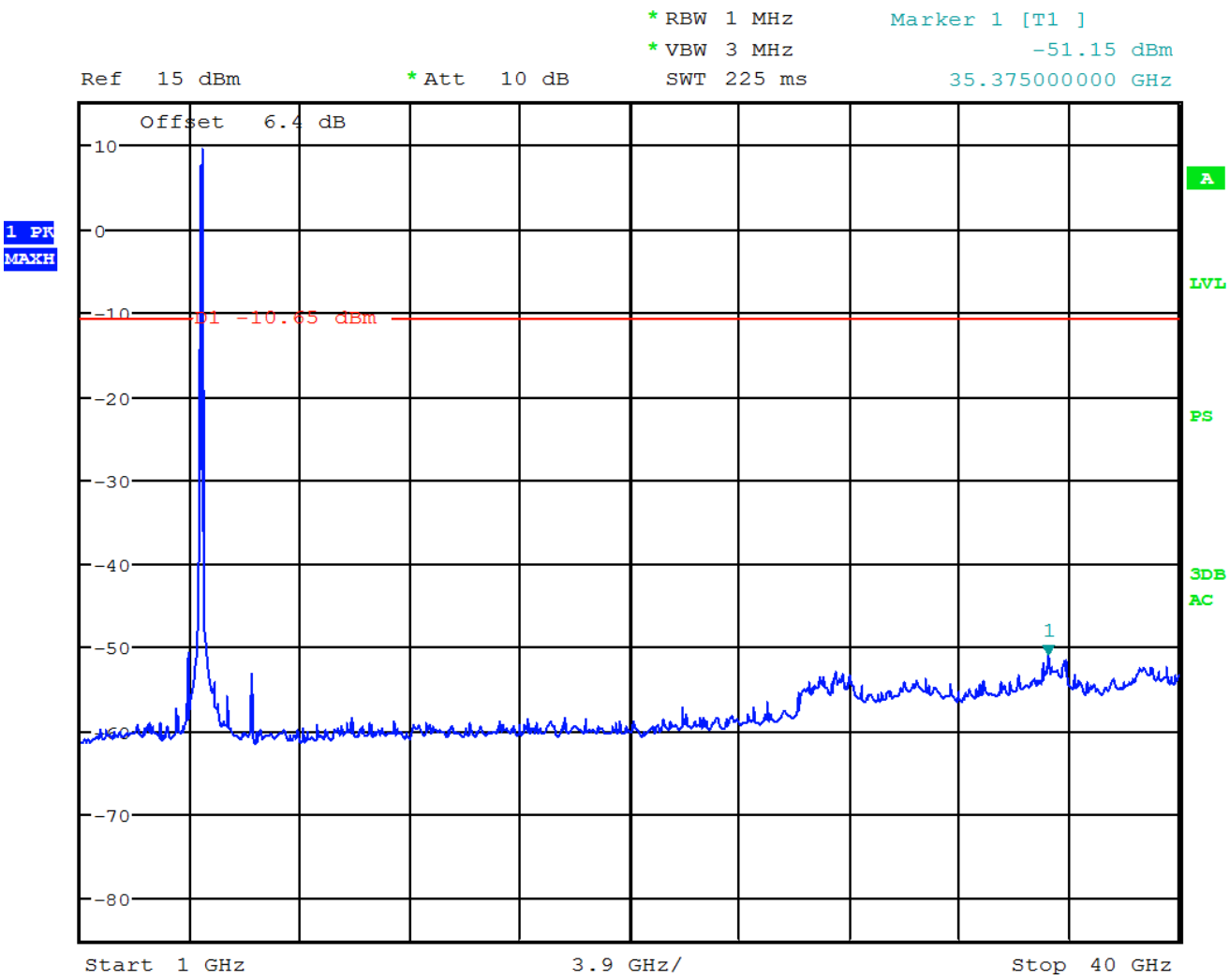
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-48b: Spurious RF Conducted Emissions, 802.11ac Channel 62, MCS0



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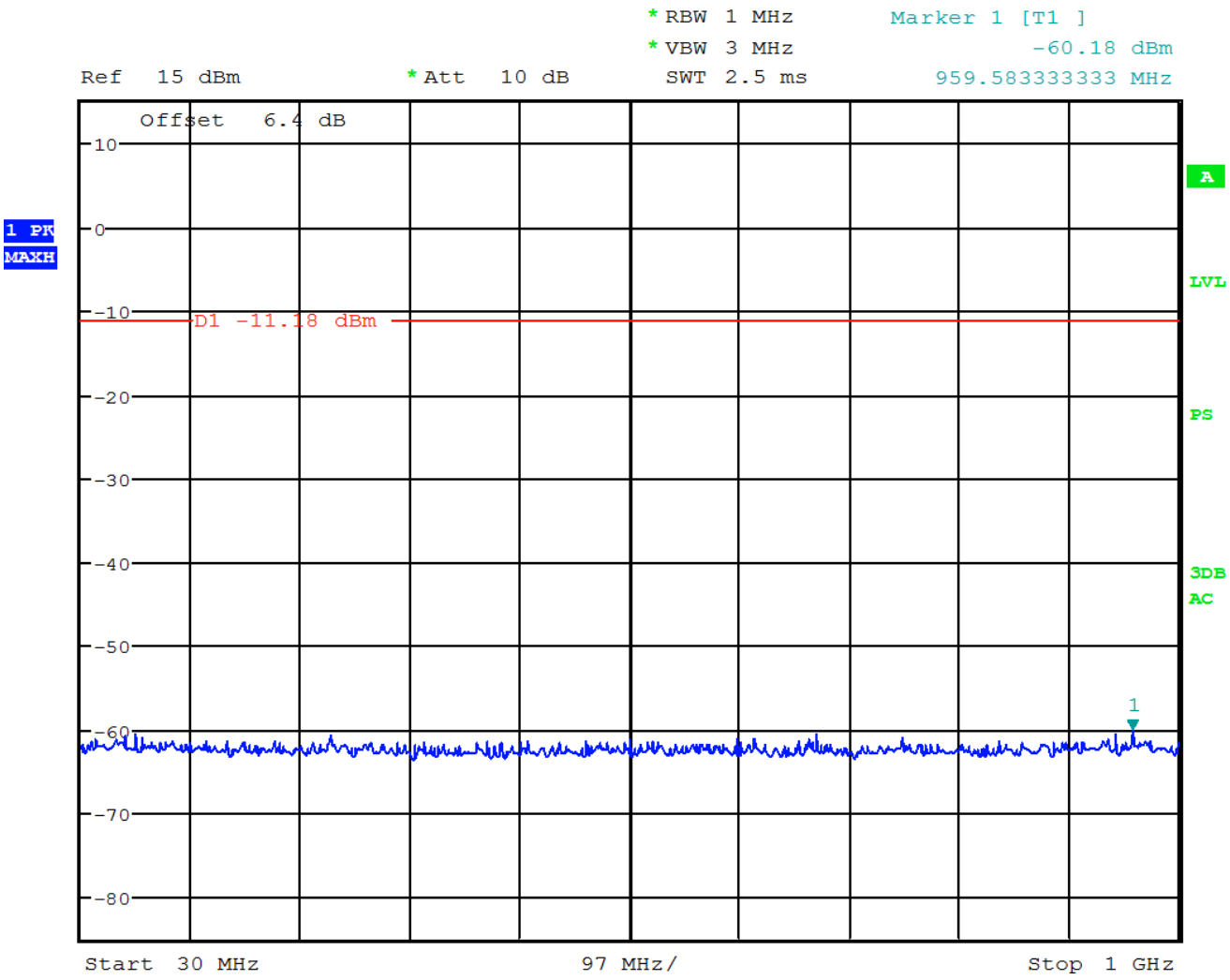
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-49a: Spurious RF Conducted Emissions, 802.11ac Channel 142, MCS0



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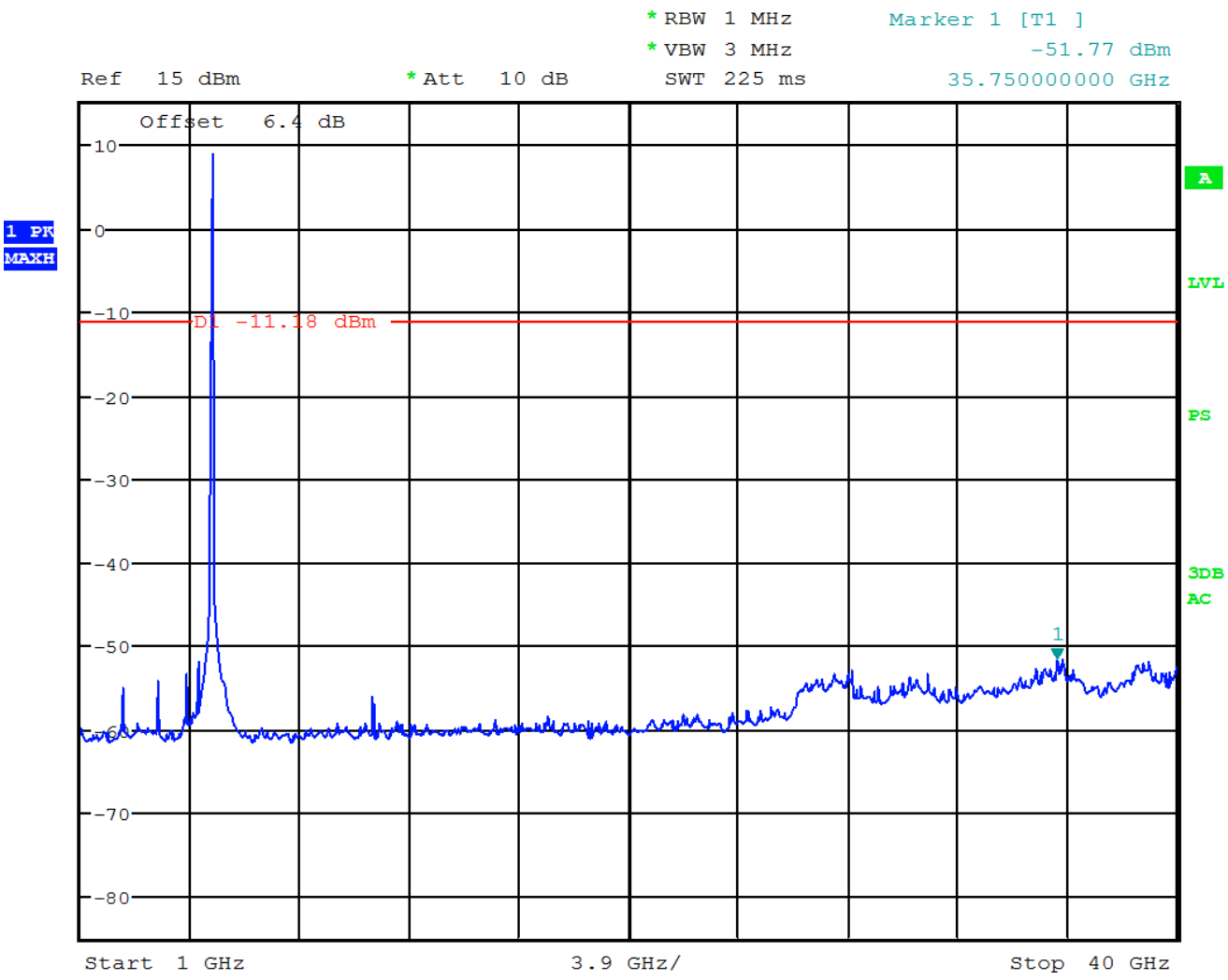
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-49b: Spurious RF Conducted Emissions, 802.11ac Channel 142, MCS0



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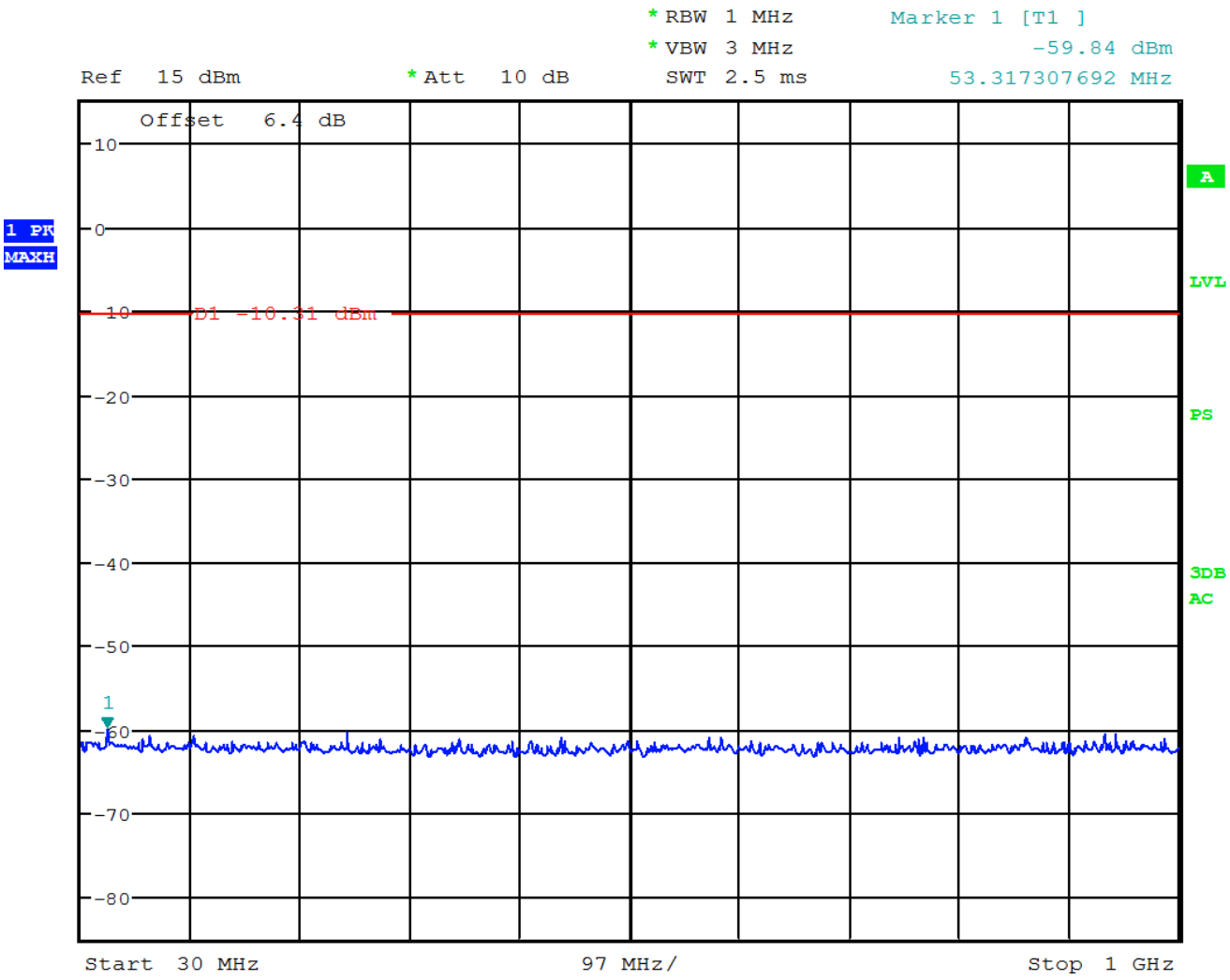
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-50a: Spurious RF Conducted Emissions, 802.11ac Channel 151, MCS0



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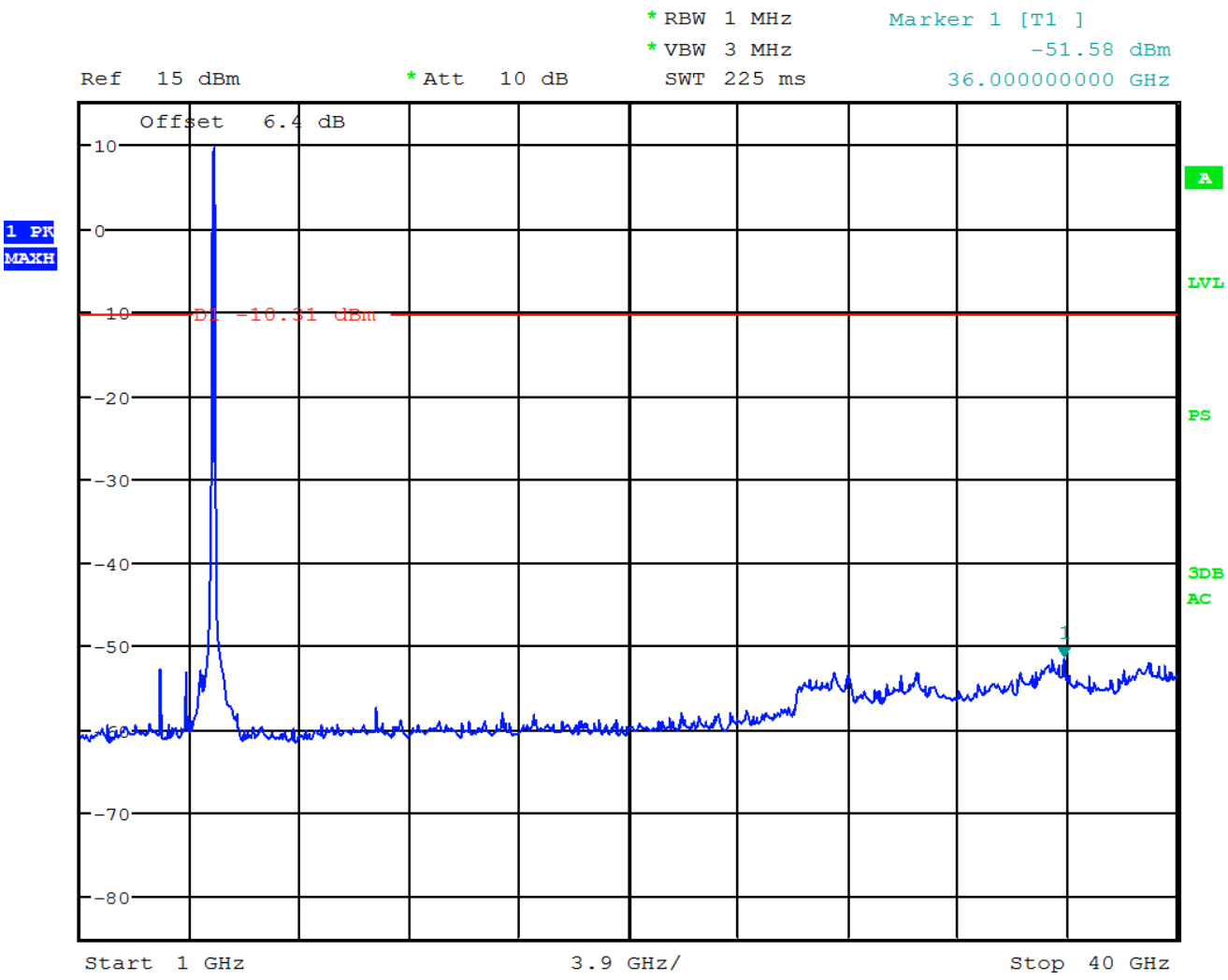
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-50b: Spurious RF Conducted Emissions, 802.11ac Channel 151, MCS0



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802.11ac RF Conducted Emission Test Results cont'd

Channels 42, 58, 138 and 155 were measured at MCS0 Mbps, MCS4 Mbps and MCS9 Mbps each for 802.11ac mode, 80MHz bandwidth. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 29.0 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

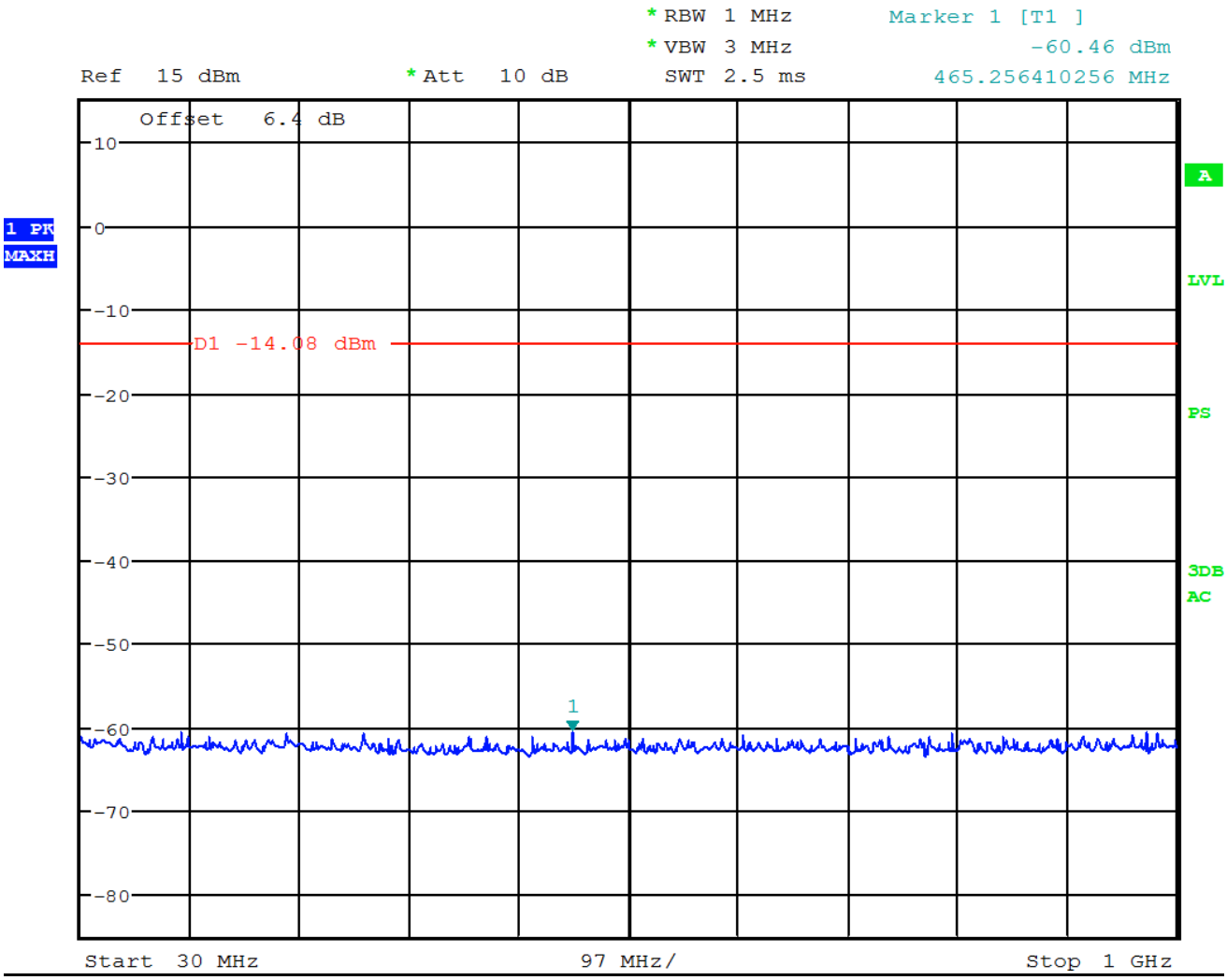
80MHZ Bandwidth

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
42	MCS0	13.66	-49.97	-63.63	-20
	MCS4	12.51	-50.16	-62.67	-20
	MCS9	8.09	-50.12	-58.21	-20
58	MCS0	13.95	-51.17	-65.12	-20
	MCS4	12.89	-52.43	-65.32	-20
	MCS9	8.13	-51.76	-59.89	-20
138	MCS0	16.05	-51.07	-67.12	-20
	MCS4	14.07	-50.44	-64.51	-20
	MCS9	8.02	-50.96	-58.98	-20
155	MCS0	14.11	-51.04	-65.15	-20
	MCS4	12.81	-51.42	-64.23	-20
	MCS9	8.35	-50.67	-59.02	-20

See figures 8-51 to 8-54 for the plots of the spurious RF conducted emissions for Channel 42, 58, 138 and 155 at MCS0 Mbps each for 802.11ac mode, bandwidth 80MHz.

802.11ac RF Conducted Emission Test Results cont'd

Figure 8-51a: Spurious RF Conducted Emissions, 802.11ac Channel 42, MCS0



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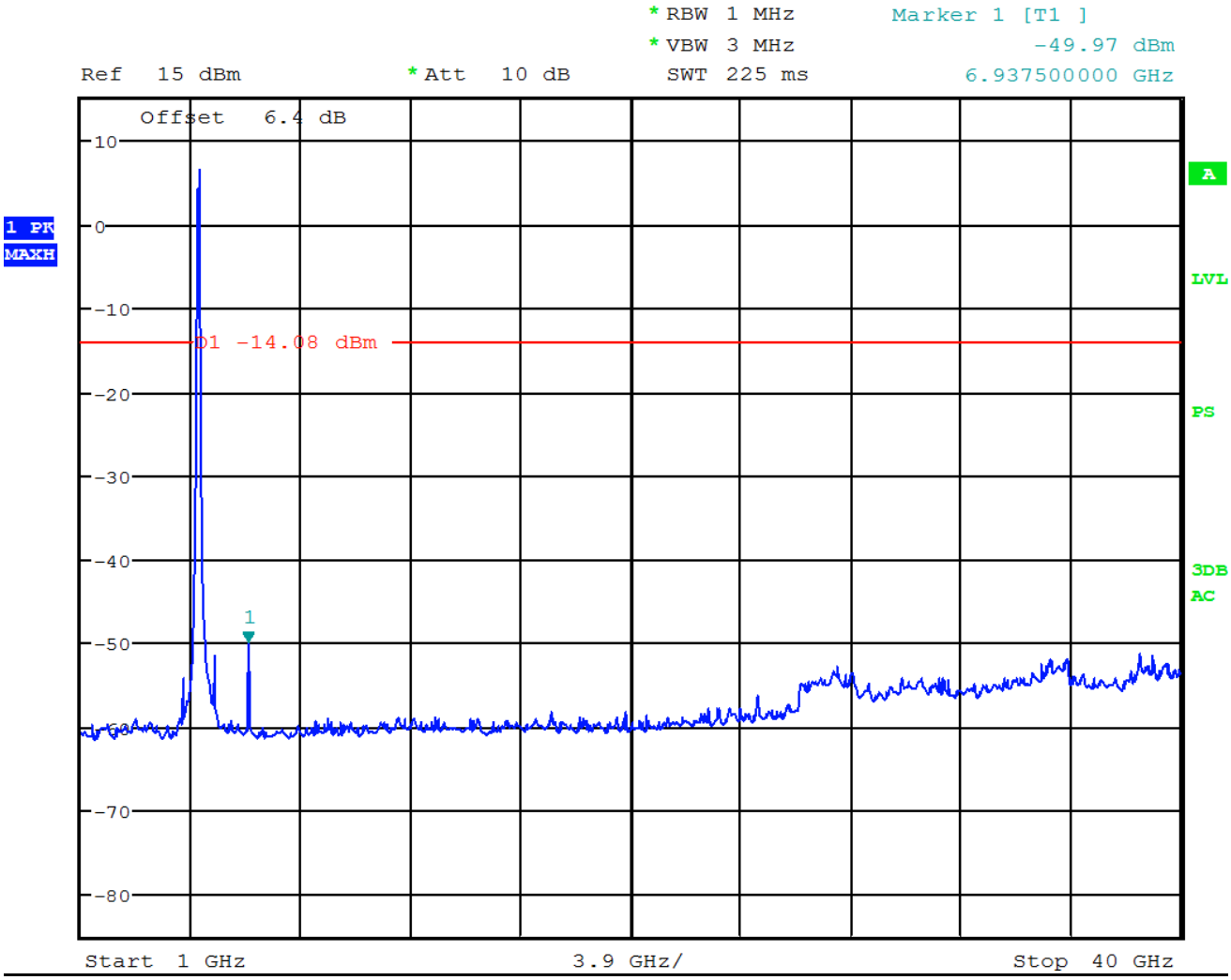
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-51b: Spurious RF Conducted Emissions, 802.11ac Channel 42, MCS0



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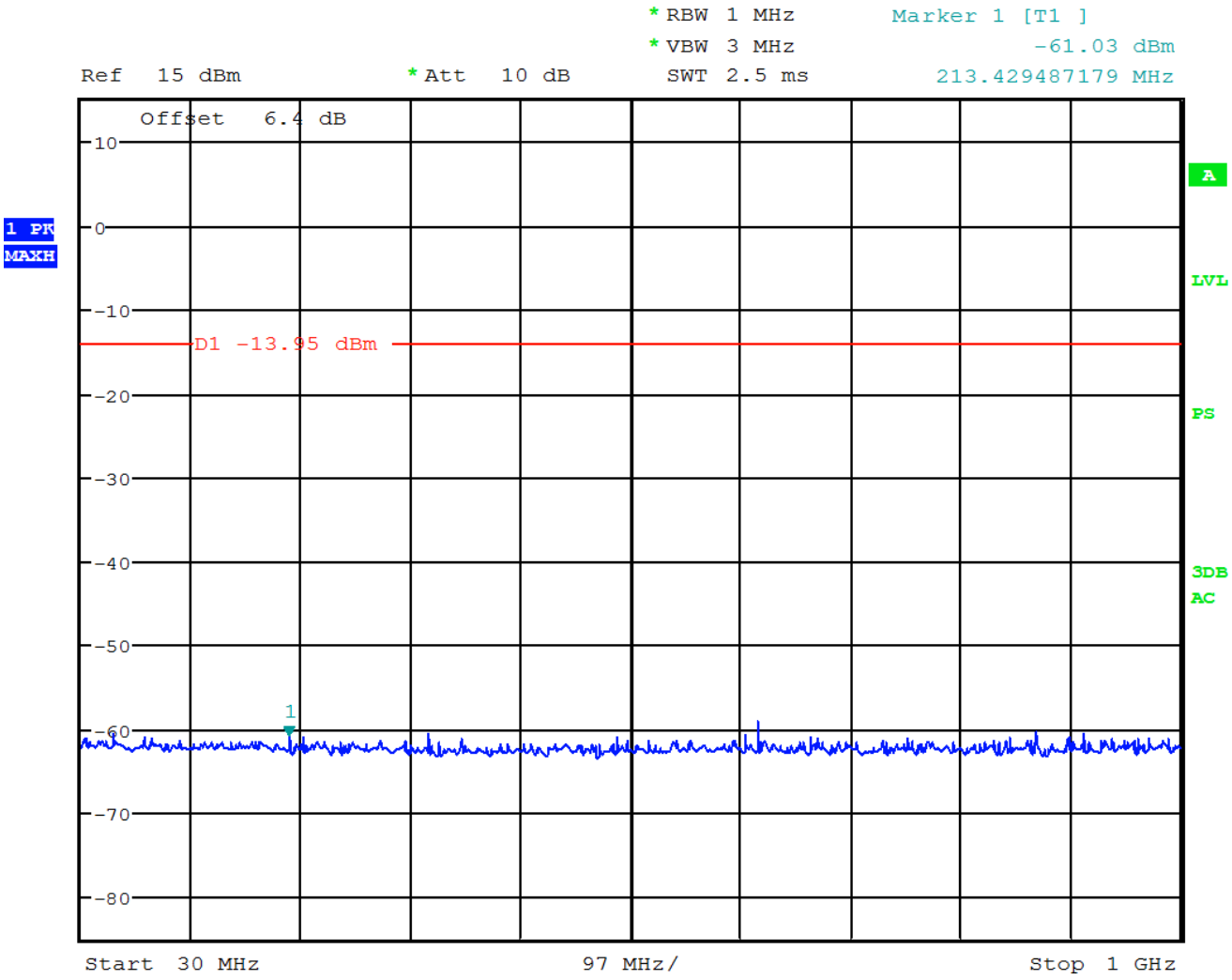
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-52a: Spurious RF Conducted Emissions, 802.11ac Channel 58, MCS0



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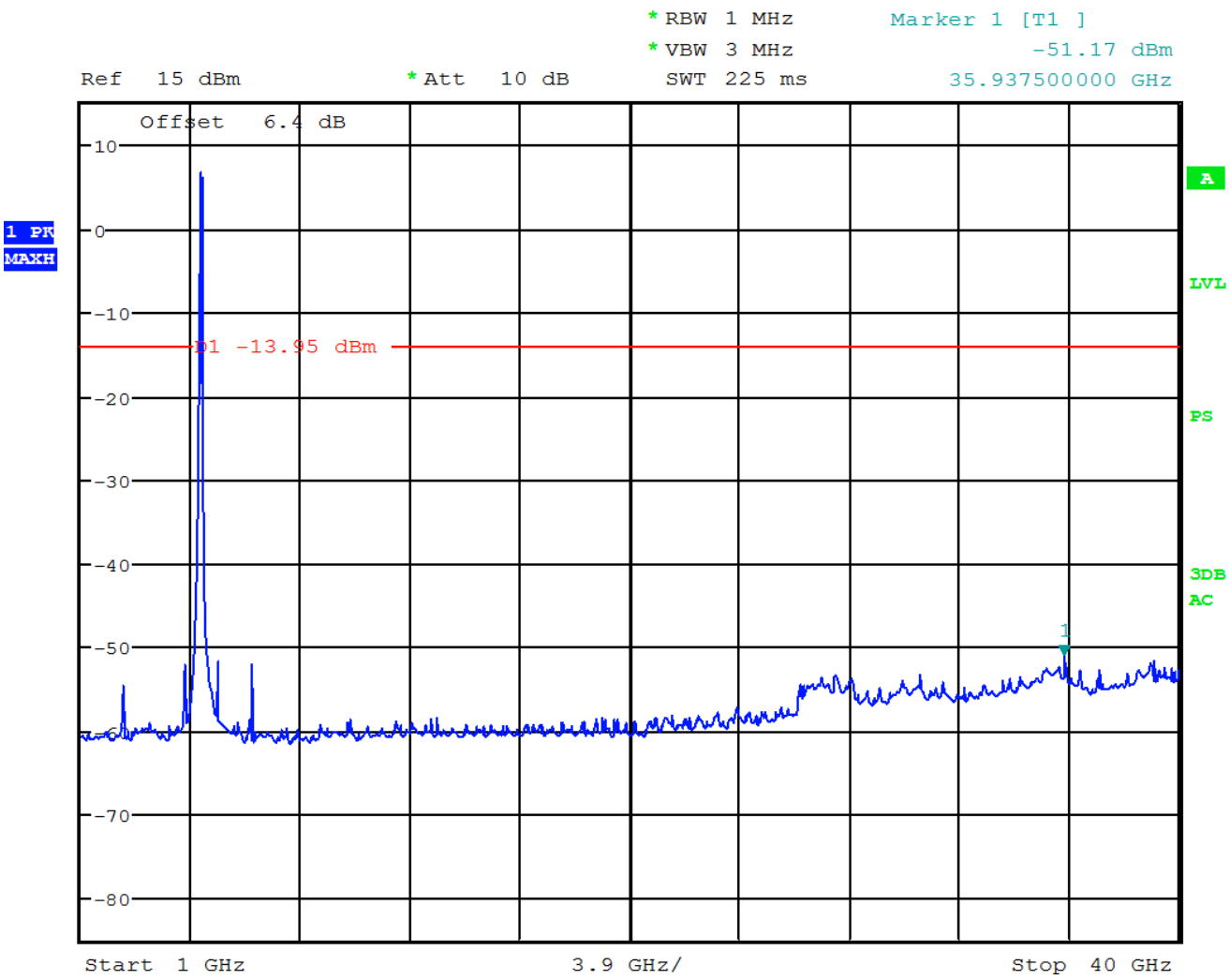
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-52b: Spurious RF Conducted Emissions, 802.11ac Channel 58, MCS0



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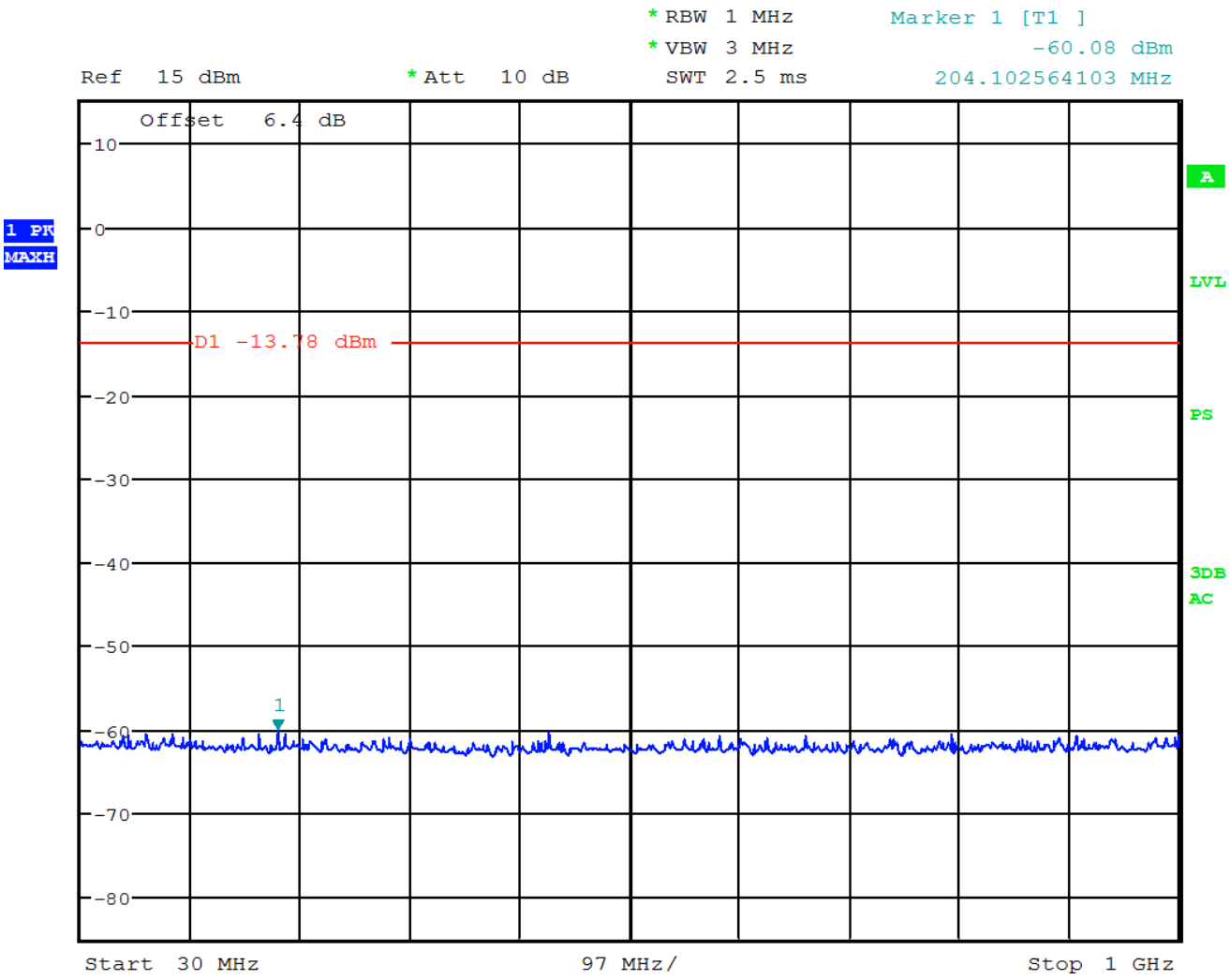
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-53a: Spurious RF Conducted Emissions, 802.11ac Channel 138, MCS0



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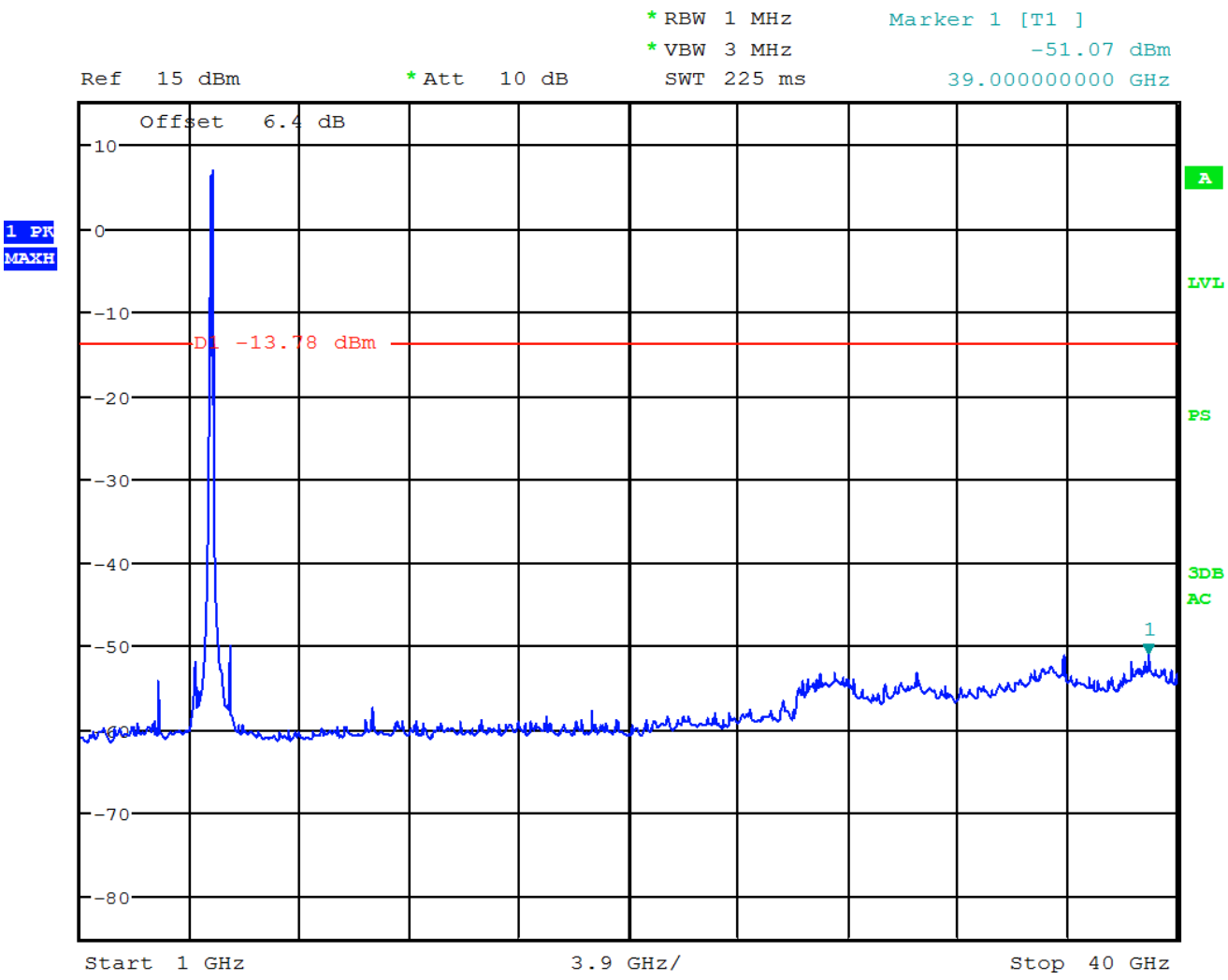
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-53b: Spurious RF Conducted Emissions, 802.11ac Channel 138, MCS0



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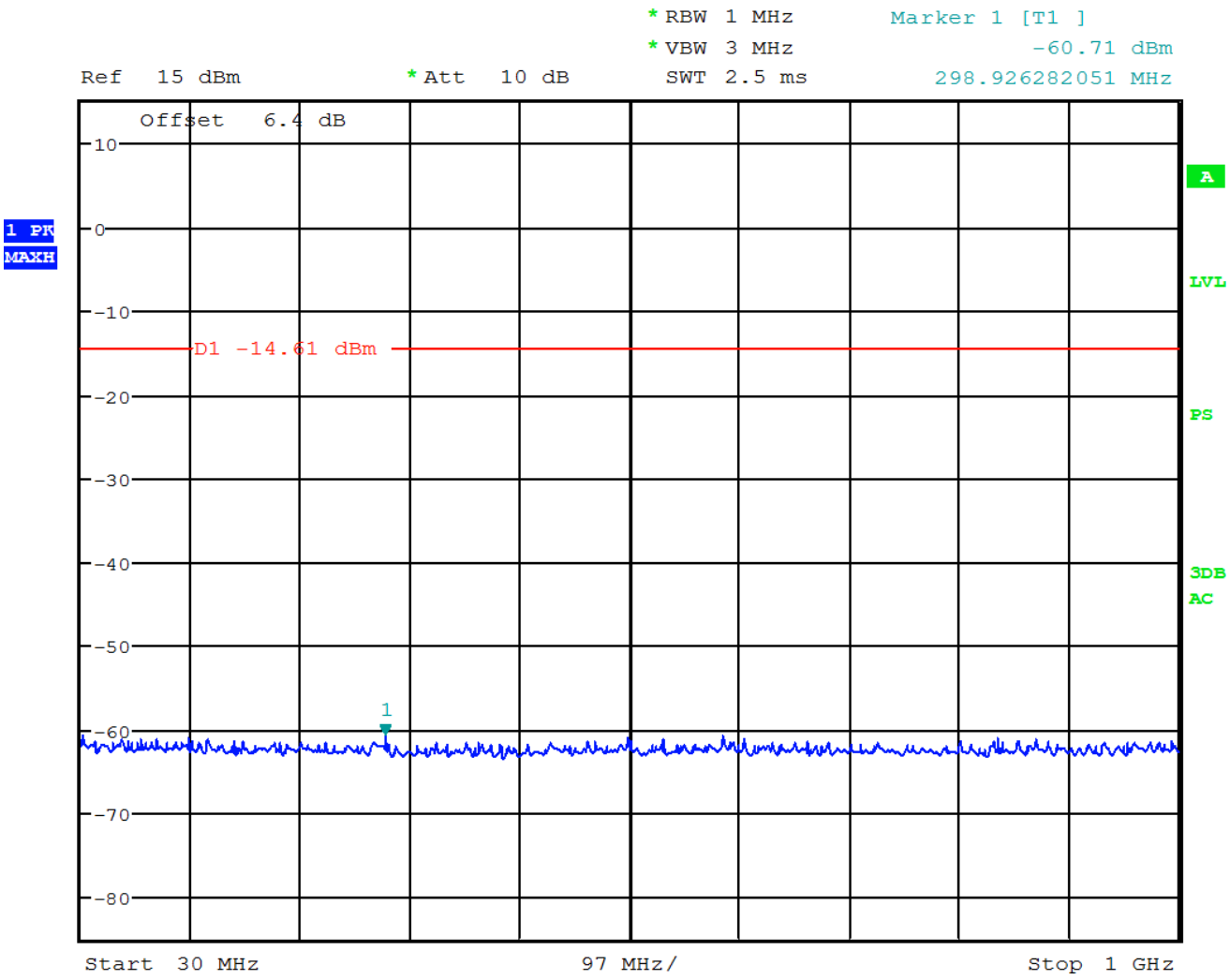
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-54a: Spurious RF Conducted Emissions, 802.11ac Channel 155, MCS0



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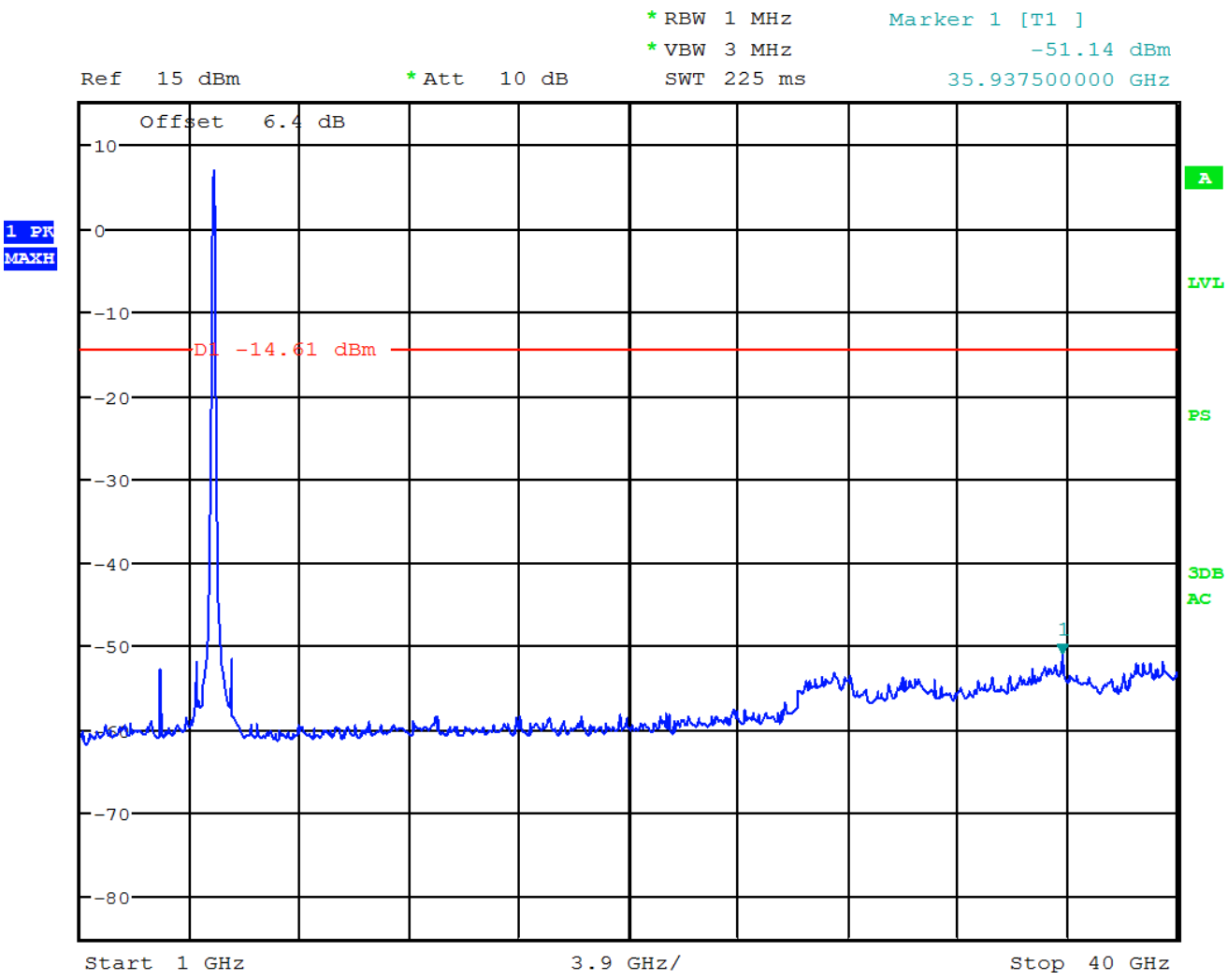
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-54b: Spurious RF Conducted Emissions, 802.11ac Channel 155, MCS0



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APPENDIX 9 – NEAR FIELD COMMUNICATIONS TEST DATA/PLOTS

Near Field Communications (NFC) Test Results

Radiated Emissions

Date of Test: June 20, 2014

Measurements were performed by Rex Zhang.

The environmental test conditions were: Temperature: 28.0 ºC
Relative Humidity: 47.6 %

The test distance was 3.0 meters with a EUT height of 0.8 meters, and sweep frequency of 9 kHz to 1 GHz.

The BlackBerry® smartphone was in vertical position.

The frequency sweep measurements were performed in Near Field Communications Tx mode at 13.56 MHz

Frequency (MHz)	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dBµV/m)	Limit (dBµV/m)	Test Margin (dB)
13.57	35.2	16.67	52.42	124.00	-71.58

All other emissions had a test margin of greater than 25.0 dB

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Near Field Communications (NFC) Test Results

Following tests were performed on the model RGY181LW.

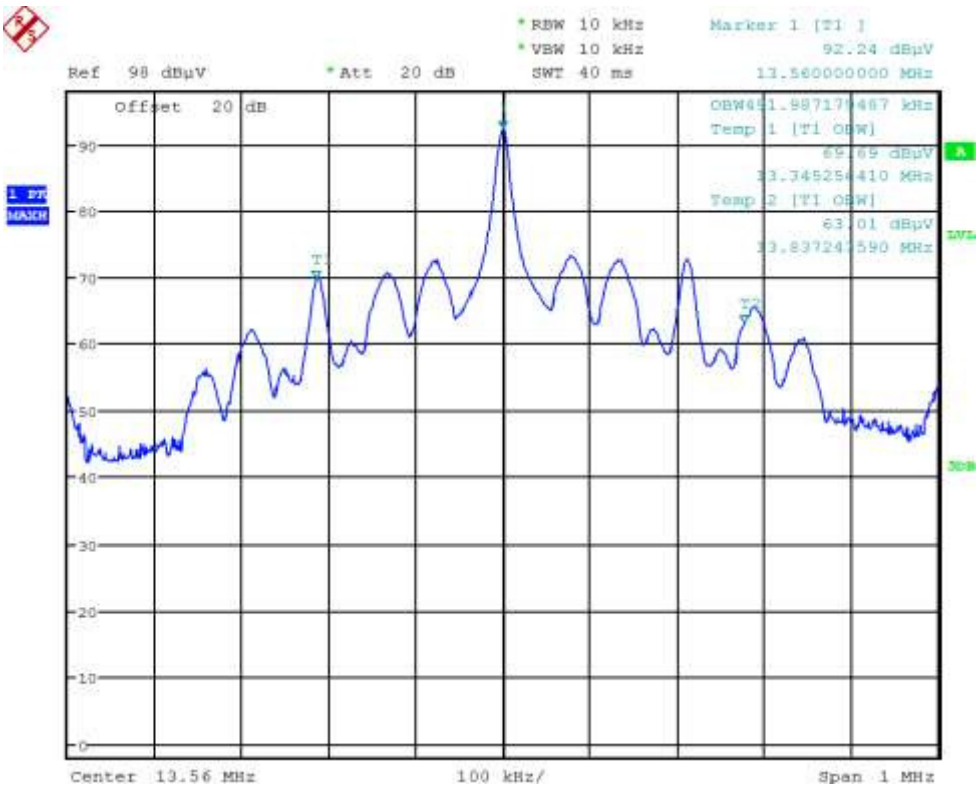
Occupied Bandwidth

Date of test: June 2, 2013
The measurements were performed by Chuan Tran.

The environmental test conditions were: Temperature: 25.2 ºC
Relative Humidity: 41.5 %

Operation mode (TX ON)	Occupied Bandwidth (kHz)
NFC, modulated	491.99

Figure 9-1: Occupied Bandwidth, NFC TX Frequency = 13.56 MHz



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Near Field Communications (NFC) Test Results cont'd

Frequency Stability

The measurements were performed by Chuan Tran.

The environmental test conditions were: Temperature: 25.2 ºC
Relative Humidity: 41.5 %

Test Temperature (Celsius)	Nominal Freq. (MHz)	Measured Freq. (MHz)	Input Voltage (Volts)	Max Freq Error (Hz)	% Deviation (Limit .01%)	PPM
-20	13.56	13.560022	3.6	0.000022	22	0.00017
-20	13.56	13.560003	3.8	0.000003	3	0.00002
-20	13.56	13.560013	4.35	0.000013	13	0.00009
-10	13.56	13.559511	3.6	-0.000489	-489	-0.00360
-10	13.56	13.559745	3.8	-0.000255	-255	-0.00188
-10	13.56	13.559579	4.35	-0.000421	-421	-0.00311
0	13.56	13.559611	3.6	-0.000389	-389	-0.00287
0	13.56	13.559599	3.8	-0.000401	-401	-0.00295
0	13.56	13.560040	4.35	0.000040	40	0.00030
10	13.56	13.559753	3.6	-0.000247	-247	-0.00182
10	13.56	13.559779	3.8	-0.000221	-221	-0.00163
10	13.56	13.559736	4.35	-0.000264	-264	-0.00195
20	13.56	13.560032	3.6	0.000032	32	0.00024
20	13.56	13.560032	3.8	0.000032	32	0.00024
20	13.56	13.560018	4.35	0.000018	18	0.00013

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Near Field Communications (NFC) Test Results cont'd

Frequency Stability cont'd

Test Temperature (Celsius)	Nominal Freq. (MHz)	Measured Freq. (MHz)	Input Voltage (Volts)	Max Freq Error (Hz)	% Deviation (Limit .01%)	PPM
30	13.56	13.560010	3.6	0.000010	10	0.00007
30	13.56	13.560024	3.8	0.000024	24	0.00018
30	13.56	13.559500	4.35	-0.000500	-500	-0.00369
40	13.56	13.559643	3.6	-0.000357	-357	-0.00264
40	13.56	13.556503	3.8	-0.003497	-3497	-0.02579
40	13.56	13.559931	4.35	-0.000069	-69	-0.00051
50	13.56	13.559532	3.6	-0.000468	-468	-0.00345
50	13.56	13.559537	3.8	-0.000463	-463	-0.00342
50	13.56	13.559684	4.35	-0.000316	-316	-0.00233
60	13.56	13.559545	3.6	-0.000455	-455	-0.00336
60	13.56	13.559606	3.8	-0.000394	-394	-0.00291
60	13.56	13.559639	4.35	-0.000361	-361	-0.00266

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