An improved method to extract the capacitances of an integrated circuit

Testresults

14th June 1998

Willemijn van Til
Delft University of Technology
Faculty of Information Technology and Systems
Sections: Circuits and Sytems
Applied Mathematics
paper nr.: A98.06

Graduation commission:
N.P van der Meijs
P. Sonneveld
P. Wesseling

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1 Tables

The tests are carried out on a Pentium 100 PC with 22 Mbyte main memory. The operating system is Linux. The testresults are made by the perlscript "proef", which uses the perlscript "calcap" and the programs "blocks" and "matrix".

In the testresults only the self-capacitance and the short-circuit capacitance of the first conductor are given. The program "proef" can be rewritten to give all the capacitances in the texfiles, generated by "proef". Be aware of the number of capacitances.

1.1 Test1

Table 1.1: 5X5 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(m)	C_{1gnd}	C_{s1}
fastcap		13.57	0.16	13.73	2.60	72.97	457.20
blocks	6.0	13.40	0.27	13.67	2.60	72.97	457.20
blocks	5.0	26.81	0.72	27.53	2.13	74.62	457.70
blocks	4.0	16.96	0.55	17.51	1.30	78.85	457.80
blocks	3.0	15.07	1.16	16.23	0.59	85.94	458.50
blocks	2.0	13.32	2.65	15.97	0.21	93.89	461.90
blocks	1.0	13.47	10.27	23.74	0.05	99.38	436.30

Table 1.2: 6X6 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(m)	C_{1gnd}	C_{s1}
fastcap		34.32	0.21	34.53	3.76	76.30	532.10
blocks	7.0	33.01	0.17	33.18	3.76	76.30	532.10
blocks	6.0	66.18	0.98	67.16	3.40	77.56	532.40
blocks	5.0	34.88	1.05	35.93	2.13	81.38	532.90
blocks	4.0	37.05	1.53	38.58	1.41	86.71	533.30
blocks	3.0	28.66	2.31	30.97	0.60	94.93	534.30
blocks	2.0	18.95	4.24	23.19	0.21	104.24	538.40
blocks	1.0	19.22	17.28	36.50	0.05	103.63	515.10

Table 1.3: 7X7 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(m)	C_{1gnd}	C_{s1}
fastcap		100.56	0.28	100.84	5.68	79.60	607.00
blocks	8.0	75.49	0.27	75.76	5.68	79.60	607.00
blocks	7.0	168.49	0.88	169.37	4.86	81.00	607.20
blocks	6.0	77.32	0.71	78.03	3.40	83.82	607.50
blocks	5.0	41.37	0.67	42.04	2.23	86.57	604.00
blocks	4.0	42.32	1.33	43.65	1.41	94.01	608.60
blocks	3.0	32.54	1.77	34.31	0.60	103.24	609.70
blocks	2.0	24.85	5.04	29.89	0.21	113.84	614.80
blocks	1.0	25.43	21.76	47.19	0.05	114.98	588.10

Table 1.4: 8X8 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(m)	C_{1gnd}	C_{s1}
fastcap		34.48	0.26	34.74	8.09	82.92	681.80
blocks	9.0	34.28	0.30	34.58	8.09	82.92	681.80
blocks	8.0	351.41	1.41	352.82	7.48	84.08	682.00
blocks	7.0	198.22	0.95	199.17	4.86	87.02	682.20
blocks	6.0	101.29	1.05	102.34	3.40	89.72	682.50
blocks	5.0	81.12	1.67	82.79	2.23	94.68	683.40
blocks	4.0	70.48	2.35	72.83	1.41	101.86	684.10
blocks	3.0	48.30	3.11	51.41	0.60	112.33	685.50
blocks	2.0	33.93	6.32	40.25	0.21	124.01	691.40
blocks	1.0	32.44	29.16	61.60	0.05	124.30	657.60

Table 1.5: 9X9 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(m)	C_{1gnd}	C_{s1}
fastcap		50.71	0.47	51.18	10.63	85.74	756.80
blocks	10.0	49.97	0.48	50.45	10.63	85.74	756.80
blocks	9.0	135.71	1.44	137.15	9.27	87.19	757.20
blocks	8.0	407.22	1.20	408.42	7.48	89.63	756.90
blocks	7.0	260.71	1.58	262.29	4.86	92.39	757.30
blocks	6.0	220.74	2.69	223.43	3.48	96.00	757.60
blocks	5.0	103.44	2.50	105.94	2.23	101.07	758.50
blocks	4.0	82.47	2.58	85.05	1.41	109.06	759.40
blocks	3.0	68.45	4.51	72.96	0.60	121.42	761.30
blocks	2.0	44.22	8.34	52.56	0.21	134.08	767.90
blocks	1.0	41.23	40.53	81.76	0.05	136.55	734.10

Table 1.6: 10X10 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(m)	C_{1gnd}	C_{s1}
fastcap		92.98	0.56	93.54	12.08	88.64	831.40
blocks	11.0	125.25	0.65	125.90	12.08	88.64	831.40
blocks	10.0	236.97	2.50	239.47	11.94	146.16	1248.00
blocks	9.0	196.00	2.15	198.15	9.27	92.50	832.10
blocks	8.0	524.38	2.10	526.48	7.48	94.84	831.80
blocks	7.0	320.40	1.20	321.60	5.12	97.78	832.10
blocks	6.0	225.59	2.27	227.86	3.48	102.16	832.70
blocks	5.0	157.87	3.18	161.05	2.23	108.03	833.90
blocks	4.0	120.16	4.17	124.33	1.41	117.14	835.00
blocks	3.0	78.46	5.07	83.53	0.60	129.69	836.70
blocks	2.0	56.86	10.86	67.72	0.21	144.24	844.50
blocks	1.0	51.54	55.61	107.15	0.05	147.93	807.10

Table 1.7: 12X12 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(m)	C_{1gnd}	C_{s1}
fastcap		192.21	3.98	196.19	16.72	94.33	980.70
blocks	13.0	166.23	3.21	169.44	16.72	94.33	980.70
blocks	12.0	462.49	8.22	470.71	17.48	95.39	980.90
blocks	11.0	424.42	2.32	426.74	13.61	97.56	981.20
blocks	10.0	399.66	2.84	402.50	11.94	83.77	793.10
blocks	9.0	222.90	2.80	225.70	9.27	102.26	981.80
blocks	8.0	1185.82	4.02	1189.84	7.63	105.57	981.70
blocks	7.0	651.91	3.62	655.53	5.22	110.01	982.40
blocks	6.0	434.76	4.91	439.67	3.48	114.43	982.80
blocks	5.0	213.92	4.84	218.76	2.23	120.00	980.20
blocks	4.0	194.66	9.12	203.78	1.41	132.21	985.70
blocks	3.0	136.32	12.07	148.39	0.60	147.73	988.30
blocks	2.0	84.57	23.56	108.13	0.21	164.19	997.40
blocks	1.0	81.74	115.57	197.31	0.05	168.48	953.10

Table 1.8: 14X14 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-15}F$)	
	(μ)	user	system	CPU	(m)	C_{1gnd}	C_{s1}
fastcap		435.74	181.85	617.59	26.26	0.10	1.13
blocks	15.0	437.73	182.54	620.27	26.26	0.10	1.13
blocks	14.0	1236.90	172.11	1409.01	23.74	0.10	1.13
blocks	13.0	681.81	91.93	773.74	18.71	0.10	1.13
blocks	12.0	516.86	11.56	528.42	17.48	0.10	1.13
blocks	11.0	401.24	3.45	404.69	13.61	0.11	1.13
blocks	10.0	334.33	2.95	337.28	11.94	0.08	0.79
blocks	9.0	455.91	4.88	460.79	9.83	0.11	1.13
blocks	8.0	1356.63	4.53	1361.16	7.63	0.12	1.13
blocks	7.0	1124.06	5.33	1129.39	5.22	0.12	1.13
blocks	6.0	517.43	4.83	522.26	3.48	0.13	1.13
blocks	5.0	301.04	5.88	306.92	2.23	0.13	1.13
blocks	4.0	250.68	10.13	260.81	1.41	0.15	1.14
blocks	3.0	176.92	14.09	191.01	0.60	0.16	1.14
blocks	2.0	110.98	29.30	140.28	0.21	0.19	1.15
blocks	1.0	101.54	159.76	261.30	0.05	0.18	1.10

1.2 Test2

Table 1.9: 5X5 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(m)	C_{1gnd}	C_{s1}
fastcap		13.38	0.10	13.48	2.60	72.97	457.20
blocks	6.0	14.36	0.21	14.57	2.60	72.97	457.20
blocks	5.0	26.73	0.70	27.43	2.13	74.62	457.70
blocks	4.0	16.72	0.76	17.48	1.30	78.85	457.80
blocks	3.0	15.17	1.11	16.28	0.59	85.94	458.50
blocks	2.0	13.37	2.55	15.92	0.21	93.89	461.90
blocks	1.0	13.07	11.97	25.04	0.05	99.38	436.30

Table 1.10: 6X6 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(m)	C_{1gnd}	C_{s1}
fastcap		34.94	0.25	35.19	3.76	76.30	532.10
blocks	7.0	33.67	0.24	33.91	3.76	76.30	532.10
blocks	6.0	66.61	0.89	67.50	3.40	77.56	532.40
blocks	5.0	34.35	0.85	35.20	2.13	81.38	532.90
blocks	4.0	36.99	1.57	38.56	1.41	86.71	533.30
blocks	3.0	28.93	2.05	30.98	0.60	94.93	534.30
blocks	2.0	19.21	3.99	23.20	0.21	104.24	538.40
blocks	1.0	19.54	17.42	36.96	0.05	103.63	515.10

Table 1.11: 7X7 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(m)	C_{1gnd}	C_{s1}
fastcap		79.20	0.33	79.53	5.68	79.60	607.00
blocks	8.0	73.61	0.29	73.90	5.68	79.60	607.00
blocks	7.0	169.21	0.90	170.11	4.86	81.00	607.20
blocks	6.0	74.87	0.79	75.66	3.40	83.82	607.50
blocks	5.0	41.06	0.72	41.78	2.23	86.57	604.00
blocks	4.0	42.40	1.14	43.54	1.41	94.01	608.60
blocks	3.0	32.62	1.63	34.25	0.60	103.24	609.70
blocks	2.0	25.08	4.65	29.73	0.21	113.84	614.80
blocks	1.0	25.40	23.41	48.81	0.05	114.98	588.10

Table 1.12: 8X8 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(m)	C_{1gnd}	C_{s1}
fastcap		34.63	0.24	34.87	8.09	82.92	681.80
blocks	9.0	34.19	0.42	34.61	8.09	82.92	681.80
blocks	8.0	337.92	1.16	339.08	7.48	84.08	682.00
blocks	7.0	202.70	0.88	203.58	4.86	87.02	682.20
blocks	6.0	102.21	0.90	103.11	3.40	89.72	682.50
blocks	5.0	82.24	1.51	83.75	2.23	94.68	683.40
blocks	4.0	70.15	2.53	72.68	1.41	101.86	684.10
blocks	3.0	48.17	3.12	51.29	0.60	112.33	685.50
blocks	2.0	33.69	6.60	40.29	0.21	124.01	691.40
blocks	1.0	32.11	30.33	62.44	0.05	124.30	657.60

Table 1.13: 9X9 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(m)	C_{1gnd}	C_{s1}
fastcap		50.06	0.49	50.55	10.63	85.74	756.80
blocks	10.0	49.99	0.47	50.46	10.63	85.74	756.80
blocks	9.0	136.19	1.43	137.62	9.27	87.19	757.20
blocks	8.0	403.42	1.35	404.77	7.48	89.63	756.90
blocks	7.0	242.10	1.20	243.30	4.86	92.39	757.30
blocks	6.0	204.94	1.95	206.89	3.48	96.00	757.60
blocks	5.0	94.56	1.64	96.20	2.23	101.07	758.50
blocks	4.0	82.06	2.92	84.98	1.41	109.06	759.40
blocks	3.0	68.15	4.88	73.03	0.60	121.42	761.30
blocks	2.0	43.66	8.74	52.40	0.21	134.08	767.90
blocks	1.0	41.55	41.31	82.86	0.05	136.55	734.10

Table 1.14: 10X10 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(m)	C_{1gnd}	C_{s1}
fastcap		92.85	0.57	93.42	12.08	88.64	831.40
blocks	11.0	100.73	0.68	101.41	12.08	88.64	831.40
blocks	10.0	214.80	2.11	216.91	11.94	146.16	1248.00
blocks	9.0	173.62	1.58	175.20	9.27	92.50	832.10
blocks	8.0	476.16	1.35	477.51	7.48	94.84	831.80
blocks	7.0	318.61	1.38	319.99	5.12	97.78	832.10
blocks	6.0	224.21	2.34	226.55	3.48	102.16	832.70
blocks	5.0	158.29	3.08	161.37	2.23	108.03	833.90
blocks	4.0	119.96	4.24	124.20	1.41	117.14	835.00
blocks	3.0	78.35	5.04	83.39	0.60	129.69	836.70
blocks	2.0	55.63	11.95	67.58	0.21	144.24	844.50
blocks	1.0	52.04	56.56	108.60	0.05	147.93	807.10

Table 1.15: 12X12 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(m)	C_{1gnd}	C_{s1}
fastcap		198.04	3.59	201.63	16.72	94.33	980.70
blocks	13.0	169.40	3.25	172.65	16.72	94.33	980.70
blocks	12.0	459.17	7.90	467.07	17.48	95.39	980.90
blocks	11.0	441.47	2.99	444.46	13.61	97.56	981.20
blocks	10.0	408.57	2.85	411.42	11.94	83.77	793.10
blocks	9.0	190.96	2.04	193.00	9.27	102.26	981.80
blocks	8.0	1146.19	3.66	1149.85	7.63	105.57	981.70
blocks	7.0	619.70	3.04	622.74	5.22	110.01	982.40
blocks	6.0	424.58	4.35	428.93	3.48	114.43	982.80
blocks	5.0	196.28	3.66	199.94	2.23	120.00	980.20
blocks	4.0	195.39	8.78	204.17	1.41	132.21	985.70
blocks	3.0	142.65	12.99	155.64	0.60	147.73	988.30
blocks	2.0	84.68	23.54	108.22	0.21	164.19	997.40
blocks	1.0	82.65	117.24	199.89	0.05	168.48	953.10

Table 1.16: 14X14 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-15}F$)	
	(μ)	user	system	CPU	(m)	C_{1gnd}	C_{s1}
fastcap		429.30	174.04	603.34	26.26	0.10	1.13
blocks	15.0	418.90	184.14	603.04	26.26	0.10	1.13
blocks	14.0	1181.76	165.28	1347.04	23.74	0.10	1.13
blocks	13.0	652.76	77.62	730.38	18.71	0.10	1.13
blocks	12.0	493.70	8.14	501.84	17.48	0.10	1.13
blocks	11.0	375.23	2.75	377.98	13.61	0.11	1.13
blocks	10.0	335.77	2.75	338.52	11.94	0.08	0.79
blocks	9.0	457.89	4.60	462.49	9.83	0.11	1.13
blocks	8.0	1386.68	4.36	1391.04	7.63	0.12	1.13
blocks	7.0	1119.83	5.25	1125.08	5.22	0.12	1.13
blocks	6.0	520.90	4.43	525.33	3.48	0.13	1.13
blocks	5.0	302.61	6.33	308.94	2.23	0.13	1.13
blocks	4.0	250.40	9.86	260.26	1.41	0.15	1.14
blocks	3.0	176.59	14.43	191.02	0.60	0.16	1.14
blocks	2.0	110.35	29.66	140.01	0.21	0.19	1.15
blocks	1.0	101.73	161.41	263.14	0.05	0.18	1.10

Table 1.17: 16X16 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-15}F$)	
	(μ)	user	system	CPU	(m)	C_{1gnd}	C_{s1}
fastcap		324.27	780.35	1104.62	36.83	0.10	1.28
blocks	17.0	321.39	768.76	1090.15	36.83	0.10	1.28
blocks	16.0	2161.76	433.46	2595.22	36.41	0.17	1.92
blocks	15.0	1561.64	227.16	1788.80	29.18	0.07	0.72
blocks	14.0	1153.55	165.87	1319.42	23.74	0.11	1.28
blocks	13.0	839.51	83.71	923.22	18.71	0.11	1.28
blocks	12.0	638.36	9.37	647.73	17.48	0.11	1.28
blocks	11.0	500.61	3.47	504.08	13.62	0.11	1.28
blocks	10.0	809.57	7.32	816.89	12.05	0.16	1.58
blocks	9.0	707.83	5.50	713.33	9.83	0.12	1.28
blocks	8.0	2364.02	7.11	2371.13	7.63	0.13	1.28
blocks	7.0	1339.18	7.53	1346.71	5.22	0.13	1.28
blocks	6.0	786.56	8.40	794.96	3.48	0.14	1.28
blocks	5.0	474.53	12.99	487.52	2.23	0.15	1.28
blocks	4.0	337.91	14.91	352.82	1.41	0.16	1.29
blocks	3.0	231.69	19.35	251.04	0.60	0.18	1.29
blocks	2.0	144.91	44.60	189.51	0.21	0.21	1.30
blocks	1.0	144.58	283.93	428.51	0.05	0.20	1.24

1.3 Test3

Table 1.18: 5X5 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(M)	C_{1gnd}	C_{s1}
fastcap		13.87	0.18	14.05	2.595	72.973	457.200
blocks	5.50	13.76	0.17	13.93	2.395	72.060	453.200
blocks	3.67	12.37	0.62	12.99	0.821	82.391	458.200
blocks	2.75	12.37	1.30	13.67	0.451	90.020	455.000
blocks	2.20	9.90	1.78	11.68	0.244	95.520	455.100
blocks	1.83	10.29	2.84	13.13	0.199	95.110	462.000
blocks	1.57	8.83	3.59	12.42	0.112	103.310	454.000
blocks	1.38	11.45	4.87	16.32	0.112	98.930	458.600
blocks	1.22	11.27	6.60	17.87	0.091	98.160	458.700
blocks	1.10	11.71	8.34	20.05	0.091	117.490	449.800
blocks	1.00	13.41	10.40	23.81	0.046	99.380	436.300

Table 1.19: 5X5 bus crossing problem with 1e-06m wires (n=2 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(M)	C_{1gnd}	C_{s1}
fastcap		70.15	6.35	76.50	16.555	73.539	473.500
blocks	5.50	68.04	1.34	69.38	16.120	72.857	470.500
blocks	3.67	214.07	1.84	215.91	6.397	80.408	473.600
blocks	2.75	97.30	2.13	99.43	2.847	88.220	472.100
blocks	2.20	70.53	2.55	73.08	1.492	94.880	472.000
blocks	1.83	70.87	3.37	74.24	1.385	96.879	476.900
blocks	1.57	64.33	4.23	68.56	0.936	100.610	474.900
blocks	1.38	51.55	4.83	56.38	0.621	100.460	473.200
blocks	1.22	53.53	6.52	60.05	0.370	109.620	479.100
blocks	1.10	46.89	7.81	54.70	0.293	110.360	482.500
blocks	1.00	48.68	9.52	58.20	0.250	104.670	466.200

Table 1.20: 5X5 bus crossing problem with 1e-06m wires (n=3 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(M)	C_{1gnd}	C_{s1}
fastcap		327.50	270.51	598.01	46.170	73.875	484.500
blocks	5.50	290.52	220.38	510.90	44.319	73.551	482.500
blocks	3.67	338.44	296.18	634.62	19.553	82.602	485.600
blocks	2.75	545.43	4.32	549.75	10.028	90.600	484.300
blocks	2.20	234.39	4.52	238.91	4.008	97.110	484.800
blocks	1.83	283.14	6.11	289.25	4.194	95.230	489.400
blocks	1.57	202.14	5.89	208.03	1.906	103.420	487.200
blocks	1.38	193.95	7.07	201.02	1.906	102.410	489.200
blocks	1.22	156.25	7.90	164.15	1.102	104.460	490.500
blocks	1.10	132.94	9.49	142.43	0.834	118.060	487.700
blocks	1.00	156.28	12.07	168.35	0.685	102.720	476.800

Table 1.21: 5X5 bus crossing problem with 1e-06m wires (n=4 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(M)	C_{1gnd}	C_{s1}
fastcap		460.34	766.49	1226.83	79.634	74.088	487.600
blocks	5.50	455.16	737.12	1192.28	78.745	73.653	485.600
blocks	3.67	654.86	601.68	1256.54	37.298	80.857	487.600
blocks	2.75	455.31	6.76	462.07	15.394	89.450	487.300
blocks	2.20	885.66	8.10	893.76	9.314	96.280	487.100
blocks	1.83	531.25	9.21	540.46	7.825	96.970	491.600
blocks	1.57	421.47	10.26	431.73	4.152	101.810	489.900
blocks	1.38	392.88	10.44	403.32	3.051	101.550	486.400
blocks	1.22	366.54	11.52	378.06	3.051	111.270	493.900
blocks	1.10	310.69	12.08	322.77	1.402	112.160	496.800
blocks	1.00	367.97	15.08	383.05	1.555	103.100	481.000

Table 1.22: 6X6 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(M)	C_{1gnd}	C_{s1}
fastcap		35.40	0.20	35.60	3.762	76.300	532.100
blocks	6.50	32.43	0.34	32.77	3.413	75.482	528.200
blocks	4.33	24.99	0.73	25.72	1.534	83.770	532.500
blocks	3.25	26.24	1.77	28.01	0.868	91.540	529.400
blocks	2.60	19.82	2.33	22.15	0.356	102.310	535.900
blocks	2.17	16.30	2.96	19.26	0.244	107.940	535.600
blocks	1.86	16.66	3.98	20.64	0.199	103.650	534.300
blocks	1.63	14.05	5.03	19.08	0.154	114.420	529.800
blocks	1.44	16.91	6.82	23.73	0.112	112.450	540.200
blocks	1.30	16.95	8.57	25.52	0.091	114.280	539.900
blocks	1.18	17.21	10.64	27.85	0.091	110.990	539.700
blocks	1.08	17.80	12.81	30.61	0.091	133.570	529.100
blocks	1.00	19.06	15.59	34.65	0.046	103.630	515.100

Table 1.23: 7X7 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(M)	C_{1gnd}	C_{s1}
fastcap		83.34	0.38	83.72	5.680	79.601	607.000
blocks	7.50	64.11	0.39	64.50	5.427	78.881	603.000
blocks	5.00	41.20	0.72	41.92	2.227	86.569	604.000
blocks	3.75	34.77	1.27	36.04	1.300	96.694	604.800
blocks	3.00	32.20	2.07	34.27	0.604	103.240	609.700
blocks	2.50	24.92	2.39	27.31	0.356	113.870	607.000
blocks	2.14	20.93	3.18	24.11	0.244	117.530	607.900
blocks	1.88	22.09	4.45	26.54	0.199	113.820	610.900
blocks	1.67	19.24	5.50	24.74	0.167	124.849	609.600
blocks	1.50	22.36	7.39	29.75	0.167	120.040	617.400
blocks	1.36	21.72	8.41	30.13	0.112	121.050	611.900
blocks	1.25	21.89	10.22	32.11	0.091	120.920	612.100
blocks	1.15	22.05	12.68	34.73	0.091	147.390	604.500
blocks	1.07	22.64	14.91	37.55	0.091	144.530	600.400
blocks	1.00	24.33	18.00	42.33	0.046	114.980	588.100

Table 1.24: 8X8 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(M)	C_{1gnd}	C_{s1}
fastcap		34.35	0.25	34.60	8.090	82.919	681.800
blocks	8.50	28.65	0.38	29.03	7.998	82.176	677.800
blocks	5.67	80.60	0.74	81.34	2.658	90.958	678.800
blocks	4.25	47.95	1.40	49.35	1.459	98.450	679.000
blocks	3.40	51.94	2.22	54.16	0.972	106.700	680.000
blocks	2.83	41.75	2.83	44.58	0.593	112.530	682.400
blocks	2.43	34.53	3.75	38.28	0.356	123.340	682.600
blocks	2.13	28.28	4.45	32.73	0.244	128.510	684.300
blocks	1.89	29.78	6.58	36.36	0.199	123.990	687.500
blocks	1.70	26.32	7.19	33.51	0.167	133.680	681.800
blocks	1.55	24.63	9.05	33.68	0.112	138.980	682.400
blocks	1.42	29.35	10.45	39.80	0.112	134.150	689.500
blocks	1.31	29.08	12.76	41.84	0.091	136.120	689.200
blocks	1.21	28.43	15.39	43.82	0.091	130.740	688.800
blocks	1.13	32.44	22.18	54.62	0.091	161.910	679.200
blocks	1.06	29.93	19.80	49.73	0.091	158.080	675.600
blocks	1.00	32.32	25.08	57.40	0.046	124.300	657.600

Table 1.25: 9X9 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(M)	C_{1gnd}	C_{s1}
fastcap		50.02	0.36	50.38	10.631	85.742	756.800
blocks	9.50	48.08	0.31	48.39	10.371	85.169	752.800
blocks	6.33	158.04	1.04	159.08	3.480	93.676	757.200
blocks	4.75	76.47	1.75	78.22	1.999	103.253	754.800
blocks	3.80	72.12	2.28	74.40	1.305	109.880	759.800
blocks	3.17	60.36	3.29	63.65	0.868	118.880	760.500
blocks	2.71	50.20	3.78	53.98	0.485	129.330	762.600
blocks	2.38	44.40	4.90	49.30	0.356	134.260	759.100
blocks	2.11	37.17	5.90	43.07	0.244	140.980	764.800
blocks	1.90	40.50	7.48	47.98	0.199	135.610	768.200
blocks	1.73	34.44	9.55	43.99	0.167	146.340	761.400
blocks	1.58	32.89	11.32	44.21	0.154	151.730	762.100
blocks	1.46	36.98	13.68	50.66	0.112	146.670	770.900
blocks	1.36	36.71	15.67	52.38	0.112	144.670	769.500
blocks	1.27	36.59	18.88	55.47	0.091	147.810	769.700
blocks	1.19	36.91	22.10	59.01	0.091	143.020	765.400
blocks	1.12	37.12	25.85	62.97	0.091	171.900	751.000
blocks	1.06	39.06	29.15	68.21	0.091	173.980	754.900
blocks	1.00	41.10	34.04	75.14	0.046	136.550	734.100

Table 1.26: 10X10 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(M)	C_{1gnd}	C_{s1}
fastcap		92.80	0.41	93.21	12.078	88.638	831.400
blocks	10.50	75.84	0.40	76.24	11.729	88.017	827.300
blocks	7.00	324.08	1.40	325.48	5.117	97.783	832.100
blocks	5.25	169.68	1.86	171.54	2.527	105.676	829.000
blocks	4.20	86.44	2.81	89.25	1.459	114.450	833.700
blocks	3.50	86.51	3.26	89.77	1.300	124.310	835.100
blocks	3.00	78.99	4.41	83.40	0.604	129.690	836.700
blocks	2.63	61.08	5.36	66.44	0.485	139.320	835.500
blocks	2.33	54.72	6.70	61.42	0.356	146.520	839.400
blocks	2.10	46.60	7.87	54.47	0.244	152.010	841.200
blocks	1.91	50.92	9.83	60.75	0.199	145.780	844.800
blocks	1.75	44.78	11.47	56.25	0.198	156.710	837.200
blocks	1.62	41.71	13.46	55.17	0.167	160.980	833.900
blocks	1.50	47.51	16.66	64.17	0.167	154.270	848.600
blocks	1.40	46.04	18.85	64.89	0.112	156.360	842.900
blocks	1.31	46.12	22.23	68.35	0.091	159.540	842.900
blocks	1.24	46.08	25.57	71.65	0.091	154.870	846.800
blocks	1.17	47.23	29.08	76.31	0.091	154.170	846.500
blocks	1.11	46.96	35.33	82.29	0.091	189.000	830.300
blocks	1.05	48.74	39.24	87.98	0.091	187.470	830.300
blocks	1.00	52.91	46.82	99.73	0.046	147.930	807.100

Table 1.27: 12X12 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(M)	C_{1gnd}	C_{s1}
fastcap		165.25	4.81	170.06	16.722	94.335	980.700
blocks	12.50	150.20	2.42	152.62	16.270	93.667	976.600
blocks	8.33	163.50	1.86	165.36	7.998	103.429	981.300
blocks	6.25	311.36	2.37	313.73	3.317	111.513	978.300
blocks	5.00	196.38	3.66	200.04	2.227	120.000	980.200
blocks	4.17	136.87	4.05	140.92	1.459	129.370	984.400
blocks	3.57	128.40	4.79	133.19	0.972	139.010	986.800
blocks	3.13	117.63	6.17	123.80	0.868	143.670	983.500
blocks	2.78	103.34	8.01	111.35	0.559	150.520	990.300
blocks	2.50	85.82	9.41	95.23	0.356	164.830	987.100
blocks	2.27	78.79	10.73	89.52	0.323	166.890	988.200
blocks	2.08	69.73	11.77	81.50	0.244	173.970	994.000
blocks	1.92	75.68	15.14	90.82	0.199	166.020	997.900
blocks	1.79	67.28	17.18	84.46	0.198	174.240	997.600
blocks	1.67	63.22	20.37	83.59	0.167	181.040	989.700
blocks	1.56	61.96	25.56	87.52	0.154	185.460	986.400
blocks	1.47	71.31	33.76	105.07	0.112	181.190	1002.000
blocks	1.39	71.05	38.16	109.21	0.112	180.470	1001.000
blocks	1.32	72.17	43.48	115.65	0.091	184.180	1001.000
blocks	1.25	71.33	46.87	118.20	0.091	176.280	995.800
blocks	1.19	67.57	46.77	114.34	0.091	176.380	995.400
blocks	1.14	69.04	54.68	123.72	0.091	215.140	976.900
blocks	1.09	69.22	62.99	132.21	0.091	216.040	980.900
blocks	1.04	71.48	71.82	143.30	0.091	214.490	980.800
blocks	1.00	74.00	83.11	157.11	0.046	168.480	953.100

Table 1.28: 14X14 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-15}F$)	
	(μ)	user	system	CPU	(M)	C_{1gnd}	C_{s1}
fastcap		403.66	178.54	582.20	26.256	0.100	1.130
blocks	14.50	391.55	177.07	568.62	25.159	0.099	1.126
blocks	9.67	524.82	4.59	529.41	10.757	0.110	1.131
blocks	7.25	973.64	3.14	976.78	6.029	0.118	1.128
blocks	5.80	441.28	4.21	445.49	3.405	0.126	1.129
blocks	4.83	319.91	7.57	327.48	2.227	0.136	1.135
blocks	4.14	235.69	7.76	243.45	1.459	0.144	1.135
blocks	3.63	188.55	7.24	195.79	1.300	0.153	1.133
blocks	3.22	169.87	9.02	178.89	0.868	0.160	1.134
blocks	2.90	159.45	10.60	170.05	0.604	0.165	1.136
blocks	2.64	132.36	11.88	144.24	0.485	0.178	1.139
blocks	2.42	129.23	16.07	145.30	0.356	0.187	1.143
blocks	2.23	108.11	14.27	122.38	0.323	0.191	1.140
blocks	2.07	105.20	22.01	127.21	0.244	0.196	1.147
blocks	1.93	105.20	20.79	125.99	0.199	0.185	1.147
blocks	1.81	95.56	24.37	119.93	0.199	0.193	1.146
blocks	1.71	90.03	28.56	118.59	0.167	0.201	1.138
blocks	1.61	86.17	32.26	118.43	0.167	0.208	1.138
blocks	1.53	85.45	36.24	121.69	0.112	0.210	1.139
blocks	1.45	91.42	42.99	134.41	0.112	0.203	1.151
blocks	1.38	91.48	48.76	140.24	0.112	0.203	1.154
blocks	1.32	92.40	58.23	150.63	0.091	0.206	1.150
blocks	1.26	91.44	66.23	157.67	0.091	0.203	1.149
blocks	1.21	97.79	86.71	184.50	0.091	0.197	1.153
blocks	1.16	93.44	76.99	170.43	0.091	0.242	1.128
blocks	1.12	93.99	94.92	188.91	0.091	0.239	1.127
blocks	1.07	101.36	122.97	224.33	0.091	0.243	1.131
blocks	1.04	103.33	130.47	233.80	0.091	0.241	1.131
blocks	1.00	101.84	121.53	223.37	0.046	0.180	1.098

Table 1.29: 16X16 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-15}F$)	
	(μ)	user	system	CPU	(M)	C_{1gnd}	C_{s1}
fastcap		326.81	792.53	1119.34	36.832	0.105	1.279
blocks	16.50	318.59	786.78	1105.37	36.701	0.104	1.275
blocks	11.00	490.59	3.00	493.59	13.619	0.114	1.276
blocks	8.25	391.94	4.23	396.17	7.772	0.124	1.277
blocks	6.60	853.21	4.97	858.18	3.955	0.135	1.279
blocks	5.50	596.29	6.09	602.38	2.665	0.144	1.280
blocks	4.71	330.35	6.98	337.33	1.999	0.152	1.282
blocks	4.13	276.92	8.28	285.20	1.459	0.158	1.282
blocks	3.67	267.47	9.53	277.00	1.300	0.170	1.288
blocks	3.30	244.17	11.02	255.19	0.868	0.175	1.285
blocks	3.00	231.11	13.07	244.18	0.604	0.183	1.291
blocks	2.75	184.83	14.51	199.34	0.485	0.194	1.289
blocks	2.54	162.20	16.43	178.63	0.356	0.198	1.292
blocks	2.36	156.13	18.51	174.64	0.356	0.207	1.292
blocks	2.20	151.44	24.38	175.82	0.323	0.215	1.298
blocks	2.06	128.49	23.66	152.15	0.244	0.216	1.295
blocks	1.94	141.12	27.57	168.69	0.199	0.205	1.300
blocks	1.83	127.99	31.54	159.53	0.199	0.209	1.304
blocks	1.74	120.37	35.45	155.82	0.167	0.224	1.293
blocks	1.65	116.76	39.85	156.61	0.167	0.230	1.290
blocks	1.57	113.86	45.39	159.25	0.167	0.232	1.291
blocks	1.50	124.50	55.06	179.56	0.167	0.223	1.311
blocks	1.43	120.70	61.85	182.55	0.112	0.224	1.304
blocks	1.38	119.91	70.11	190.02	0.112	0.224	1.303
blocks	1.32	120.84	79.72	200.56	0.091	0.230	1.308
blocks	1.27	119.43	88.08	207.51	0.091	0.226	1.302
blocks	1.22	126.88	107.78	234.66	0.091	0.221	1.307
blocks	1.18	121.80	108.27	230.07	0.091	0.218	1.302
blocks	1.14	122.80	120.81	243.61	0.091	0.270	1.278
blocks	1.10	130.89	166.83	297.72	0.091	0.271	1.282
blocks	1.06	127.18	148.08	275.26	0.091	0.270	1.282
blocks	1.03	128.63	177.79	306.42	0.091	0.266	1.278
blocks	1.00	134.00	196.86	330.86	0.046	0.201	1.244

Table 1.30: 18X18 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(M)	C_{1gnd}	C_{s1}
fastcap		471.95	1496.77	1968.72	47.242	0.000	0.000
blocks	18.50	469.34	1482.70	1952.04	46.962	109.263	1425.000
blocks	12.33	1512.44	9.08	1521.52	16.270	119.011	1425.000
blocks	9.25	641.82	6.12	647.94	10.599	129.787	1427.000
blocks	7.40	2398.22	8.91	2407.13	6.306	140.203	1431.000
blocks	6.17	1094.66	9.11	1103.77	3.438	149.540	1433.000
blocks	5.29	778.67	8.11	786.78	2.527	156.860	1430.000
blocks	4.63	432.62	9.51	442.13	1.981	167.370	1433.000
blocks	4.11	364.75	11.16	375.91	1.459	173.590	1433.000
blocks	3.70	395.83	15.11	410.94	1.300	185.850	1439.000
blocks	3.36	343.24	16.72	359.96	0.972	191.220	1439.000
blocks	3.08	305.42	18.98	324.40	0.868	197.530	1442.000
blocks	2.85	277.82	21.85	299.67	0.604	202.770	1444.000
blocks	2.64	228.33	20.85	249.18	0.485	215.180	1442.000
blocks	2.47	211.20	22.62	233.82	0.356	225.460	1443.000
blocks	2.31	194.48	24.97	219.45	0.356	229.090	1445.000
blocks	2.18	181.25	28.34	209.59	0.323	235.360	1446.000
blocks	2.06	165.22	31.38	196.60	0.244	238.110	1448.000
blocks	1.95	181.75	37.09	218.84	0.199	225.110	1453.000
blocks	1.85	175.96	47.14	223.10	0.199	228.790	1457.000
blocks	1.76	166.96	55.67	222.63	0.174	240.000	1457.000
blocks	1.68	162.05	63.12	225.17	0.167	248.250	1446.000
blocks	1.61	147.22	62.66	209.88	0.167	254.120	1442.000
blocks	1.54	154.93	80.40	235.33	0.167	258.650	1447.000
blocks	1.48	154.30	79.24	233.54	0.112	248.130	1459.000
blocks	1.42	159.18	100.47	259.65	0.112	250.240	1462.000
blocks	1.37	159.13	109.27	268.40	0.112	247.950	1461.000
blocks	1.32	154.17	111.21	265.38	0.091	252.930	1458.000
blocks	1.28	159.71	134.10	293.81	0.112	248.410	1459.000
blocks	1.23	152.59	135.62	288.21	0.091	241.080	1456.000
blocks	1.19	155.36	149.02	304.38	0.091	243.520	1456.000
blocks	1.16	155.65	165.94	321.59	0.091	296.960	1429.000
blocks	1.12	158.32	181.16	339.48	0.091	295.510	1429.000
blocks	1.09	159.45	218.49	377.94	0.091	296.380	1429.000
blocks	1.06	160.78	240.69	401.47	0.091	293.930	1428.000
blocks	1.03	163.72	263.02	426.74	0.091	292.500	1428.000
blocks	1.00	171.01	289.04	460.05	0.046	221.180	1390.000

Table 1.31: 20X20 bus crossing problem with 1e-06m wires (n=1 e=0.1)

program	w	time			memory	Capacitances ($10^{-18}F$)	
	(μ)	user	system	CPU	(M)	C_{1gnd}	C_{s1}
fastcap		N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
blocks	20.50	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
blocks	13.67	1588.68	495.64	2084.32	21.627	125.315	1578.000
blocks	10.25	1088.77	8.11	1096.88	11.338	134.929	1575.000
blocks	8.20	1056.72	8.23	1064.95	7.772	145.785	1577.000
blocks	6.83	1975.21	8.25	1983.46	4.865	155.296	1582.000
blocks	5.86	1159.07	10.03	1169.10	3.481	163.420	1580.000
blocks	5.13	820.86	11.37	832.23	2.527	172.870	1581.000
blocks	4.56	534.40	12.30	546.70	1.798	183.070	1588.000
blocks	4.10	465.35	14.06	479.41	1.459	187.810	1583.000
blocks	3.73	454.01	16.18	470.19	1.300	201.470	1590.000
blocks	3.42	420.50	18.21	438.71	0.972	207.510	1590.000
blocks	3.15	395.45	26.41	421.86	0.868	212.990	1592.000
blocks	2.93	355.27	24.16	379.43	0.604	216.960	1590.000
blocks	2.73	296.07	24.67	320.74	0.485	232.370	1596.000
blocks	2.56	270.68	29.44	300.12	0.485	236.670	1596.000
blocks	2.41	272.14	39.65	311.79	0.356	246.620	1595.000
blocks	2.28	252.38	39.65	292.03	0.323	252.320	1602.000
blocks	2.16	224.70	37.78	262.48	0.323	257.570	1599.000
blocks	2.05	207.17	41.77	248.94	0.244	260.370	1601.000
blocks	1.95	226.70	50.08	276.78	0.199	245.250	1606.000
blocks	1.86	208.88	57.96	266.84	0.199	248.960	1610.000
blocks	1.78	197.17	65.37	262.54	0.198	261.120	1610.000
blocks	1.71	193.37	73.02	266.39	0.167	269.830	1598.000
blocks	1.64	187.31	81.07	268.38	0.167	278.210	1598.000
blocks	1.58	184.39	90.45	274.84	0.167	280.570	1599.000
blocks	1.52	180.90	100.87	281.77	0.112	283.500	1600.000
blocks	1.46	192.06	111.63	303.69	0.112	271.630	1613.000
blocks	1.41	191.58	123.96	315.54	0.112	272.000	1616.000
blocks	1.37	190.97	137.35	328.32	0.112	271.070	1615.000
blocks	1.32	192.59	151.00	343.59	0.091	275.550	1611.000
blocks	1.28	190.17	166.52	356.69	0.112	270.640	1609.000
blocks	1.24	190.33	183.68	374.01	0.091	264.440	1610.000
blocks	1.21	204.48	241.66	446.14	0.091	260.300	1609.000
blocks	1.17	193.57	226.37	419.94	0.091	263.510	1613.000
blocks	1.14	196.46	247.81	444.27	0.091	328.130	1583.000
blocks	1.11	198.07	272.29	470.36	0.091	326.680	1583.000
blocks	1.08	200.00	316.24	516.24	0.091	320.500	1579.000
blocks	1.05	201.89	345.57	547.46	0.091	323.800	1583.000
blocks	1.02	205.21	377.80	583.01	0.091	320.020	1579.000
blocks	1.00	210.78	412.58	623.36	0.046	243.290	1539.000

2 Figures

2.1 Panel size s^2

In this section the figures show the effect of the panel size s^2 on the CPU time.

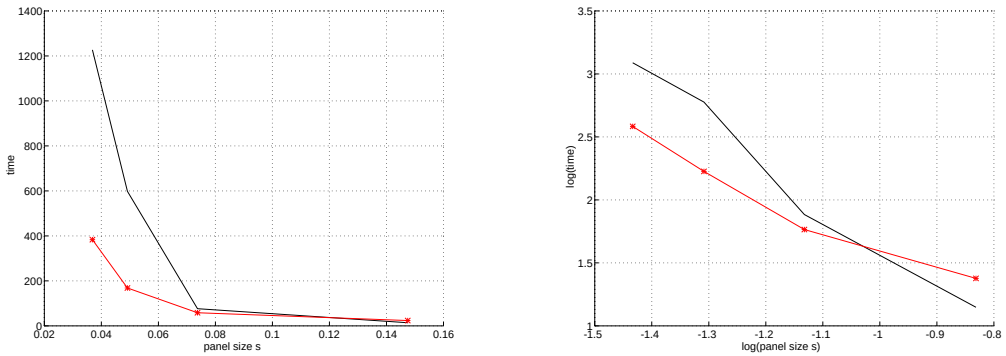

Figure 2.1: 2×5 crossing bus, window width 5.50

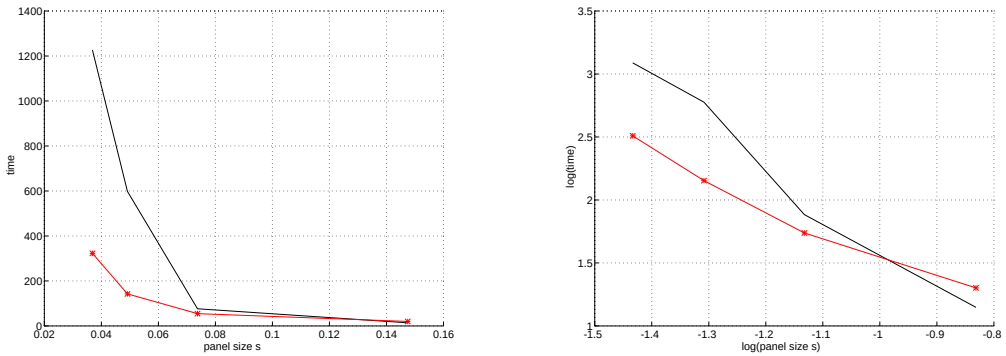

Figure 2.2: 2×5 crossing bus, window width 3.67

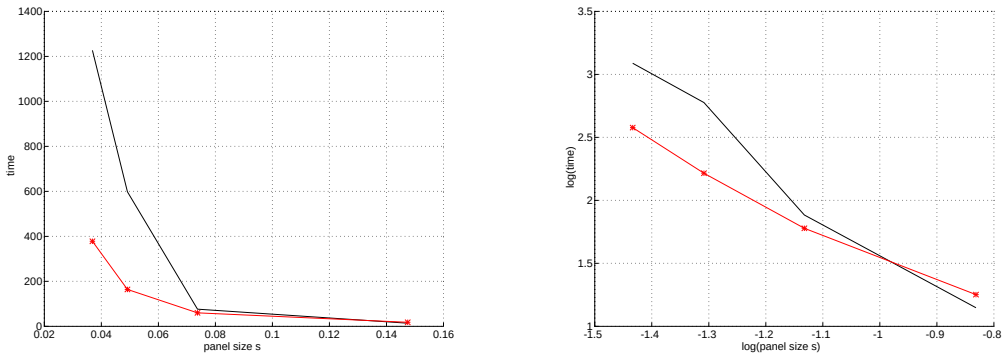

Figure 2.3: 2×5 crossing bus, window width 2.75

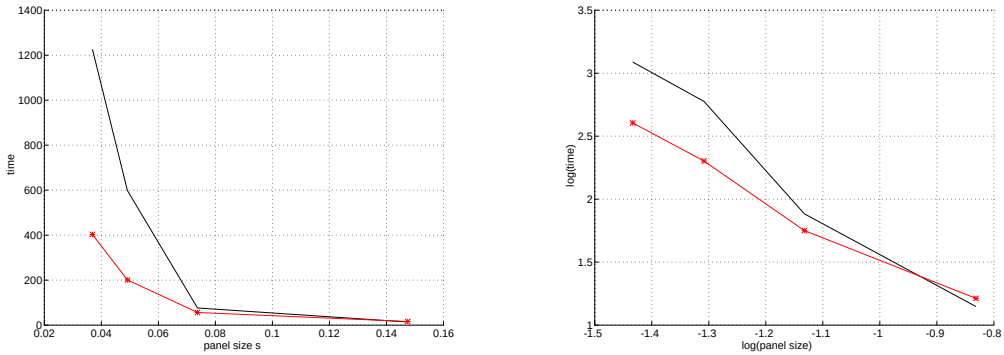

Figure 2.4: 2×5 crossing bus, window width 2.20

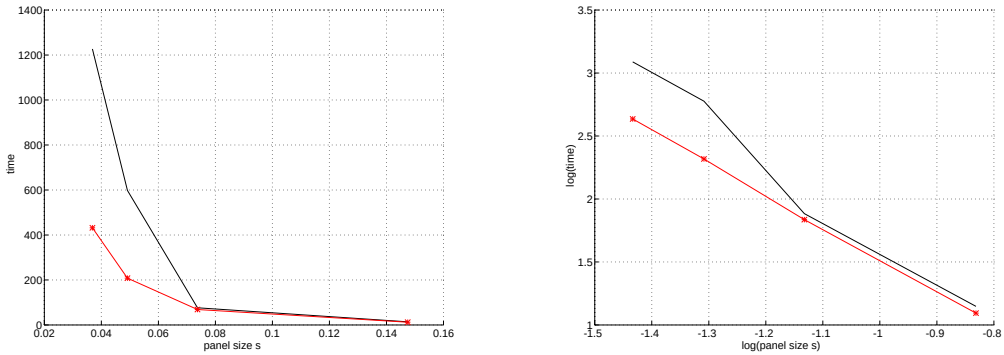

Figure 2.5: 2×5 crossing bus, window width 1.83

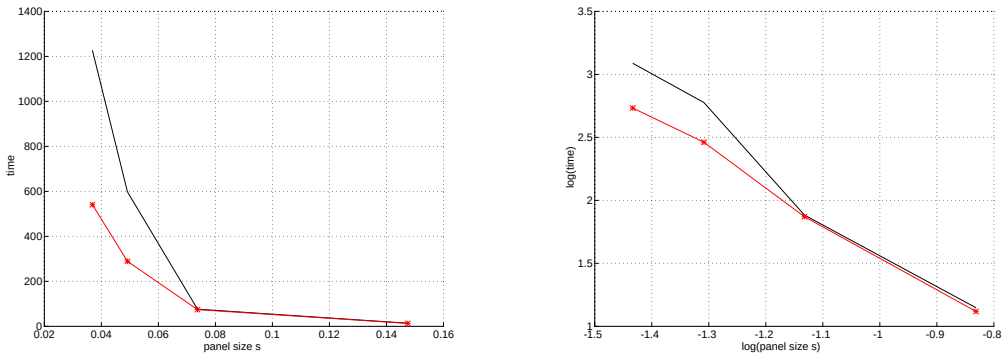

Figure 2.6: 2×5 crossing bus, window width 1.57

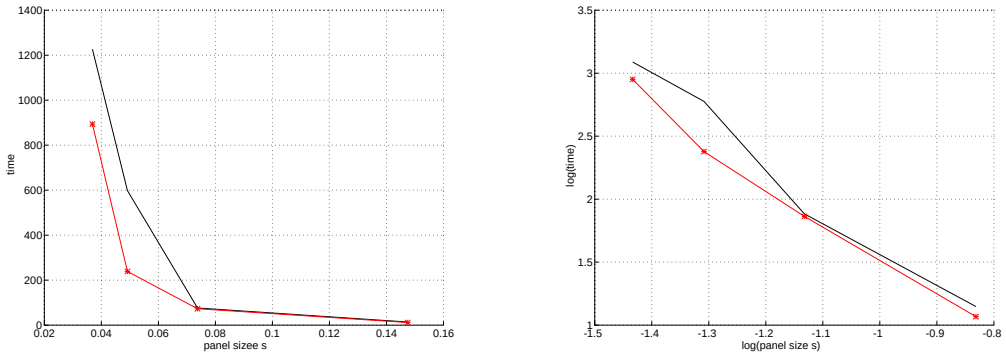

Figure 2.7: 2×5 crossing bus, window width 1.38

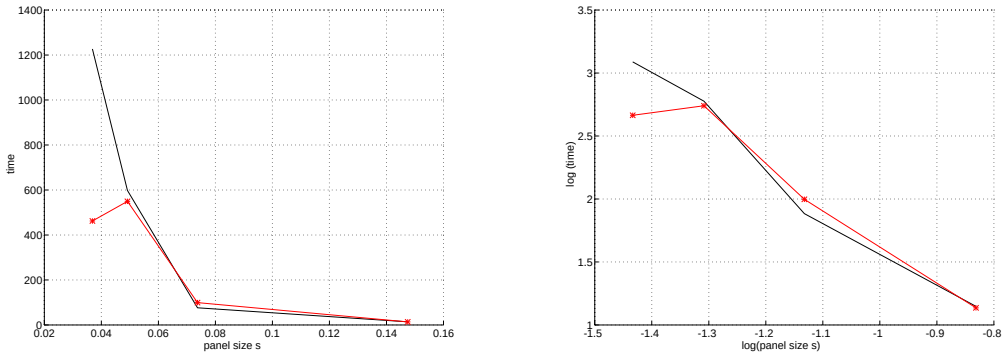

Figure 2.8: 2×5 crossing bus, window width 1.22

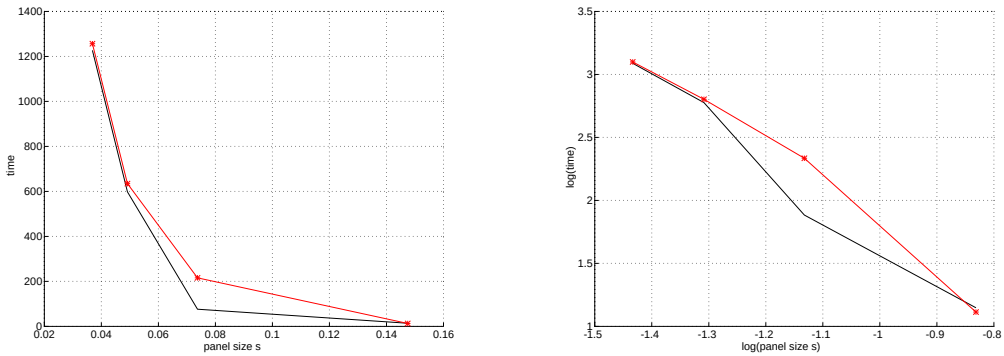

Figure 2.9: 2×5 crossing bus, window width 1.10

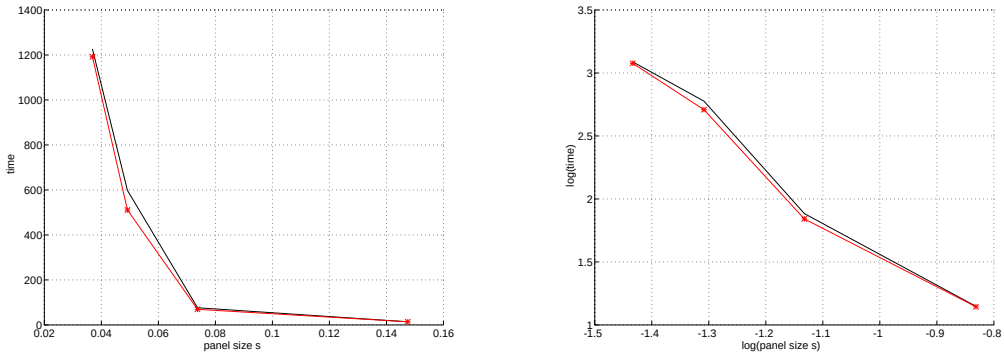

Figure 2.10: 2×5 crossing bus, window width 1.00

2.2 Circuit size A

In this section the figures show the effect of the circuit size A on the CPU time.

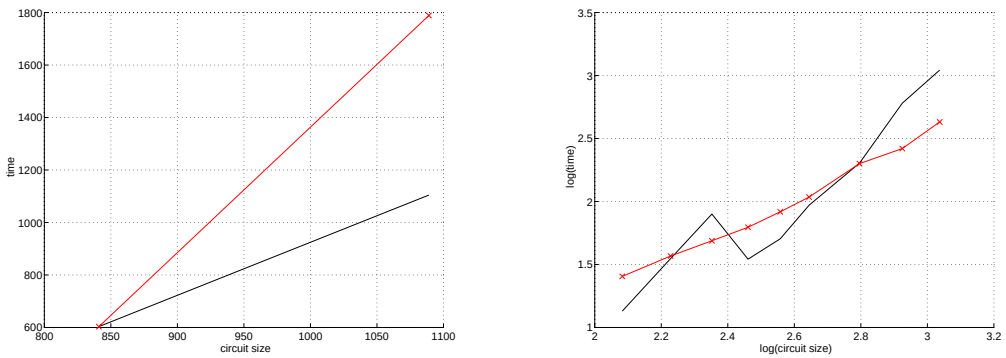

Figure 2.11: Window width 1.0

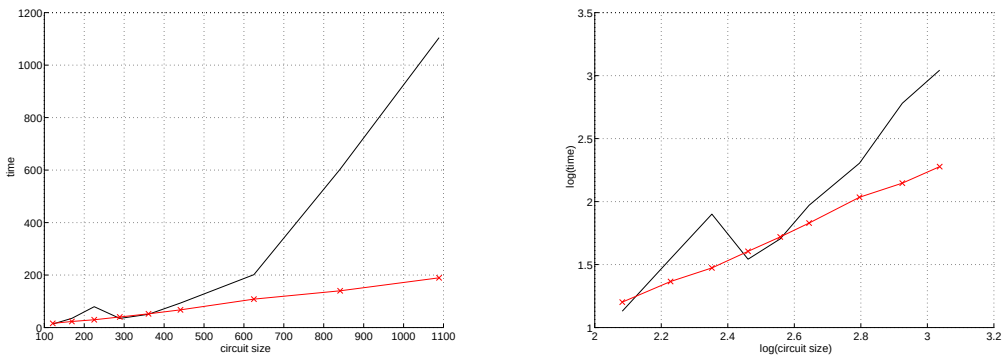

Figure 2.12: Window width 2.0

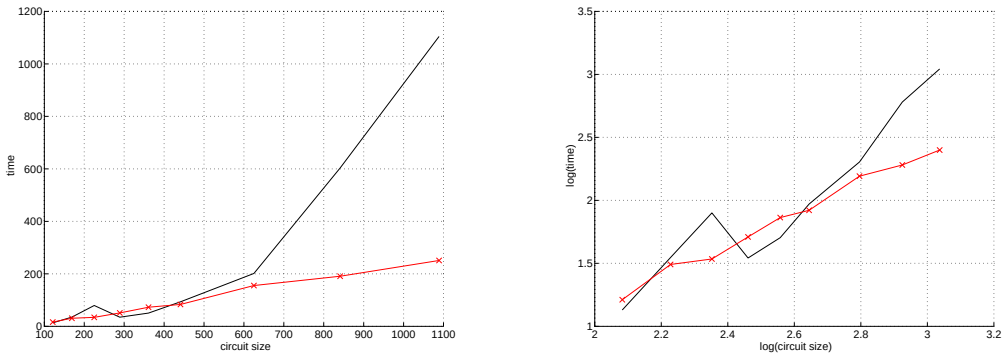

Figure 2.13: Window width 3.0

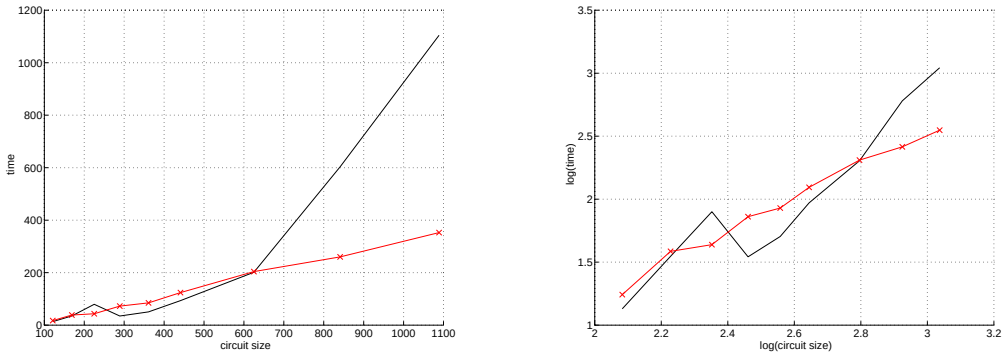

Figure 2.14: Window width 4.0

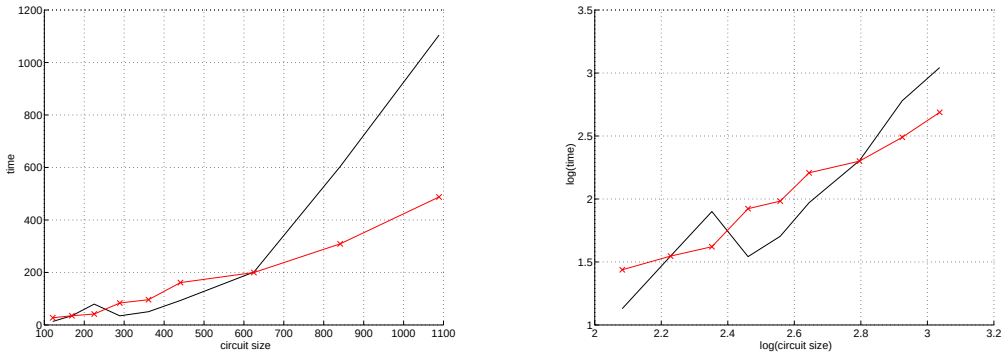

Figure 2.15: Window width 5.0

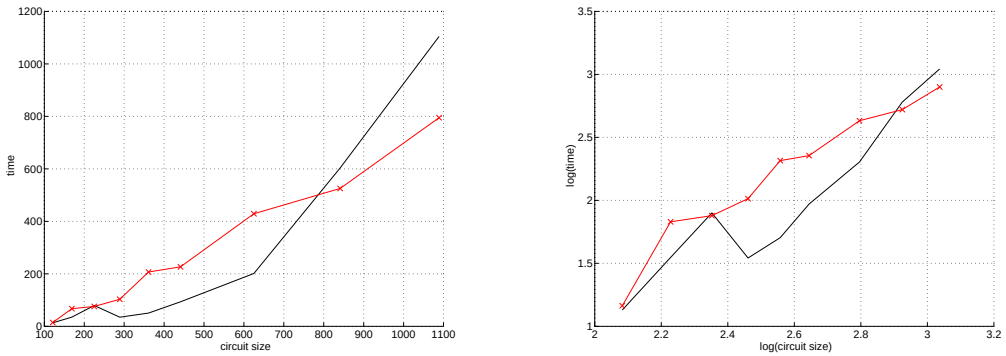

Figure 2.16: Window width 6.0

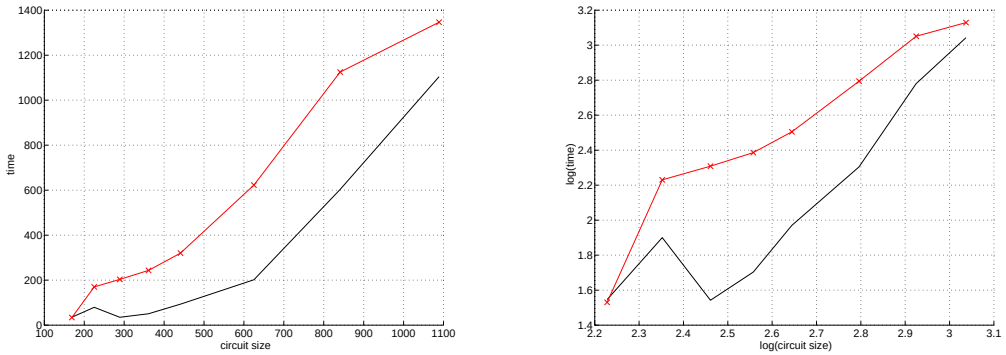

Figure 2.17: Window width 7.0

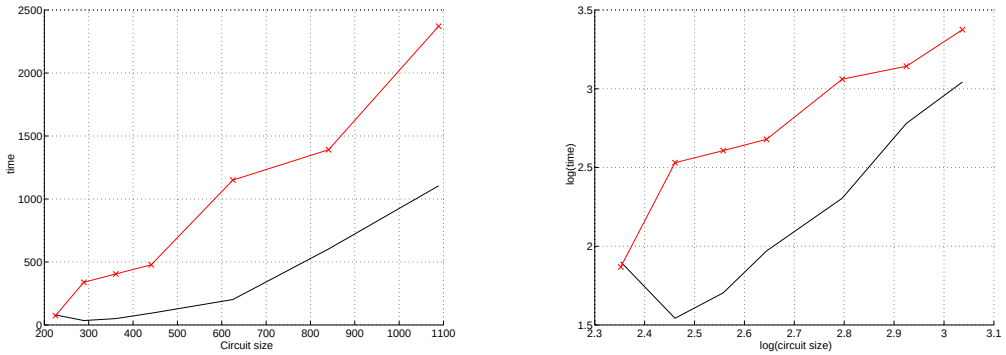

Figure 2.18: Window width 8.0

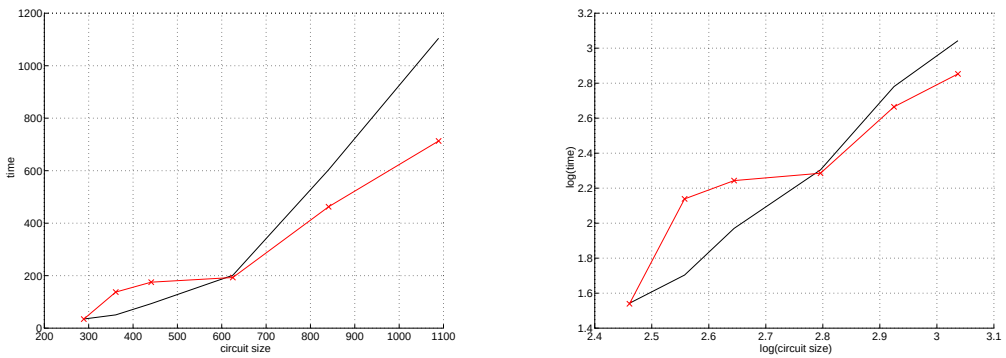

Figure 2.19: Window width 9.0

2.3 Window width ω

In this section the figures show the effect of the window width ω on the CPU time.

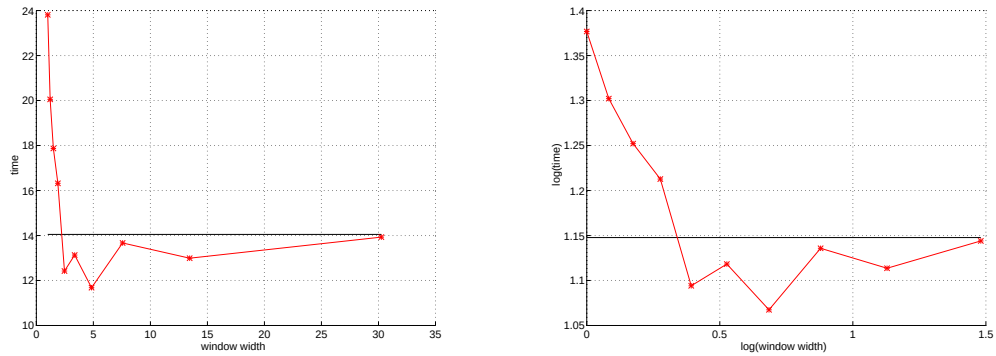

Figure 2.20: 2×5 crossing bus, number of panels 460

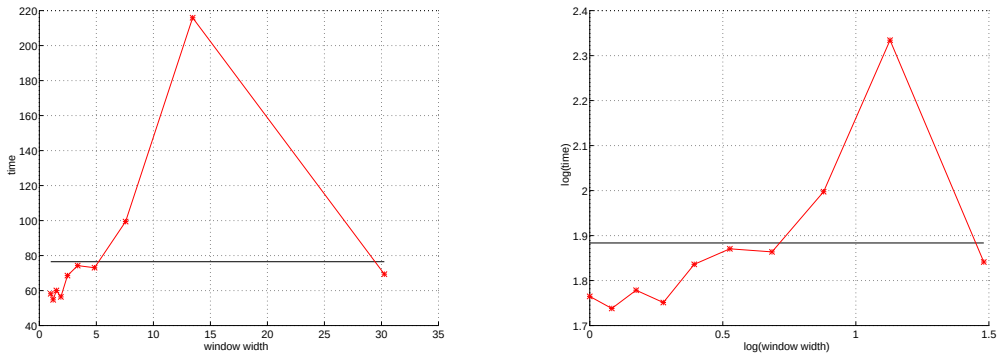

Figure 2.21: 2×5 crossing bus, number of panels 920

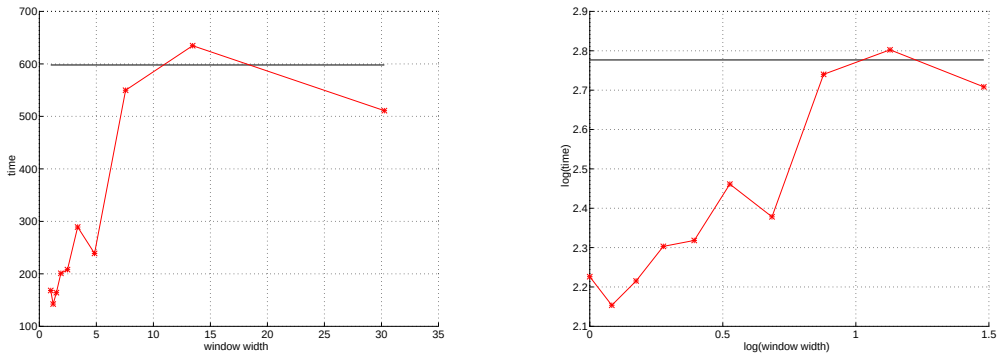

Figure 2.22: 2×5 crossing bus, number of panels 1380

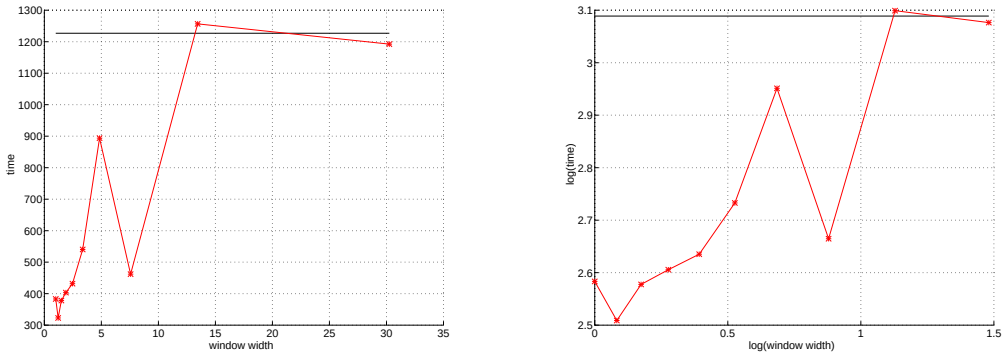

Figure 2.23: 2×5 crossing bus, number of panels 1840

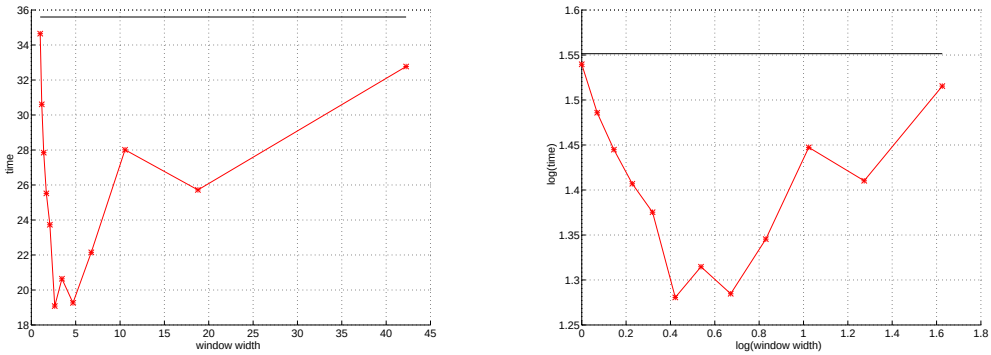

Figure 2.24: 2×6 crossing bus

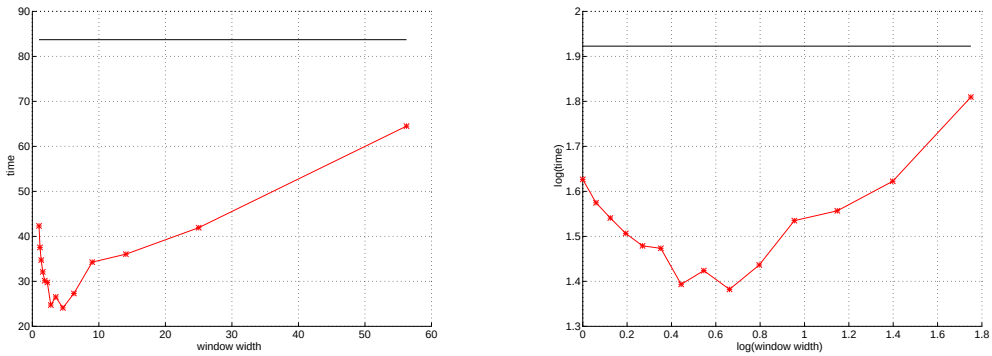

Figure 2.25: 2×7 crossing bus

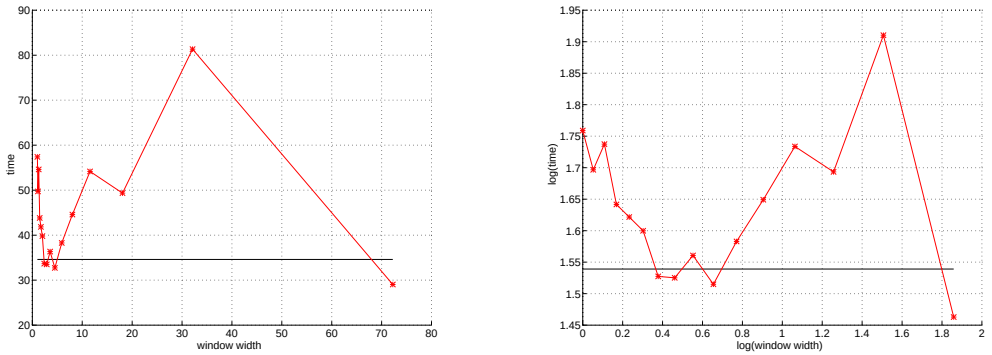

Figure 2.26: 2×8 crossing bus

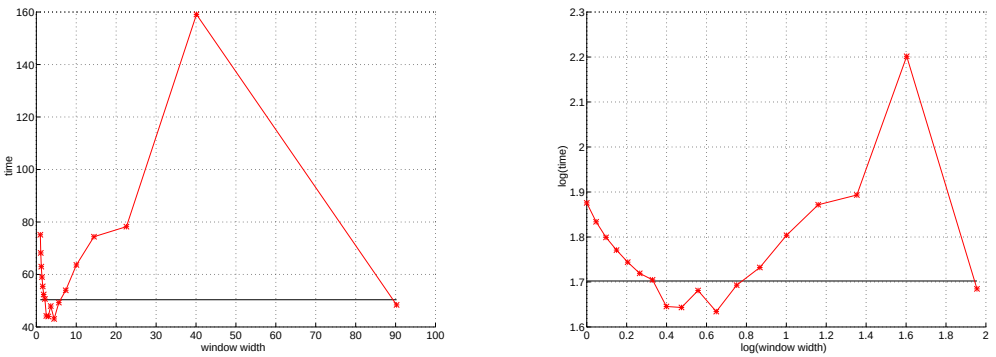

Figure 2.27: 2×9 crossing bus

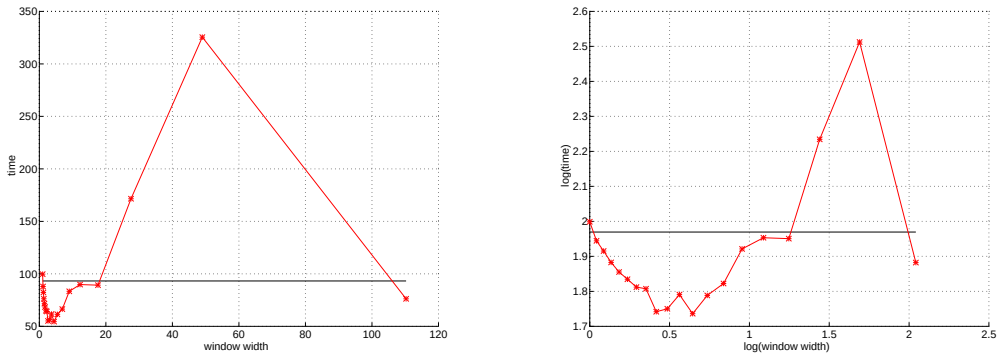

Figure 2.28: 2×10 crossing bus

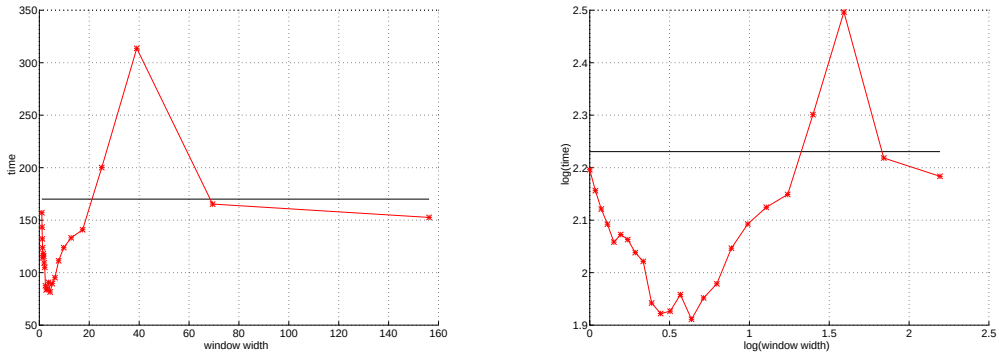

Figure 2.29: 2×12 crossing bus

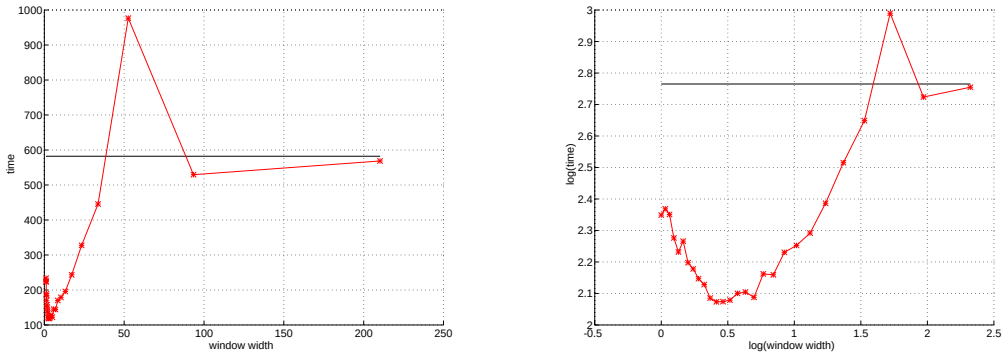

Figure 2.30: 2×14 crossing bus

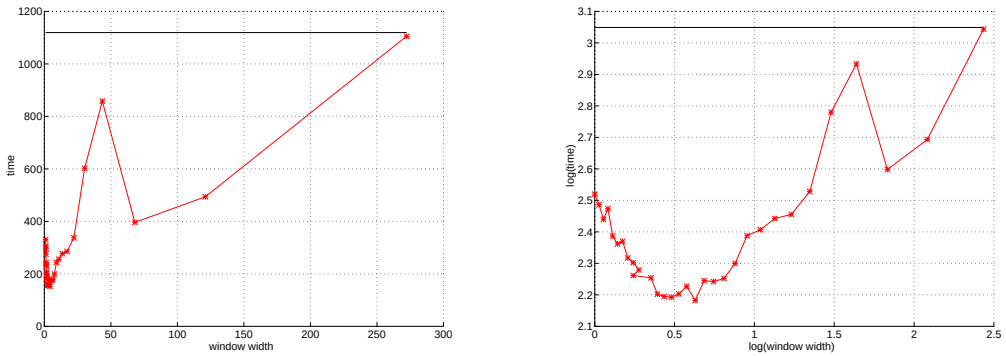

Figure 2.31: 2×16 crossing bus

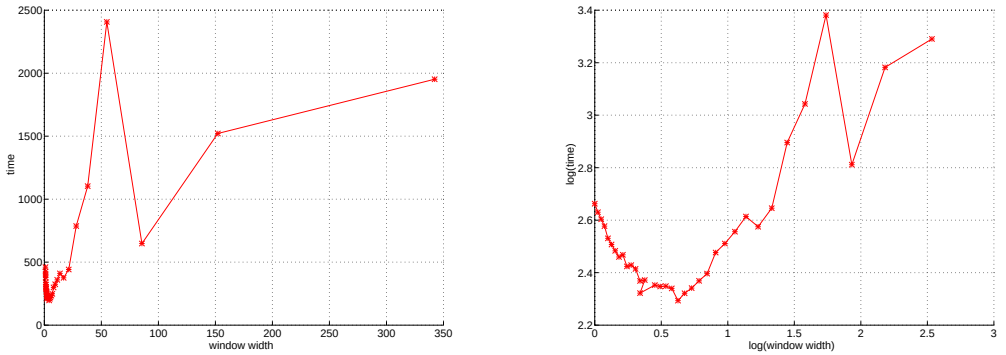

Figure 2.32: 2×18 crossing bus

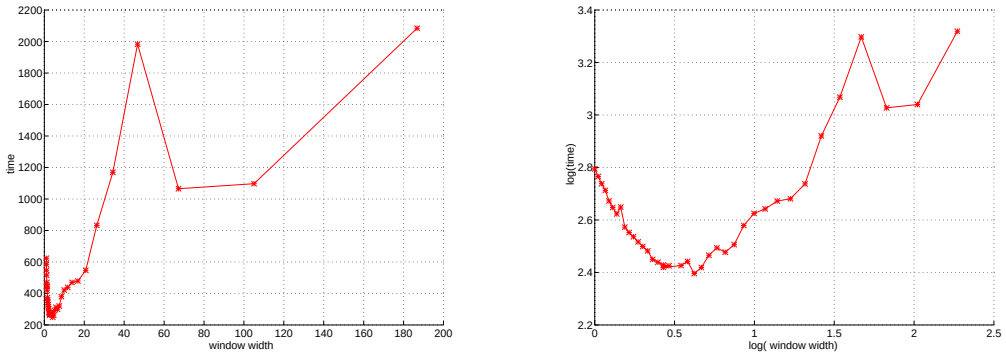

Figure 2.33: 2×20 crossing bus

2.4 Scaling parameter λ

In this section the figures show the effect of the scaling parameter λ on the CPU time.

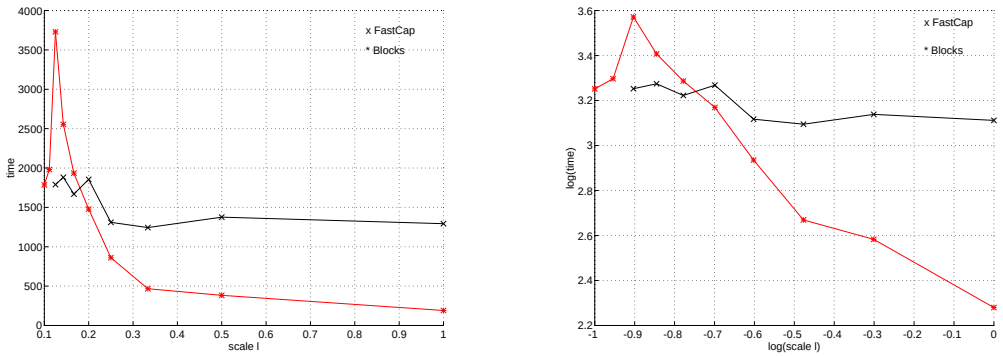

Figure 2.34: 2×16 crossing bus, window width 2.06

2.5 Values

In this section the figures show the values given by the new algorithm and the values given by *FastCap*.

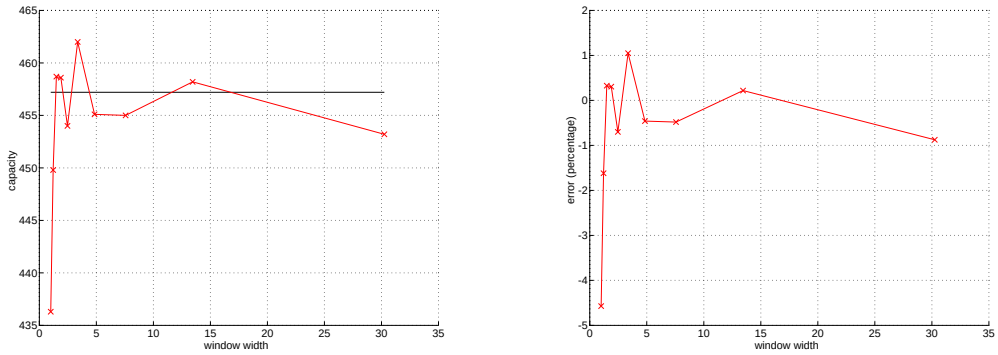

Figure 2.35: 2×5 crossing bus, number of panels 460

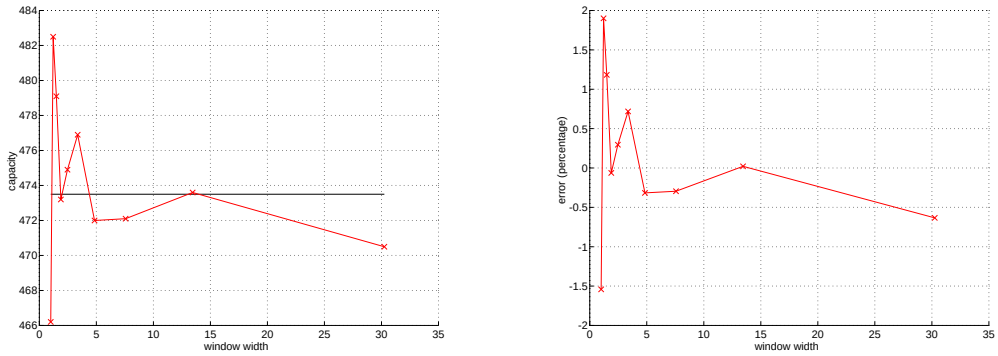

Figure 2.36: 2×5 crossing bus, number of panels 920

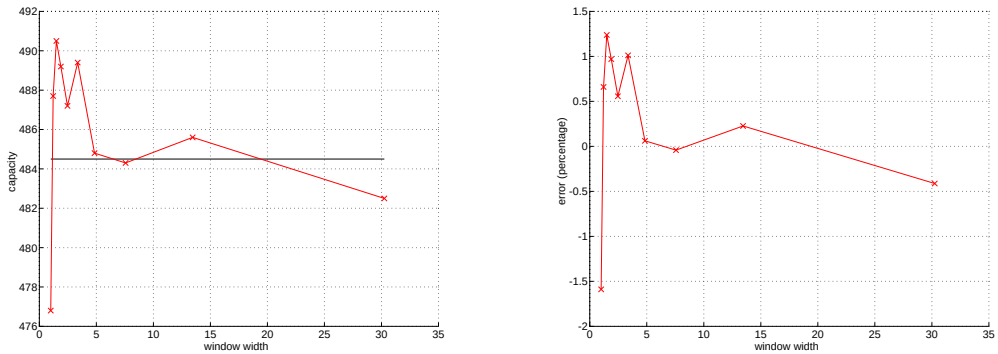

Figure 2.37: 2×5 crossing bus, number of panels 1380

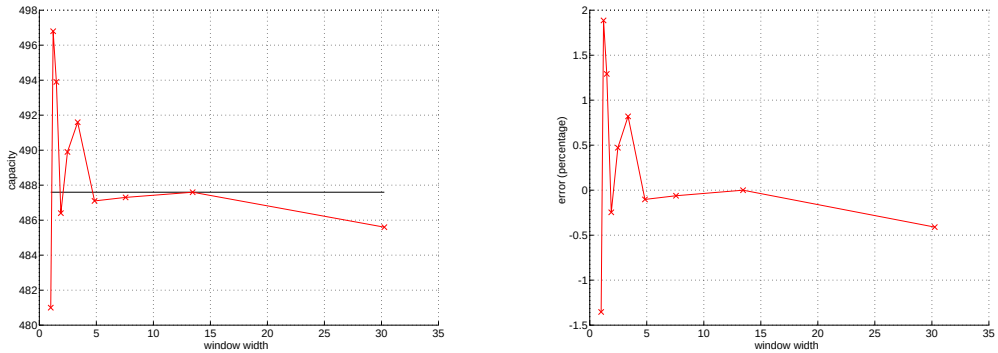

Figure 2.38: 2×5 crossing bus, number of panels 1840

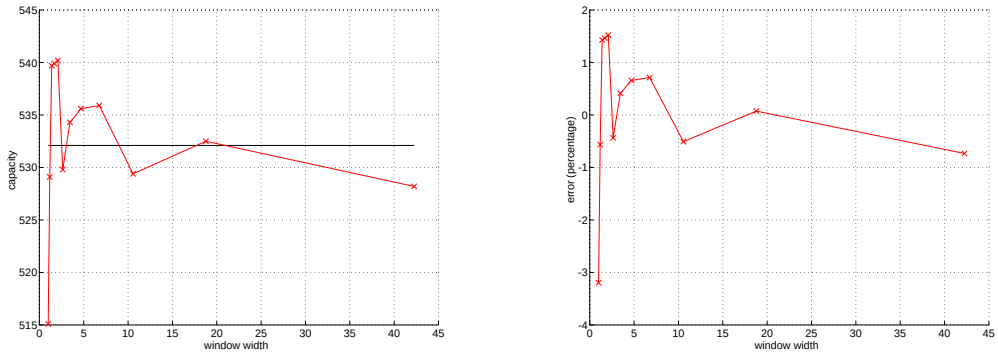

Figure 2.39: 2×6 crossing bus

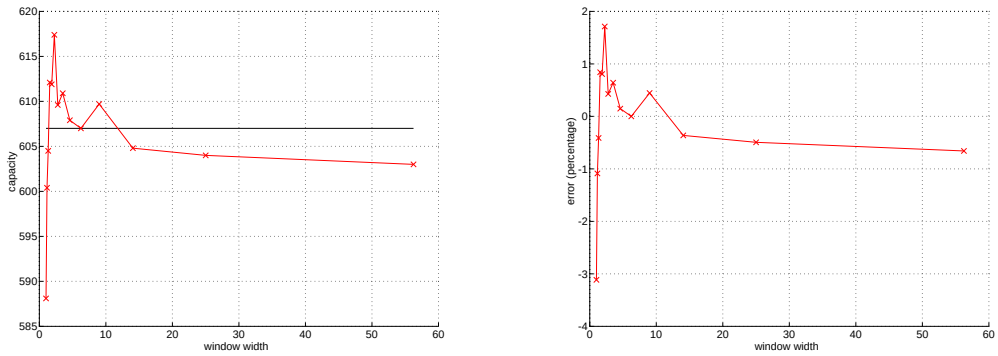

Figure 2.40: 2×7 crossing bus

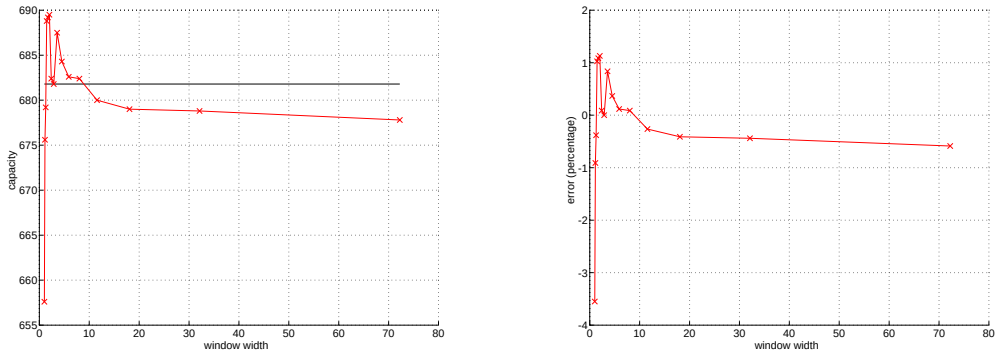

Figure 2.41: 2×8 crossing bus

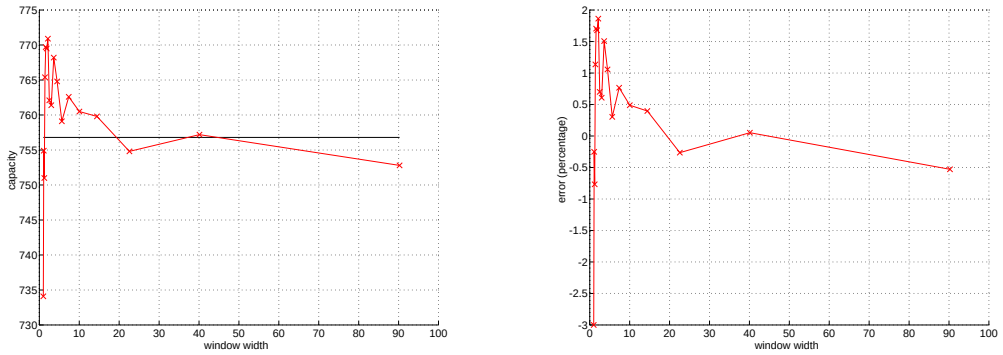

Figure 2.42: 2×9 crossing bus

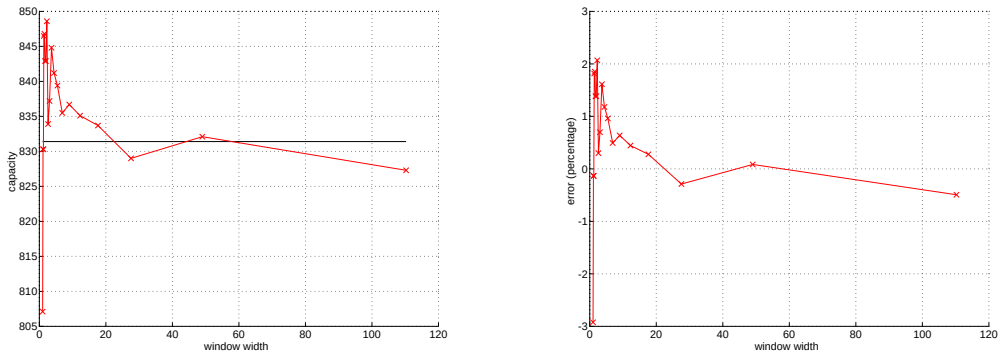

Figure 2.43: 2×10 crossing bus

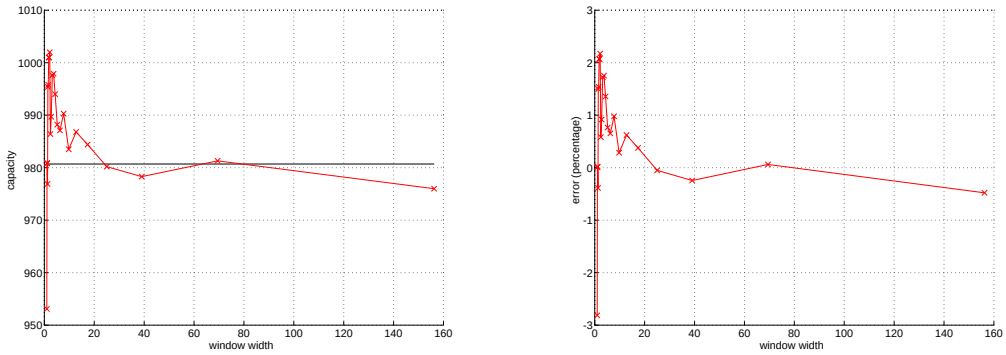

Figure 2.44: 2×12 crossing bus

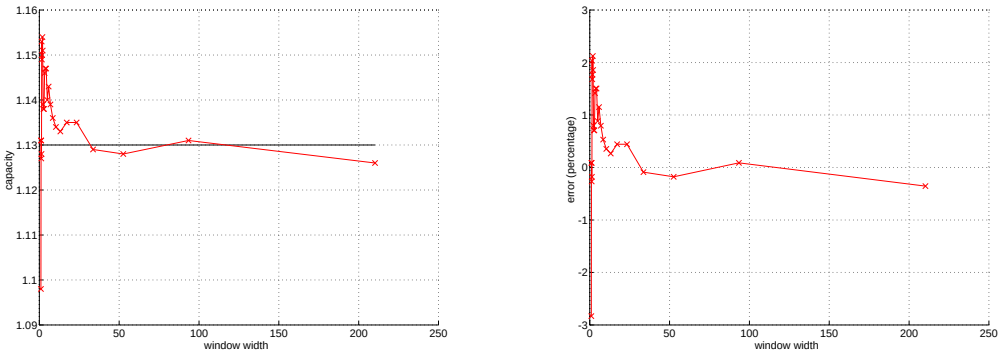

Figure 2.45: 2×14 crossing bus

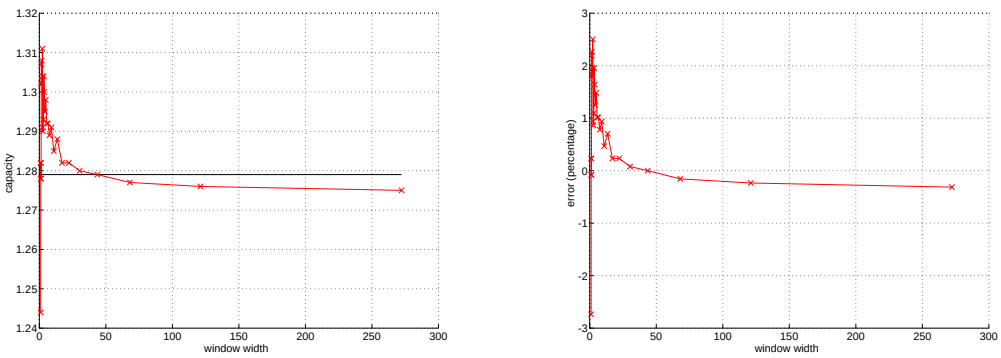

Figure 2.46: 2×16 crossing bus