Diamond Light Source Ltd
Beam Diagnostics Group

Date: June 19, 2017

BPM Test Report

This is a LaTeXtest report for the, beam profile monitor electronics that are used at Diamond. In this document the different tests will be recorded in their own individual section. along with the specific parameters that are being tested and the test method used.

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1 Beam Power Dependance

Text that will describe the test

The devices used for this test are:

RF Source Rigol Technologies,DSG3030,DSG3B174500308,00.01.06
Libera BPM with the Epics ID "TS-DI-EBPM-04:" and the MAC Address "00:d0:50:31:03:b9"

The parameters used in this test are:

Frequency: 499.6817682MHz
Starting output power: -70dBm
Final output power: -60dBm
Samples: 30
Settling time: 3s

Figure 1: Beam Power Dependence Results

Output Power (dBm)	Input Power (dBm)	BPM Current (mA)	X Position (mm)	Y Position (mm)	ADC Sum (Counts)
-70.0	-83.55	0.07	0.48	0.54	4699298.0
-69.66	-83.24	0.07	0.47	0.53	4868309.0
-69.31	-82.92	0.07	0.47	0.52	5050801.0
-68.97	-82.61	0.07	0.47	0.51	5236309.0
-68.62	-82.31	0.08	0.47	0.5	5417115.0
-68.28	-82.0	0.08	0.46	0.49	5615912.0
-67.93	-81.67	0.08	0.46	0.48	5834238.0
-67.59	-81.35	0.09	0.45	0.47	6055346.0
-67.24	-81.02	0.09	0.45	0.46	6285617.0
-66.9	-80.69	0.09	0.45	0.45	6533428.0
-66.55	-80.36	0.1	0.45	0.44	6784100.0
-66.21	-80.04	0.1	0.45	0.43	7040658.0
-65.86	-79.7	0.1	0.44	0.43	7314827.0
-65.52	-79.38	0.11	0.44	0.42	7596200.0
-65.17	-79.04	0.11	0.45	0.41	7898990.0
-64.83	-78.71	0.12	0.44	0.4	8205531.0
-64.48	-78.36	0.12	0.44	0.39	8536338.0
-64.14	-78.03	0.13	0.45	0.39	8872140.0
-63.79	-77.69	0.13	0.45	0.38	9229760.0
-63.45	-77.26	0.14	0.45	0.37	9692182.0
-63.1	-76.92	0.14	0.45	0.36	10082324.0
-62.76	-76.57	0.15	0.45	0.35	10488923.0
-62.41	-76.25	0.15	0.45	0.34	10888333.0
-62.07	-75.92	0.16	0.45	0.33	11315891.0
-61.72	-75.57	0.17	0.45	0.33	11777270.0
-61.38	-75.24	0.17	0.45	0.32	12232080.0
-61.03	-74.91	0.18	0.44	0.31	12702607.0
-60.69	-74.56	0.19	0.44	0.31	13222240.0
-60.34	-74.22	0.19	0.43	0.3	13749432.0
-60.0	-73.89	0.2	0.43	0.3	14290258.0

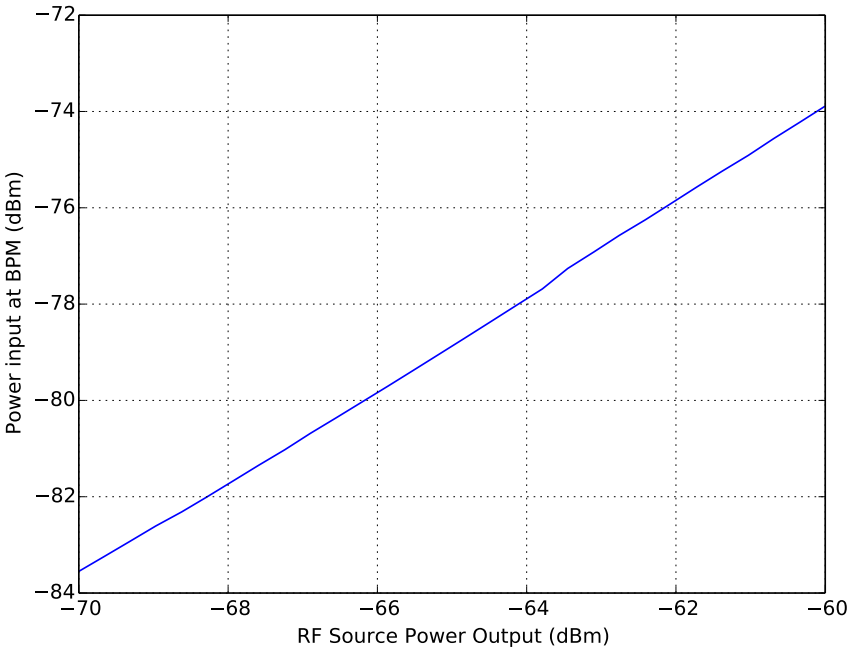


Figure 2:

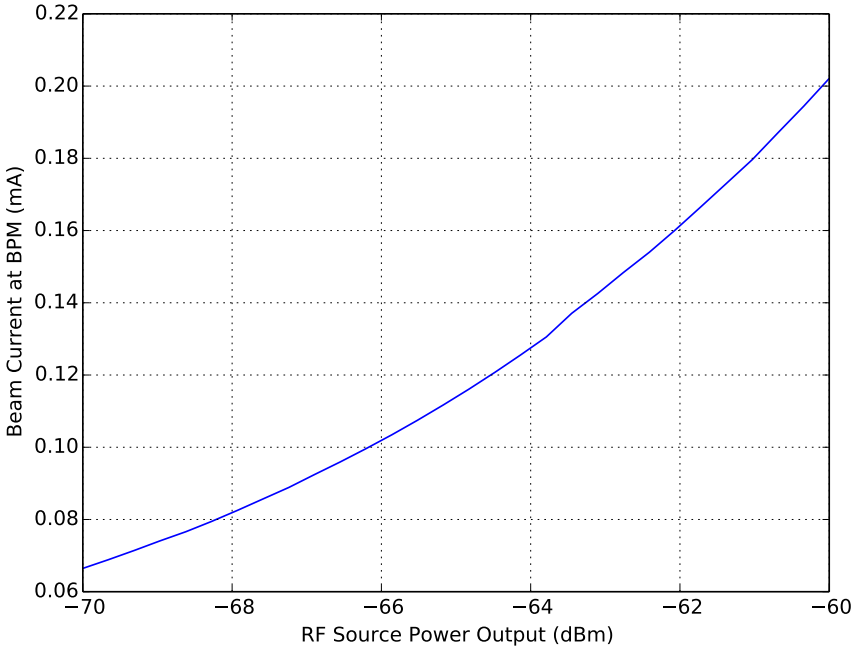


Figure 3:

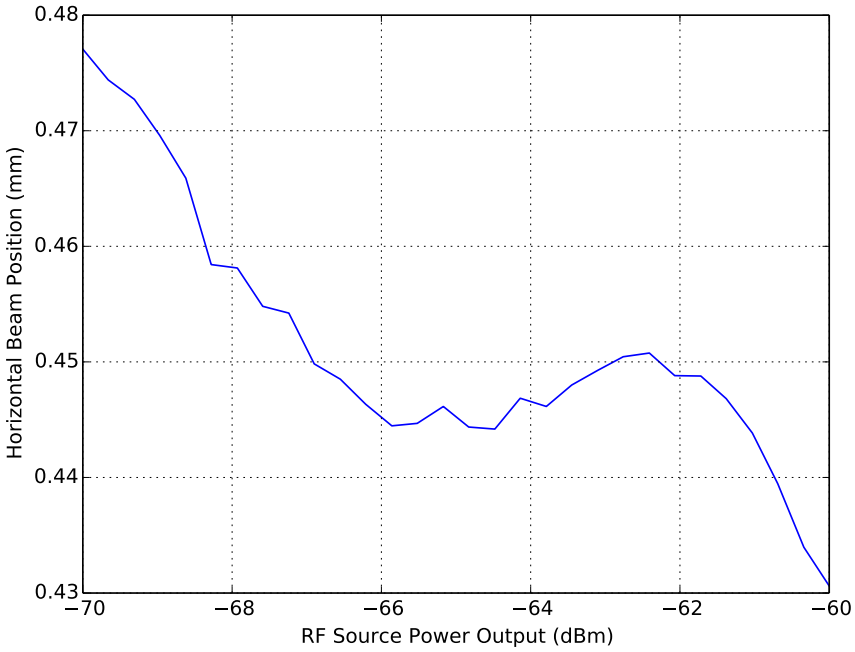


Figure 4:

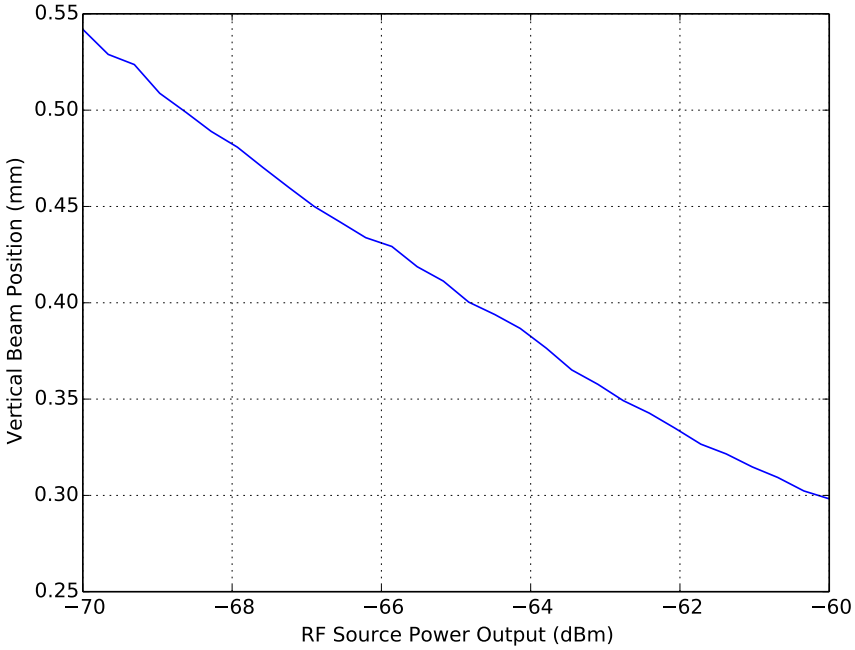


Figure 5:

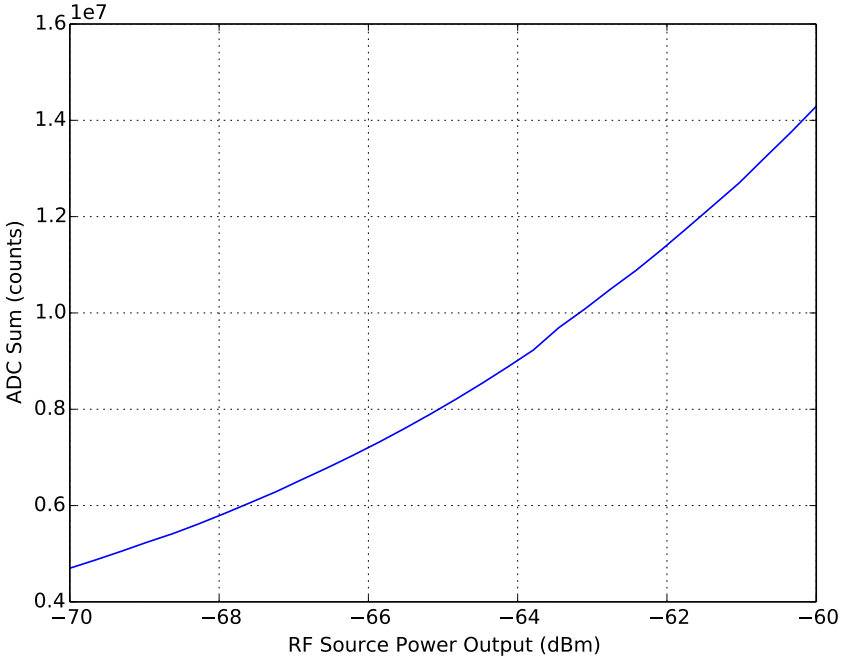

1e7
1.6
1.4
1.2
1.0
0.8
0.6
0.4
ADC Sum (counts)
−70
−68
−66
−64
−62
−60
RF Source Power Output (dBm)

Figure 6:

2 Fixed amplitude fill pattern test

The "Fixed output fill pattern test" is supposed to test the BPM parameters reliance onthe bunch shape that has a variable charge size. The signal suppled by the RF signal generatorwill have a fixed frequency and power output, this is then mixed with a gating signal, modulating the RF signal. The duty cycle of the gating signal is then changed and the BPM parameters recorded. This test will see how these parameters change as the duty cycle is changed.For example, ss the signal provided by the RF is constant the power at the BPM will drop the lower the duty cycle.

The devices used for this test are:

RF Source Rigol Technologies,DSG3030,DSG3B174500308,00.01.06
Gating Device Rigol Technologies,DSG3030,DSG3B174500308,00.01.06
Libera BPM with the Epics ID "TS-DI-EBPM-04:" and the MAC Address "00:d0:50:31:03:b9"

The parameters used in this test are:

Frequency: 499.681 768 20MHz
Output Power: -60.00DBM
Pulse Period: 1.873us
Samples: 30

Figure 7: Changing gate duty cycle, with fixed RF amplitude

Duty Cycle (0-1)	Input Power (dBm)	BPM Current (mA)	X Position (mm)	Y Position (mm)	ADC Sum (Counts)
0.1	-91.51	0.03	0.11	0.27	1879375.0
0.13	-89.85	0.03	0.21	0.26	2274979.0
0.16	-88.4	0.04	0.26	0.25	2686890.0
0.19	-87.35	0.04	0.29	0.24	3034501.0
0.22	-86.22	0.05	0.32	0.24	3453669.0
0.26	-85.22	0.05	0.34	0.24	3875834.0
0.29	-84.32	0.06	0.36	0.25	4301211.0
0.32	-83.5	0.07	0.38	0.25	4726988.0
0.35	-82.87	0.07	0.38	0.26	5081966.0
0.38	-82.19	0.08	0.39	0.26	5495412.0
0.41	-81.57	0.08	0.39	0.28	5901990.0
0.44	-80.99	0.09	0.4	0.29	6306338.0
0.47	-80.45	0.09	0.41	0.29	6716430.0
0.5	-80.01	0.1	0.41	0.3	7059112.0
0.53	-79.52	0.11	0.42	0.3	7473186.0
0.57	-79.05	0.11	0.42	0.31	7891658.0
0.6	-78.59	0.12	0.43	0.31	8316464.0
0.63	-78.15	0.12	0.44	0.31	8747317.0
0.66	-77.73	0.13	0.44	0.31	9182467.0
0.69	-77.39	0.14	0.44	0.31	9546636.0
0.72	-77.0	0.14	0.44	0.31	9991186.0
0.75	-76.61	0.15	0.44	0.3	10443749.0
0.78	-76.24	0.15	0.44	0.3	10905941.0
0.81	-75.86	0.16	0.45	0.31	11382624.0
0.84	-75.56	0.17	0.45	0.31	11784808.0
0.88	-75.21	0.17	0.44	0.3	12267094.0
0.91	-74.9	0.18	0.43	0.29	12723856.0
0.94	-74.6	0.19	0.43	0.3	13161250.0
0.97	-74.31	0.19	0.43	0.31	13616952.0
0.99	-74.0	0.2	0.43	0.3	14113226.0

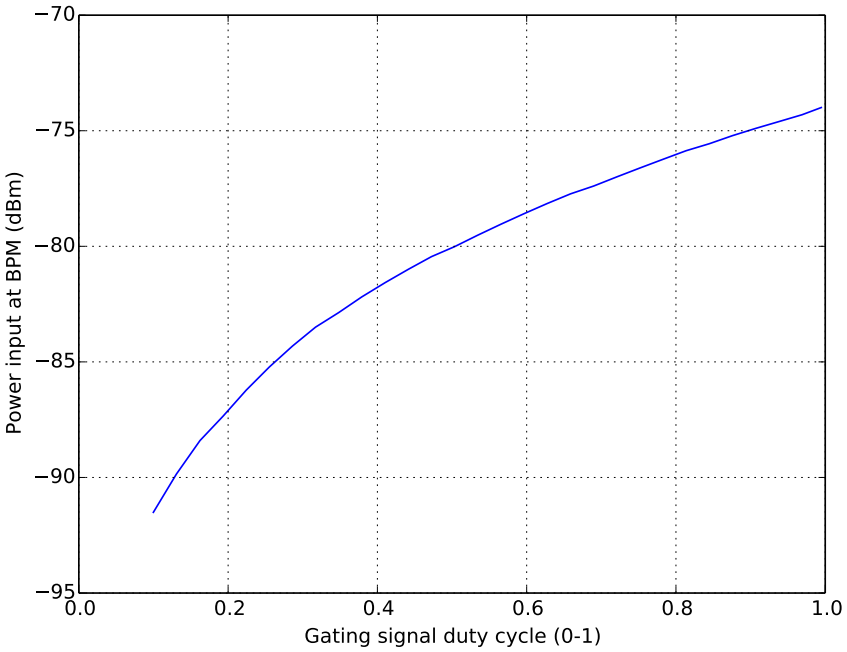


Figure 8:

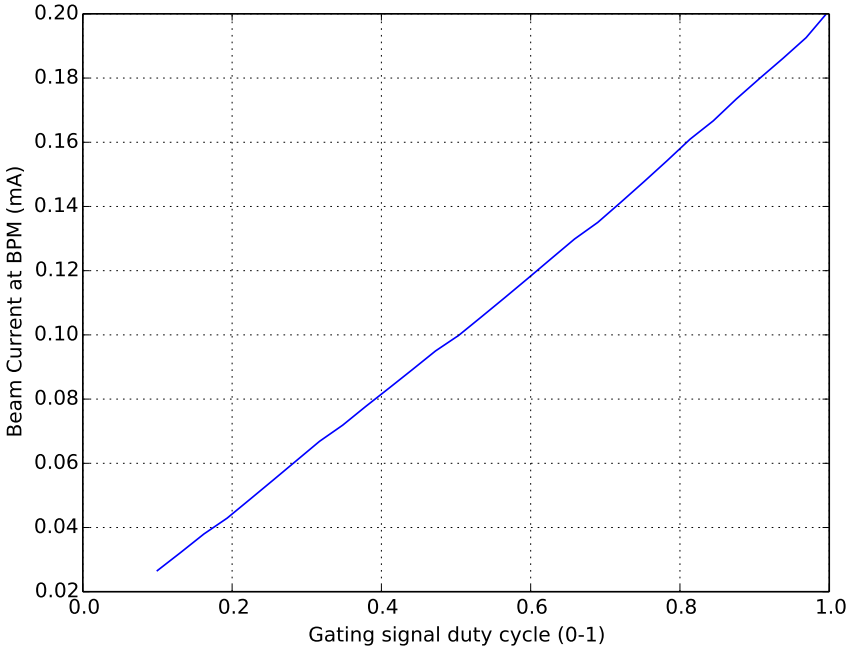


Figure 9:

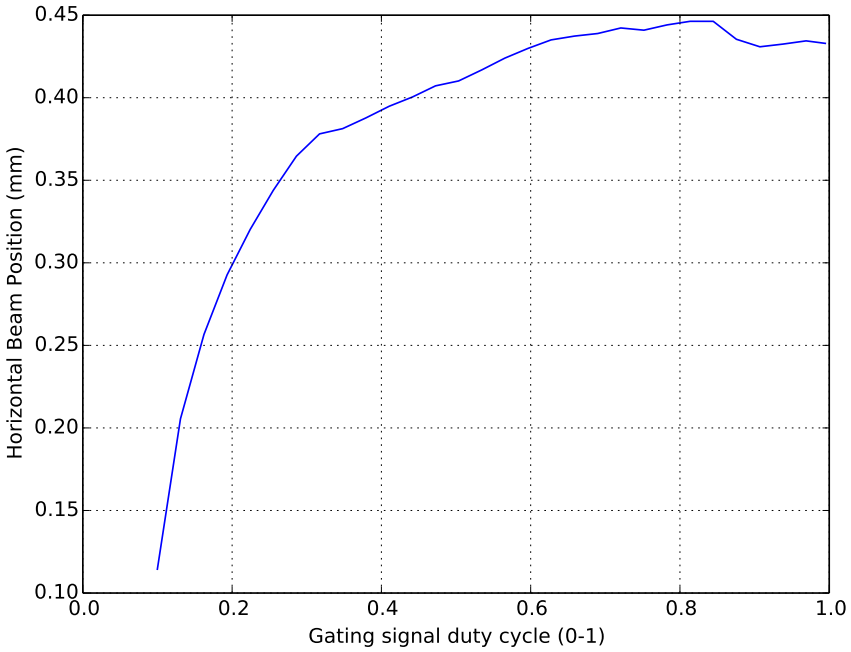


Figure 10:

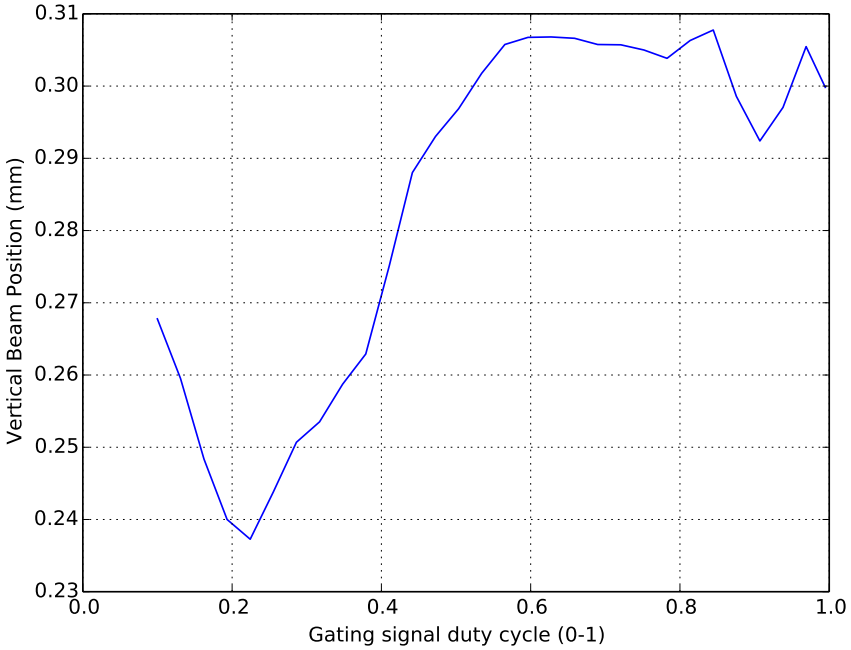


Figure 11:

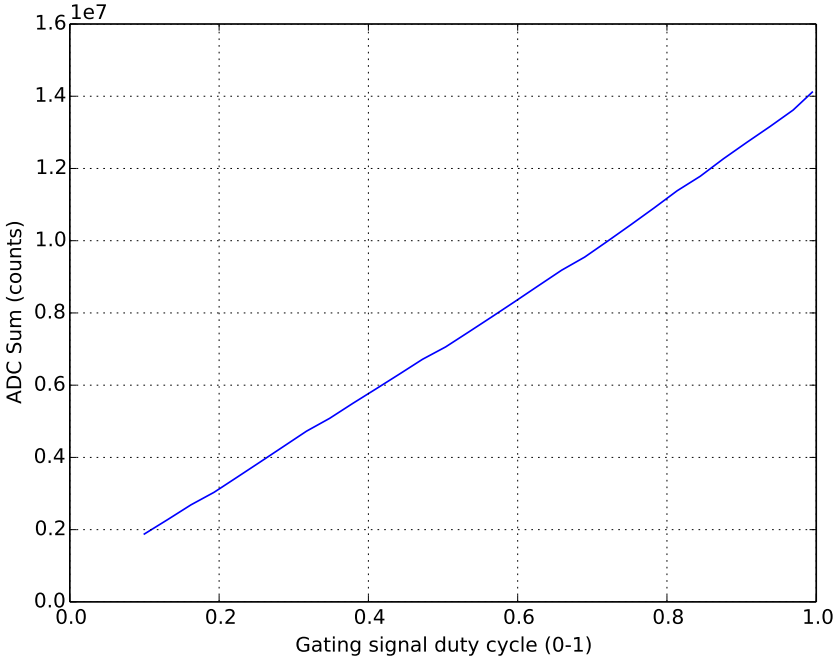

1e7
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
ADC Sum (counts)
0.0
0.2
0.4
0.6
0.8
1.0
Gating signal duty cycle (0-1)

Figure 12:

3 Scaled amplitude fill pattern test

Scaled output fill pattern test intro text

The devices used for this test are:

RF Source Rigol Technologies,DSG3030,DSG3B174500308,00.01.06
Gating Device Rigol Technologies,DSG3030,DSG3B174500308,00.01.06
Libera BPM with the Epics ID "TS-DI-EBPM-04:" and the MAC Address "00:d0:50:31:03:b9"

The parameters used in this test are:

Frequency: 499.681 768 20MHz
Desired Power: -60
Pulse Period: 1.873us
Samples: 30
Settling time: 3s

Figure 13: Changing gate duty cycle, with fixed RF amplitude

Duty Cycle (0-1)	Output Power (dBm)	Input Power (dBm)	BPM Current (mA)	X Position (mm)	Y Position (mm)	ADC Sum (Counts)
0.1	-39.99	-73.82	0.2	0.38	0.08	14406707.0
0.13	-42.33	-73.77	0.2	0.38	0.09	14485897.0
0.16	-44.21	-74.17	0.2	0.38	0.09	13828508.0
0.19	-45.72	-74.45	0.19	0.38	0.1	13387542.0
0.22	-47.01	-73.69	0.21	0.39	0.11	14624983.0
0.26	-48.14	-73.84	0.2	0.4	0.12	14367662.0
0.29	-49.13	-73.81	0.2	0.4	0.14	14421846.0
0.32	-50.02	-73.83	0.2	0.4	0.15	14380350.0
0.35	-50.83	-74.01	0.2	0.41	0.17	14087897.0
0.38	-51.57	-74.51	0.19	0.41	0.18	13307205.0
0.41	-52.27	-74.6	0.19	0.42	0.2	13162619.0
0.44	-52.9	-74.62	0.19	0.43	0.21	13134781.0
0.47	-53.49	-74.61	0.19	0.43	0.22	13150311.0
0.5	-54.04	-74.7	0.18	0.44	0.22	13011297.0
0.53	-54.56	-74.72	0.18	0.44	0.22	12985000.0
0.57	-55.05	-74.75	0.18	0.44	0.23	12936980.0
0.6	-55.51	-74.73	0.18	0.44	0.24	12972953.0
0.63	-55.95	-74.72	0.18	0.44	0.25	12986074.0
0.66	-56.38	-74.72	0.18	0.44	0.26	12986325.0
0.69	-56.77	-74.01	0.2	0.44	0.25	14085248.0
0.72	-57.16	-74.09	0.2	0.44	0.26	13968770.0
0.75	-57.52	-74.1	0.2	0.43	0.26	13949694.0
0.78	-57.87	-74.06	0.2	0.43	0.27	14014376.0
0.81	-58.21	-74.06	0.2	0.43	0.27	14009020.0
0.84	-58.53	-74.08	0.2	0.43	0.28	13970969.0
0.88	-58.85	-74.05	0.2	0.42	0.28	14019718.0
0.91	-59.15	-74.05	0.2	0.42	0.28	14023020.0
0.94	-59.44	-74.06	0.2	0.43	0.29	14017485.0
0.97	-59.73	-74.04	0.2	0.43	0.3	14037531.0
0.99	-59.95	-73.98	0.2	0.43	0.3	14142492.0

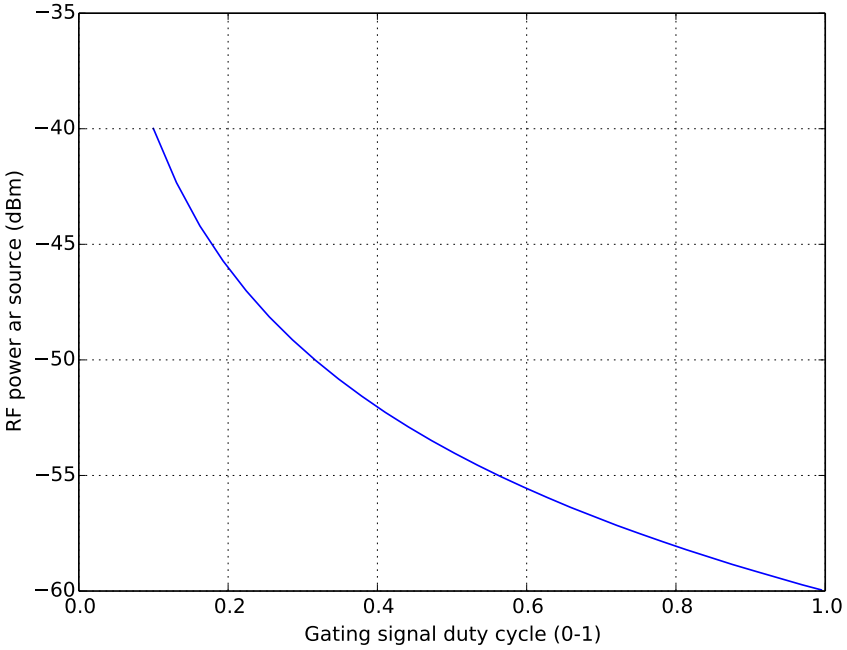


Figure 14:

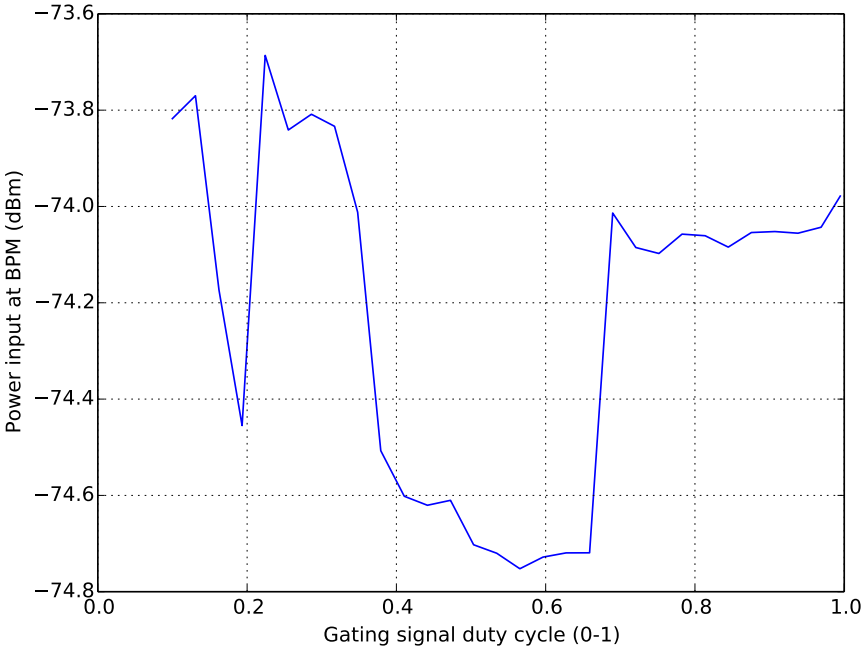


Figure 15:

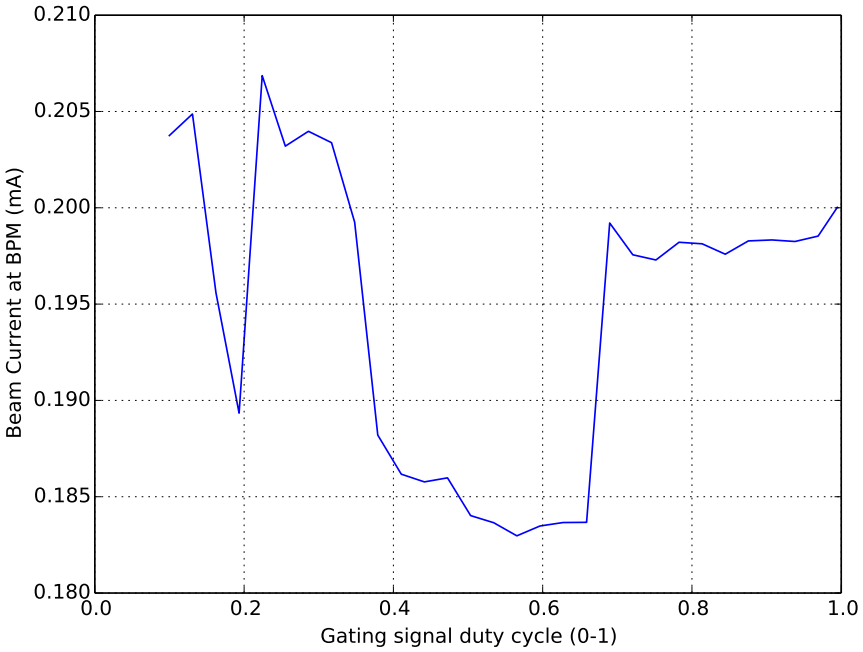
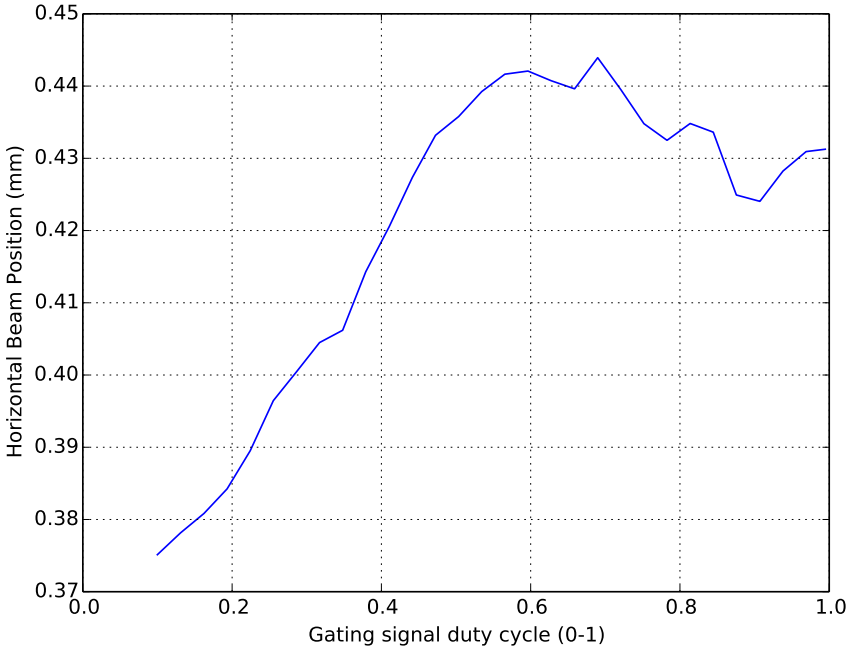


Figure 16:



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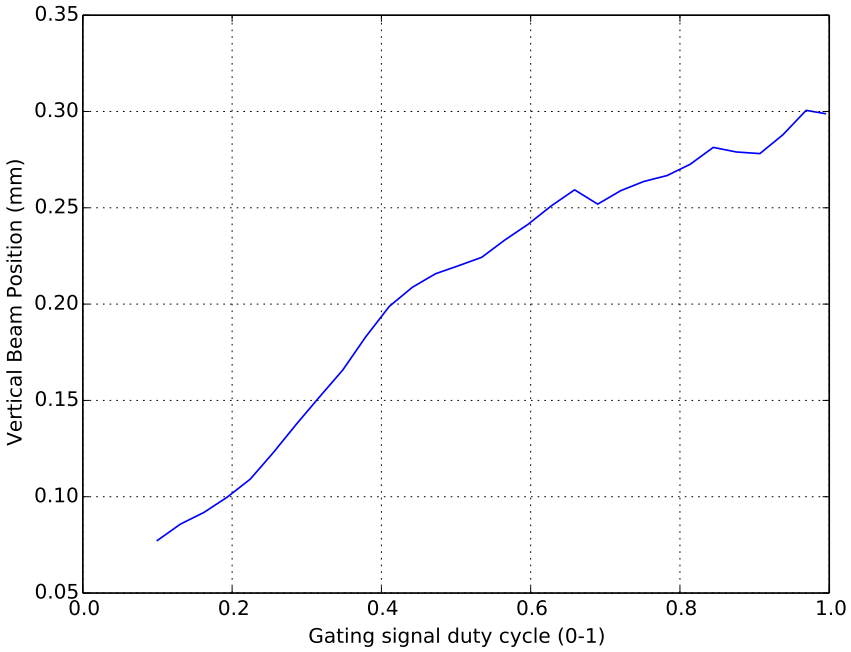

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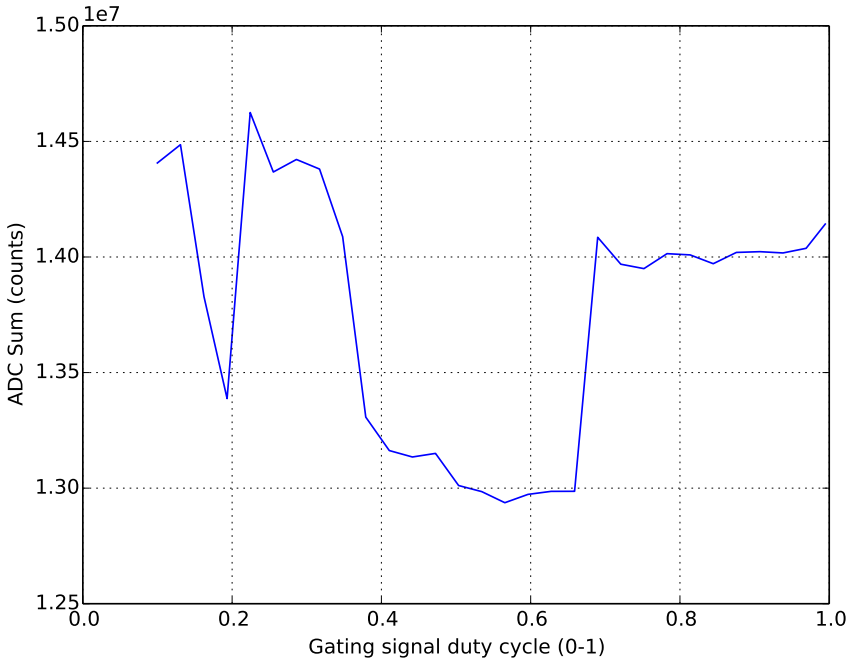

Figure 19: