Table 1: Additional swap gates and circuit depth, n = 5

benchmark	g	d	layout	s_B	s_S	s_L	Δs_B	Δs_S	d_B	d_S	d_L	Δd_B	Δd_S
ghz	7	7	full_10_2	0	0	0	nan	nan	7	7	7	0	0
ghz	7	7	full_7_3	0	0	0	nan	nan	7	7	7	0	0
ghz	7	7	ring_10_2	0	3	9	nan	-200	7	10	8	-14.29	20
ghz	7	7	ring_7_3	0	0	9	nan	nan	7	7	8	-14.29	-14.29
ghz	7	7	grid_9_3	6	3	6	0	-100	13	10	8	38.46	20
ghz	7	7	grid_4_5	3	0	9	-200	nan	10	7	8	20	-14.29
ghz	7	7	line_5_4	0	9	18	nan	-100	7	13	9	-28.57	30.77
ghz	7	7	t_horizontal_5_4	9	3	6	33.33	-100	16	10	9	43.75	10
ghz	7	7	t_vertical_5_4	9	0	6	33.33	nan	16	7	9	43.75	-28.57
ghz	7	7	ring_5_4	0	6	9	nan	-50	7	8	8	-14.29	0
dj	36	11	full_10_2	0	0	0	nan	nan	11	11	11	0	0
dj	36	11	full_7_3	0	0	0	nan	nan	11	11	11	0	0
dj	36	11	ring_10_2	36	3	3	91.67	0	40	17	12	70	29.41
dj	36	11	ring_7_3	24	3	3	87.5	0	30	14	12	60	14.29
dj	36	11	grid_9_3	9	3	0	100	100	21	17	11	47.62	35.29
dj	36	11	grid_4_5	21	3	3	85.71	0	37	14	12	67.57	14.29
dj	36	11	line_5_4	36	6	6	83.33	0	40	17	14	65	17.65
dj	36	11	t_horizontal_5_4	24	3	3	87.5	0	37	16	12	67.57	25
dj	36	11	t_vertical_5_4	24	3	3	87.5	0	37	17	12	67.57	29.41
dj	36	11	ring_5_4	9	3	3	66.67	0	24	14	12	50	14.29
graphstate	50	22	full_10_2	0	3	0	nan	100	22	22	22	0	0
graphstate	50	22	full_7_3	0	6	0	nan	100	22	25	22	0	12
graphstate	50	22	ring_10_2	12	6	9	25	-50	32	25	20	37.5	20
graphstate	50	22	ring_7_3	18	6	12	33.33	-100	38	25	21	44.74	16
graphstate	50	22	grid_9_3	15	3	6	60	-100	37	32	20	45.95	37.5
graphstate	50	22	grid_4_5	18	3	9	50	-200	41	25	20	51.22	20
graphstate	50	22	line_5_4	12	9	12	0	-33.33	32	25	21	34.38	16
graphstate	50	22	t_horizontal_5_4	12	6	9	25	-50	35	25	20	42.86	20
graphstate	50	22	t_vertical_5_4	12	6	9	25	-50	35	22	20	42.86	9.09
graphstate	50	22	ring_5_4	12	6	12	0	-100	33	25	25	24.24	0
qft	71	38	full_10_2	0	0	0	nan	nan	38	38	38	0	0
qft	71	38	full_7_3	0	0	0	nan	nan	38	38	38	0	0
qft	71	38	ring_10_2	72	15	24	66.67	-60	92	60	42	54.35	30
qft	71	38	ring_7_3	51	18	24	52.94	-33.33	77	59	42	45.45	28.81
qft	71	38	grid_9_3	39	12	21	46.15	-75	74	53	41	44.59	22.64
qft	71	38	grid_4_5	36	15	27	25	-80	82	54	52	36.59	3.7
qft	71	38	line_5_4	72	24	24	66.67	0	92	57	42	54.35	26.32
qft	71	38	t_horizontal_5_4	48	15	24	50	-60	82	60	42	48.78	30
qft	71	38	t_vertical_5_4	48	15	24	50	-60	82	60	42	48.78	30
qft	71	38	ring_5_4	27	18	18	33.33	0	65	57	43	33.85	24.56
wstate	73	45	full_10_2	0	0	0	nan	nan	45	45	45	0	0
wstate	73	45	full_7_3	0	0	0	nan	nan	45	45	45	0	0
wstate	73	45	ring_10_2	0	0	9	nan	nan	45	45	40	11.11	11.11
wstate	73	45	ring_7_3	0	0	9	nan	nan	45	45	40	11.11	11.11
wstate	73	45	grid_9_3	18	0	12	33.33	nan	54	45	41	24.07	8.89
wstate	73	45	grid_4_5	12	0	9	25	nan	51	45	40	21.57	11.11
wstate	73	45	line_5_4	0	0	15	nan	nan	45	45	33	26.67	26.67
wstate	73	45	t_horizontal_5_4	18	0	6	66.67	nan	58	45	39	32.76	13.33
wstate	73	45	t_vertical_5_4	18	0	6	66.67	nan	58	45	39	32.76	13.33
wstate	73	45	ring_5_4	nan	nan	9	nan	nan	nan	nan	39	nan	nan
qftentangled	78	42	full_10_2	0	0	0	nan	nan	42	42	42	0	0
qftentangled	78	42	full_7_3	0	6	0	nan	100	42	63	42	0	33.33
qftentangled	78	42	ring_10_2	72	21	30	58.33	-42.86	96	75	49	48.96	34.67
qftentangled	78	42	ring_7_3	51	21	30	41.18	-42.86	81	75	49	39.51	34.67
qftentangled	78	42	grid_9_3	45	21	27	40	-28.57	87	76	45	48.28	40.79
qftentangled	78	42	grid_4_5	36	18	15	58.33	16.67	78	57	45	42.31	21.05
qftentangled	78	42	line_5_4	72	24	36	50	-50	96	73	50	47.92	31.51
qftentangled	78	42	t_horizontal_5_4	60	24	33	45	-37.5	90	73	48	46.67	34.25
qftentangled	78	42	t_vertical_5_4	60	21	33	45	-57.14	90	75	48	46.67	36
qftentangled	78	42	ring_5_4	27	21	30	-11.11	-42.86	69	76	49	28.99	35.53
vqe	83	21	full_10_2	0	0	0	nan	nan	21	21	21	0	0

Continued on next page

Table 1: Additional swap gates and circuit depth, n = 5

benchmark	g	d	layout	s_B	s_S	s_L	Δs_B	Δs_S	d_B	d_S	d_L	Δd_B	Δd_S
vqe	83	21	full_7_3	0	0	0	nan	nan	21	21	21	0	0
vqe	83	21	ring_10_2	0	0	15	nan	nan	21	21	29	-38.1	-38.1
vqe	83	21	ring_7_3	0	0	15	nan	nan	21	21	29	-38.1	-38.1
vqe	83	21	grid_9_3	15	0	12	20	nan	35	21	27	22.86	-28.57
vqe	83	21	grid_4_5	18	0	15	16.67	nan	39	21	29	25.64	-38.1
vqe	83	21	line_5_4	0	0	15	nan	nan	21	21	24	-14.29	-14.29
vqe	83	21	t_horizontal_5_4	12	0	12	0	nan	33	21	25	24.24	-19.05
vqe	83	21	t_vertical_5_4	12	0	12	0	nan	33	21	25	24.24	-19.05
vqe	83	21	ring_5_4	0	0	15	nan	nan	21	21	29	-38.1	-38.1
qaoa	95	31	full_10_2	0	3	0	nan	100	31	42	31	0	26.19
qaoa	95	31	full_7_3	0	0	0	nan	nan	31	31	31	0	0
qaoa	95	31	ring_10_2	48	12	27	43.75	-125	106	47	45	57.55	4.26
qaoa	95	31	ring_7_3	24	9	27	-12.5	-200	54	58	45	16.67	22.41
qaoa	95	31	grid_9_3	9	9	21	-133.33	-133.33	37	48	48	-29.73	0
qaoa	95	31	grid_4_5	18	6	27	-50	-350	59	50	45	23.73	10
qaoa	95	31	line_5_4	48	12	18	62.5	-50	106	42	39	63.21	7.14
qaoa	95	31	t_horizontal_5_4	33	9	24	27.27	-166.67	100	48	45	55	6.25
qaoa	95	31	t_vertical_5_4	33	9	24	27.27	-166.67	100	48	45	55	6.25
qaoa	95	31	ring_5_4	18	9	27	-50	-200	53	39	48	9.43	-23.08
realamprandom	130	37	full_10_2	0	0	0	nan	nan	37	37	37	0	0
realamprandom	130	37	full_7_3	0	0	0	nan	nan	37	37	37	0	0
realamprandom	130	37	ring_10_2	180	51	60	66.67	-17.65	206	109	66	67.96	39.45
realamprandom	130	37	ring_7_3	120	51	60	50	-17.65	129	109	66	48.84	39.45
realamprandom	130	37	grid_9_3	96	24	42	56.25	-75	145	89	64	55.86	28.09
realamprandom	130	37	grid_4_5	81	42	48	40.74	-14.29	160	97	59	63.12	39.18
realamprandom	130	37	line_5_4	180	72	93	48.33	-29.17	206	128	59	71.36	53.91
realamprandom	130	37	t_horizontal_5_4	117	51	60	48.72	-17.65	185	106	66	64.32	37.74
realamprandom	130	37	t_vertical_5_4	117	51	60	48.72	-17.65	185	106	66	64.32	37.74
twolocalrandom	130	37	full_10_2	0	0	0	nan	nan	37	37	37	0	0
twolocalrandom	130	37	full_7_3	0	18	0	nan	100	37	81	37	0	54.32
twolocalrandom	130	37	ring_10_2	180	51	60	66.67	-17.65	206	109	66	67.96	39.45
twolocalrandom	130	37	ring_7_3	120	51	60	50	-17.65	129	112	66	48.84	41.07
twolocalrandom	130	37	grid_9_3	96	36	42	56.25	-16.67	145	93	64	55.86	31.18
twolocalrandom	130	37	grid_4_5	81	42	48	40.74	-14.29	160	101	59	63.12	41.58
twolocalrandom	130	37	line_5_4	180	72	93	48.33	-29.17	206	113	59	71.36	47.79
twolocalrandom	130	37	t_horizontal_5_4	117	72	60	48.72	16.67	185	126	66	64.32	47.62
twolocalrandom	130	37	t_vertical_5_4	117	48	60	48.72	-25	185	107	66	64.32	38.32
su2random	150	41	full_10_2	0	15	0	nan	100	41	64	41	0	35.94
su2random	150	41	full_7_3	0	0	0	nan	nan	41	41	41	0	0
su2random	150	41	ring_10_2	180	48	60	66.67	-25	219	110	70	68.04	36.36
su2random	150	41	ring_7_3	120	48	60	50	-25	138	115	70	49.28	39.13
su2random	150	41	grid_9_3	96	24	42	56.25	-75	155	96	68	56.13	29.17
su2random	150	41	grid_4_5	81	42	48	40.74	-14.29	174	106	63	63.79	40.57
su2random	150	41	line_5_4	180	69	93	48.33	-34.78	219	123	63	71.23	48.78
su2random	150	41	t_horizontal_5_4	117	48	60	48.72	-25	198	115	70	64.65	39.13
su2random	150	41	t_vertical_5_4	117	48	60	48.72	-25	198	110	70	64.65	36.36
qnn	154	58	full_10_2	0	39	0	nan	100	58	133	58	0	56.39
qnn	154	58	full_7_3	0	0	0	nan	nan	58	58	58	0	0
qnn	154	58	ring_10_2	120	39	66	45	-69.23	172	122	84	51.16	31.15
qnn	154	58	ring_7_3	93	36	66	29.03	-83.33	122	122	84	31.15	31.15
qnn	154	58	grid_9_3	63	30	48	23.81	-60	132	97	78	40.91	19.59
qnn	154	58	grid_4_5	54	30	54	0	-80	151	103	80	47.02	22.33
qnn	154	58	line_5_4	120	48	84	30	-75	172	127	80	53.49	37.01
qnn	154	58	t_horizontal_5_4	81	48	66	18.52	-37.5	172	127	84	51.16	33.86
qnn	154	58	t_vertical_5_4	81	45	66	18.52	-46.67	172	133	84	51.16	36.84
qnn	154	58	ring_5_4	48	36	66	-37.5	-83.33	95	122	84	11.58	31.15
portfolioqaoa	195	72	full_10_2	0	0	0	nan	nan	72	72	72	0	0
portfolioqaoa	195	72	full_7_3	0	21	0	nan	100	72	135	72	0	46.67
portfolioqaoa	195	72	ring_10_2	180	66	87	51.67	-31.82	255	166	110	56.86	33.73
portfolioqaoa	195	72	ring_7_3	120	51	87	27.5	-70.59	157	164	110	29.94	32.93
portfolioqaoa	195	72	grid_9_3	96	39	69	28.12	-76.92	199	141	121	39.2	14.18

Continued on next page

Table 1: Additional swap gates and circuit depth, n = 5

benchmark	g	d	layout	s_B	s_S	s_L	Δs_B	Δs_S	d_B	d_S	d_L	Δd_B	Δd_S
portfolioqaoa	195	72	grid_4_5	81	42	69	14.81	-64.29	220	138	104	52.73	24.64
portfolioqaoa	195	72	line_5_4	180	66	93	48.33	-40.91	255	166	90	64.71	45.78
portfolioqaoa	195	72	t_horizontal_5_4	117	60	87	25.64	-45	252	179	110	56.35	38.55
portfolioqaoa	195	72	t_vertical_5_4	117	66	87	25.64	-31.82	252	166	110	56.35	33.73
random	223	97	full_10_2	0	12	0	nan	100	97	126	97	0	23.02
random	223	97	full_7_3	0	12	0	nan	100	97	123	97	0	21.14
random	223	97	ring_10_2	63	12	66	-4.76	-450	160	106	121	24.38	-14.15
random	223	97	ring_7_3	60	12	66	-10	-450	157	106	121	22.93	-14.15
random	223	97	grid_9_3	30	12	27	10	-125	114	106	111	2.63	-4.72
random	223	97	grid_4_5	39	12	27	30.77	-125	169	106	111	34.32	-4.72
random	223	97	line_5_4	63	12	30	52.38	-150	160	106	99	38.12	6.6
random	223	97	t_horizontal_5_4	36	12	66	-83.33	-450	151	106	121	19.87	-14.15
random	223	97	t_vertical_5_4	36	12	66	-83.33	-450	151	106	121	19.87	-14.15
random	223	97	ring_5_4	24	12	66	-175	-450	120	106	121	-0.83	-14.15
portfoliovqe	310	107	full_10_2	0	0	0	nan	nan	107	107	107	0	0
portfoliovqe	310	107	full_7_3	0	21	0	nan	100	107	161	107	0	33.54
portfoliovqe	310	107	ring_10_2	180	51	93	48.33	-82.35	242	204	125	48.35	38.73
portfoliovqe	310	107	ring_7_3	120	48	93	22.5	-93.75	179	193	125	30.17	35.23
portfoliovqe	310	107	grid_9_3	96	42	57	40.62	-35.71	209	181	111	46.89	38.67
portfoliovqe	310	107	grid_4_5	81	39	48	40.74	-23.08	239	175	115	51.88	34.29
portfoliovqe	310	107	line_5_4	180	69	90	50	-30.43	242	187	126	47.93	32.62
portfoliovqe	310	107	t_horizontal_5_4	117	48	93	20.51	-93.75	239	193	125	47.7	35.23
portfoliovqe	310	107	t_vertical_5_4	117	57	93	20.51	-63.16	239	205	125	47.7	39.02

Table 2: Additional swap gates and circuit depth, n = 10

benchmark	g	d	layout	s_B	s_S	s_L	Δs_B	Δs_S	d_B	d_S	d_L	Δd_B	Δd_S
ghz	12	12	full_10_2	0	6	0	nan	100	12	15	12	0	20
ghz	12	12	full_7_3	0	9	0	nan	100	12	21	12	0	42.86
ghz	12	12	ring_10_2	0	9	36	nan	-300	12	21	17	-41.67	19.05
ghz	12	12	ring_7_3	0	15	51	nan	-240	12	24	25	-108.33	-4.17
ghz	12	12	grid_9_3	12	9	24	-100	-166.67	24	21	16	33.33	23.81
ghz	12	12	grid_4_5	6	6	24	-300	-300	18	18	16	11.11	11.11
ghz	12	12	line_5_4	0	9	27	nan	-200	12	21	15	-25	28.57
ghz	12	12	t_horizontal_5_4	18	0	21	-16.67	nan	30	12	17	43.33	-41.67
ghz	12	12	t_vertical_5_4	27	9	30	-11.11	-233.33	39	18	19	51.28	-5.56
ghz	12	12	ring_5_4	nan	nan	45	nan	nan	nan	nan	21	nan	nan
dj	79	17	full_10_2	0	3	0	nan	100	17	20	17	0	15
dj	79	17	full_7_3	48	9	9	81.25	0	70	26	22	68.57	15.38
dj	79	17	ring_10_2	78	21	24	69.23	-14.29	64	43	21	67.19	51.16
dj	79	17	ring_7_3	126	15	24	80.95	-60	79	35	19	75.95	45.71
dj	79	17	grid_9_3	90	21	12	86.67	42.86	82	46	22	73.17	52.17
dj	79	17	grid_4_5	144	21	18	87.5	14.29	88	44	24	72.73	45.45
dj	79	17	line_5_4	216	21	21	90.28	0	94	54	30	68.09	44.44
dj	79	17	t_horizontal_5_4	150	21	15	90	28.57	88	51	26	70.45	49.02
dj	79	17	t_vertical_5_4	135	30	15	88.89	50	85	49	25	70.59	48.98
dj	79	17	ring_5_4	nan	nan	12	nan	nan	nan	nan	23	nan	nan
graphstate	100	26	full_10_2	0	6	0	nan	100	23	30	23	0	23.33
graphstate	100	26	full_7_3	18	3	12	33.33	-300	53	24	23	56.6	4.17
graphstate	100	26	ring_10_2	30	12	39	-30	-225	45	28	29	35.56	-3.57
graphstate	100	26	ring_7_3	48	18	39	18.75	-116.67	63	33	29	53.97	12.12
graphstate	100	26	grid_9_3	42	15	48	-14.29	-220	57	33	26	54.39	21.21
graphstate	100	26	grid_4_5	51	15	36	29.41	-140	70	35	24	65.71	31.43
graphstate	100	26	line_5_4	72	24	57	20.83	-137.5	68	36	32	52.94	11.11
graphstate	100	26	t_horizontal_5_4	60	21	36	40	-71.43	66	38	23	65.15	39.47
graphstate	100	26	t_vertical_5_4	63	21	39	38.1	-85.71	76	34	24	68.42	29.41
graphstate	100	26	ring_5_4	nan	nan	39	nan	nan	nan	nan	30	nan	nan
wstate	163	90	full_10_2	0	0	0	nan	nan	90	90	90	0	0
wstate	163	90	full_7_3	0	0	0	nan	nan	90	90	90	0	0
wstate	163	90	ring_10_2	0	12	48	nan	-300	90	96	62	31.11	35.42
wstate	163	90	grid_9_3	21	0	27	-28.57	nan	102	90	46	54.9	48.89
wstate	163	90	grid_4_5	24	15	42	-75	-180	96	99	65	32.29	34.34
wstate	163	90	line_5_4	0	0	27	nan	nan	90	90	76	15.56	15.56
wstate	163	90	t_horizontal_5_4	45	0	27	40	nan	116	90	72	37.93	20
wstate	163	90	t_vertical_5_4	72	0	45	37.5	nan	137	90	66	51.82	26.67
wstate	163	90	ring_5_4	0	12	45	nan	-275	90	96	55	38.89	42.71
wstate	163	90	ring_7_3	0	6	66	nan	-1000	90	96	62	31.11	35.42
vqe	168	26	full_10_2	0	0	0	nan	nan	26	26	26	0	0
vqe	168	26	full_7_3	0	0	0	nan	nan	26	26	26	0	0
vqe	168	26	ring_10_2	0	9	66	nan	-633.33	26	40	40	-53.85	0
vqe	168	26	grid_9_3	9	6	54	-500	-800	31	35	43	-38.71	-22.86
vqe	168	26	grid_4_5	36	3	45	-25	-1400	61	35	33	45.9	5.71
vqe	168	26	line_5_4	0	0	27	nan	nan	26	26	33	-26.92	-26.92
vqe	168	26	t_horizontal_5_4	51	0	33	35.29	nan	71	26	37	47.89	-42.31
vqe	168	26	t_vertical_5_4	66	3	51	22.73	-1600	73	35	38	47.95	-8.57
vqe	168	26	ring_5_4	0	15	57	nan	-280	26	38	35	-34.62	7.89
vqe	168	26	ring_7_3	0	0	84	nan	nan	26	26	43	-65.38	-65.38
qaoa	190	34	grid_9_3	63	12	78	-23.81	-550	145	56	49	66.21	12.5
qaoa	190	34	grid_4_5	105	21	33	68.57	-57.14	174	59	38	78.16	35.59
qaoa	190	34	line_5_4	168	30	75	55.36	-150	228	53	44	80.7	16.98
qaoa	190	34	t_horizontal_5_4	129	21	78	39.53	-271.43	206	50	50	75.73	0
qaoa	190	34	t_vertical_5_4	114	27	81	28.95	-200	196	82	56	71.43	31.71
qaoa	190	34	full_10_2	0	6	0	nan	100	34	47	34	0	27.66
qaoa	190	34	full_7_3	48	9	15	68.75	-66.67	138	48	42	69.57	12.5
qaoa	190	34	ring_10_2	120	24	60	50	-150	154	42	48	68.83	-14.29
qaoa	190	34	ring_7_3	81	18	75	7.41	-316.67	158	64	52	67.09	18.75
qaoa	190	34	ring_5_4	117	12	72	38.46	-500	191	56	56	70.68	0
qft	270	78	full_10_2	0	18	0	nan	100	78	133	78	0	41.35

Continued on next page

Table 2: Additional swap gates and circuit depth, n = 10

benchmark	g	d	layout	s_B	s_S	s_L	Δs_B	Δs_S	d_B	d_S	d_L	Δd_B	Δd_S
qft	270	78	full_7_3	168	75	150	10.71	-100	236	181	140	40.68	22.65
qft	270	78	ring_10_2	330	141	165	50	-17.02	233	205	103	55.79	49.76
qft	270	78	ring_7_3	540	120	159	70.56	-32.5	319	204	116	63.64	43.14
qft	270	78	grid_9_3	279	96	180	35.48	-87.5	288	211	120	58.33	43.13
qft	270	78	grid_4_5	507	108	195	61.54	-80.56	335	176	130	61.19	26.14
qft	270	78	line_5_4	780	168	195	75	-16.07	342	181	106	69.01	41.44
qft	270	78	t_horizontal_5_4	486	162	195	59.88	-20.37	331	198	106	67.98	46.46
qft	270	78	t_vertical_5_4	498	144	195	60.84	-35.42	273	187	106	61.17	43.32
qftentangled	282	82	full_10_2	0	18	0	nan	100	82	156	82	0	47.44
qftentangled	282	82	full_7_3	168	45	150	10.71	-233.33	240	176	144	40	18.18
qftentangled	282	82	ring_10_2	330	147	165	50	-12.24	237	239	107	54.85	55.23
qftentangled	282	82	ring_7_3	540	129	150	72.22	-16.28	323	244	115	64.4	52.87
qftentangled	282	82	grid_9_3	282	99	198	29.79	-100	288	177	135	53.12	23.73
qftentangled	282	82	grid_4_5	414	108	180	56.52	-66.67	285	213	122	57.19	42.72
qftentangled	282	82	line_5_4	780	195	195	75	0	346	217	110	68.21	49.31
qftentangled	282	82	t_horizontal_5_4	510	156	195	61.76	-25	313	225	110	64.86	51.11
qftentangled	282	82	t_vertical_5_4	510	153	195	61.76	-27.45	309	228	110	64.4	51.75
qftentangled	282	82	ring_5_4	336	153	195	41.96	-27.45	262	256	137	47.71	46.48
realamprandom	335	57	full_10_2	0	105	0	nan	100	57	213	57	0	73.24
realamprandom	335	57	full_7_3	471	99	141	70.06	-42.42	632	223	130	79.43	41.7
realamprandom	335	57	ring_10_2	885	399	516	41.69	-29.32	522	351	215	58.81	38.75
realamprandom	335	57	grid_9_3	690	231	321	53.48	-38.96	591	248	151	74.45	39.11
realamprandom	335	57	grid_4_5	1323	258	375	71.66	-45.35	786	246	138	82.44	43.9
realamprandom	335	57	line_5_4	2160	369	396	81.67	-7.32	876	278	112	87.21	59.71
realamprandom	335	57	t_horizontal_5_4	1614	363	414	74.35	-14.05	840	263	143	82.98	45.63
realamprandom	335	57	t_vertical_5_4	1515	378	447	70.5	-18.25	835	243	154	81.56	36.63
realamprandom	335	57	ring_7_3	1299	339	465	64.2	-37.17	799	323	171	78.6	47.06
twolocalrandom	335	57	full_10_2	0	81	0	nan	100	57	196	57	0	70.92
twolocalrandom	335	57	full_7_3	471	162	141	70.06	12.96	632	235	130	79.43	44.68
twolocalrandom	335	57	ring_10_2	885	405	516	41.69	-27.41	522	402	215	58.81	46.52
twolocalrandom	335	57	grid_9_3	690	273	321	53.48	-17.58	591	299	151	74.45	49.5
twolocalrandom	335	57	grid_4_5	1323	258	375	71.66	-45.35	786	254	138	82.44	45.67
twolocalrandom	335	57	line_5_4	2160	360	396	81.67	-10	876	268	112	87.21	58.21
twolocalrandom	335	57	t_horizontal_5_4	1614	366	414	74.35	-13.11	840	265	143	82.98	46.04
twolocalrandom	335	57	t_vertical_5_4	1515	423	447	70.5	-5.67	835	304	154	81.56	49.34
twolocalrandom	335	57	ring_7_3	1299	417	465	64.2	-11.51	799	370	171	78.6	53.78
su2random	375	61	full_10_2	0	99	0	nan	100	61	236	61	0	74.15
su2random	375	61	full_7_3	471	174	141	70.06	18.97	657	292	135	79.45	53.77
su2random	375	61	ring_10_2	885	402	537	39.32	-33.58	543	381	224	58.75	41.21
su2random	375	61	grid_9_3	690	273	321	53.48	-17.58	619	310	157	74.64	49.35
su2random	375	61	grid_4_5	1323	261	375	71.66	-43.68	815	267	142	82.58	46.82
su2random	375	61	line_5_4	2160	360	396	81.67	-10	904	291	116	87.17	60.14
su2random	375	61	t_horizontal_5_4	1614	372	414	74.35	-11.29	868	292	147	83.06	49.66
su2random	375	61	t_vertical_5_4	1515	384	447	70.5	-16.41	863	310	160	81.46	48.39
qnn	459	108	full_10_2	0	90	0	nan	100	108	310	108	0	65.16
qnn	459	108	full_7_3	294	180	249	15.31	-38.33	531	338	214	59.7	36.69
qnn	459	108	ring_10_2	663	288	432	34.84	-50	440	360	232	47.27	35.56
qnn	459	108	grid_9_3	456	180	240	47.37	-33.33	537	275	174	67.6	36.73
qnn	459	108	grid_4_5	876	186	390	55.48	-109.68	636	291	220	65.41	24.4
qnn	459	108	line_5_4	1440	249	327	77.29	-31.33	657	258	155	76.41	39.92
qnn	459	108	t_horizontal_5_4	1056	249	402	61.93	-61.45	662	258	194	70.69	24.81
qnn	459	108	t_vertical_5_4	1002	258	423	57.78	-63.95	662	304	204	69.18	32.89
portfolioqaoa	615	132	full_10_2	0	111	0	nan	100	132	426	132	0	69.01
portfolioqaoa	615	132	full_7_3	471	156	231	50.96	-48.08	845	478	239	71.72	50
portfolioqaoa	615	132	ring_10_2	885	387	594	32.88	-53.49	606	496	292	51.82	41.13
portfolioqaoa	615	132	grid_9_3	690	249	384	44.35	-54.22	803	384	248	69.12	35.42
portfolioqaoa	615	132	grid_4_5	1323	261	450	65.99	-72.41	956	356	262	72.59	26.4
portfolioqaoa	615	132	line_5_4	2160	360	408	81.11	-13.33	985	380	176	82.13	53.68
portfolioqaoa	615	132	t_horizontal_5_4	1614	366	489	69.7	-33.61	979	367	238	75.69	35.15
portfolioqaoa	615	132	t_vertical_5_4	1515	396	504	66.73	-27.27	976	462	255	73.87	44.81
random	646	155	full_10_2	0	93	0	nan	100	155	320	155	0	51.56

Continued on next page

Table 2: Additional swap gates and circuit depth, n = 10

benchmark	g	d	layout	s_B	s_S	s_L	Δs_B	Δs_S	d_B	d_S	d_L	Δd_B	Δd_S
random	646	155	full_7_3	159	111	132	16.98	-18.92	419	348	179	57.28	48.56
random	646	155	ring_10_2	402	237	381	5.22	-60.76	493	375	244	50.51	34.93
random	646	155	grid_9_3	285	171	225	21.05	-31.58	455	312	185	59.34	40.71
random	646	155	grid_4_5	477	186	375	21.38	-101.61	643	325	222	65.47	31.69
random	646	155	line_5_4	582	312	435	25.26	-39.42	708	342	225	68.22	34.21
random	646	155	t_horizontal_5_4	522	273	402	22.99	-47.25	660	419	231	65	44.87
random	646	155	t_vertical_5_4	525	246	381	27.43	-54.88	710	351	228	67.89	35.04
portfoliovqe	1145	217	grid_9_3	690	222	387	43.91	-74.32	951	479	284	70.14	40.71
portfoliovqe	1145	217	grid_4_5	1323	261	342	74.15	-31.03	994	465	265	73.34	43.01
portfoliovqe	1145	217	line_5_4	2160	360	408	81.11	-13.33	1007	402	255	74.68	36.57
portfoliovqe	1145	217	t_horizontal_5_4	1614	366	441	72.68	-20.49	1001	444	276	72.43	37.84
portfoliovqe	1145	217	t_vertical_5_4	1515	396	507	66.53	-28.03	997	536	282	71.72	47.39
portfoliovqe	1145	217	full_10_2	0	15	0	nan	100	217	288	217	0	24.65
portfoliovqe	1145	217	full_7_3	471	105	255	45.86	-142.86	878	450	308	64.92	31.56
portfoliovqe	1145	217	ring_10_2	885	411	636	28.14	-54.74	636	588	298	53.14	49.32

Table 3: Additional swap gates and circuit depth, n = 15

benchmark	g	d	layout	s_B	s_S	s_L	Δs_B	Δs_S	d_B	d_S	d_L	Δd_B	Δd_S
ghz	17	17	full_10_2	0	6	0	nan	100	17	20	17	0	15
ghz	17	17	full_7_3	0	6	0	nan	100	17	20	17	0	15
ghz	17	17	ring_10_2	0	21	111	nan	-428.57	17	26	40	-135.29	-53.85
ghz	17	17	grid_9_3	18	9	42	-133.33	-366.67	35	20	25	28.57	-25
ghz	17	17	grid_4_5	12	18	33	-175	-83.33	29	32	25	13.79	21.88
ghz	17	17	line_5_4	0	12	42	nan	-250	17	23	20	-17.65	13.04
ghz	17	17	t_horizontal_5_4	27	39	39	-44.44	0	44	53	28	36.36	47.17
ghz	17	17	t_vertical_5_4	45	51	54	-20	-5.88	62	59	29	53.23	50.85
ghz	17	17	ring_5_4	0	27	51	nan	-88.89	17	41	30	-76.47	26.83
ghz	17	17	ring_7_3	0	18	84	nan	-366.67	17	32	28	-64.71	12.5
dj	118	22	full_10_2	66	9	9	86.36	0	95	33	29	69.47	12.12
dj	118	22	full_7_3	96	9	15	84.38	-66.67	116	36	30	74.14	16.67
dj	118	22	ring_10_2	336	33	60	82.14	-81.82	122	71	28	77.05	60.56
dj	118	22	grid_9_3	234	48	24	89.74	50	122	67	34	72.13	49.25
dj	118	22	grid_4_5	324	45	27	91.67	40	128	75	38	70.31	49.33
dj	118	22	line_5_4	546	66	36	93.41	45.45	146	102	45	69.18	55.88
dj	118	22	t_horizontal_5_4	384	42	27	92.97	35.71	137	65	40	70.8	38.46
dj	118	22	t_vertical_5_4	318	48	27	91.51	43.75	131	69	38	70.99	44.93
dj	118	22	ring_5_4	153	36	27	82.35	25	113	71	33	70.8	53.52
dj	118	22	ring_7_3	168	39	42	75	-7.69	116	66	29	75	56.06
graphstate	150	29	full_10_2	30	6	24	20	-300	51	40	34	33.33	15
graphstate	150	29	full_7_3	36	9	27	25	-200	67	35	32	52.24	8.57
graphstate	150	29	ring_10_2	111	27	108	2.7	-300	84	32	31	63.1	3.12
graphstate	150	29	grid_9_3	108	30	87	19.44	-190	86	38	33	61.63	13.16
graphstate	150	29	grid_4_5	147	24	111	24.49	-362.5	94	31	38	59.57	-22.58
graphstate	150	29	line_5_4	186	36	138	25.81	-283.33	95	33	49	48.42	-48.48
graphstate	150	29	t_horizontal_5_4	147	42	147	0	-250	96	37	45	53.12	-21.62
graphstate	150	29	t_vertical_5_4	150	30	138	8	-360	107	35	41	61.68	-17.14
graphstate	150	29	ring_5_4	78	18	102	-30.77	-466.67	72	38	32	55.56	15.79
graphstate	150	29	ring_7_3	84	24	96	-14.29	-300	85	43	35	58.82	18.6
vqe	253	31	full_10_2	0	6	0	nan	100	31	41	31	0	24.39
vqe	253	31	ring_10_2	0	33	192	nan	-481.82	31	63	59	-90.32	6.35
vqe	253	31	grid_9_3	48	9	66	-37.5	-633.33	60	45	47	21.67	-4.44
vqe	253	31	grid_4_5	48	12	78	-62.5	-550	75	60	49	34.67	18.33
vqe	253	31	line_5_4	0	69	42	nan	39.13	31	83	43	-38.71	48.19
vqe	253	31	t_horizontal_5_4	63	6	54	14.29	-800	79	34	47	40.51	-38.24
vqe	253	31	t_vertical_5_4	150	12	99	34	-725	94	54	48	48.94	11.11
vqe	253	31	ring_7_3	0	24	138	nan	-475	31	63	53	-70.97	15.87
vqe	253	31	full_7_3	0	12	0	nan	100	31	56	31	0	44.64
vqe	253	31	ring_5_4	0	39	63	nan	-61.54	31	76	44	-41.94	42.11
wstate	253	135	full_10_2	0	12	0	nan	100	135	141	135	0	4.26
wstate	253	135	ring_10_2	0	15	177	nan	-1080	135	138	78	42.22	43.48
wstate	253	135	grid_9_3	57	18	72	-26.32	-300	156	147	107	31.41	27.21
wstate	253	135	grid_4_5	39	3	57	-46.15	-1800	147	138	102	30.61	26.09
wstate	253	135	line_5_4	0	0	42	nan	nan	135	135	121	10.37	10.37
wstate	253	135	t_horizontal_5_4	63	21	45	28.57	-114.29	166	141	111	33.13	21.28
wstate	253	135	t_vertical_5_4	126	45	84	33.33	-86.67	200	153	97	51.5	36.6
wstate	253	135	ring_7_3	0	15	108	nan	-620	135	144	81	40	43.75
wstate	253	135	full_7_3	0	12	0	nan	100	135	141	135	0	4.26
wstate	253	135	ring_5_4	0	48	72	nan	-50	135	150	79	41.48	47.33
qaoa	285	34	full_10_2	63	6	69	-9.52	-1050	164	50	65	60.37	-30
qaoa	285	34	ring_10_2	291	36	141	51.55	-291.67	303	54	60	80.2	-11.11
qaoa	285	34	grid_9_3	198	36	243	-22.73	-575	247	51	71	71.26	-39.22
qaoa	285	34	grid_4_5	357	39	141	60.5	-261.54	369	58	70	81.03	-20.69
qaoa	285	34	line_5_4	438	75	210	52.05	-180	391	56	71	81.84	-26.79
qaoa	285	34	t_horizontal_5_4	348	54	234	32.76	-333.33	337	56	67	80.12	-19.64
qaoa	285	34	t_vertical_5_4	336	63	234	30.36	-271.43	351	62	89	74.64	-43.55
qaoa	285	34	ring_5_4	171	51	93	45.61	-82.35	250	83	43	82.8	48.19
qaoa	285	34	ring_7_3	228	51	177	22.37	-247.06	267	76	71	73.41	6.58
qaoa	285	34	full_7_3	108	15	51	52.78	-240	223	50	53	76.23	-6
qft	591	118	full_10_2	378	48	321	15.08	-568.75	485	307	241	50.31	21.5

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Table 3: Additional swap gates and circuit depth, n = 15

benchmark	g	d	layout	s_B	s_S	s_L	Δs_B	Δs_S	d_B	d_S	d_L	Δd_B	Δd_S
qft	591	118	ring_10_2	2034	384	504	75.22	-31.25	707	389	186	73.69	52.19
qft	591	118	grid_9_3	1164	270	450	61.34	-66.67	680	292	203	70.15	30.48
qft	591	118	grid_4_5	1698	312	525	69.08	-68.27	734	324	214	70.84	33.95
qft	591	118	line_5_4	2877	426	519	81.96	-21.83	742	316	170	77.09	46.2
qft	591	118	t_horizontal_5_4	1842	381	519	71.82	-36.22	729	309	170	76.68	44.98
qft	591	118	t_vertical_5_4	1680	396	615	63.39	-55.3	642	352	222	65.42	36.93
qft	591	118	full_7_3	501	117	300	40.12	-156.41	588	295	213	63.78	27.8
qftentangled	608	122	full_10_2	378	72	321	15.08	-345.83	489	329	245	49.9	25.53
qftentangled	608	122	ring_10_2	2034	360	624	69.32	-73.33	711	344	216	69.62	37.21
qftentangled	608	122	grid_9_3	1128	279	357	68.35	-27.96	650	327	192	70.46	41.28
qftentangled	608	122	grid_4_5	1575	300	561	64.38	-87	687	315	223	67.54	29.21
qftentangled	608	122	line_5_4	2877	414	543	81.13	-31.16	746	311	177	76.27	43.09
qftentangled	608	122	t_horizontal_5_4	1788	390	543	69.63	-39.23	698	320	177	74.64	44.69
qftentangled	608	122	t_vertical_5_4	1764	411	621	64.8	-51.09	653	393	234	64.17	40.46
qftentangled	608	122	full_7_3	501	150	300	40.12	-100	592	399	217	63.34	45.61
realamprandom	615	77	full_10_2	1146	177	315	72.51	-77.97	1399	372	210	84.99	43.55
realamprandom	615	77	ring_10_2	5427	1155	1332	75.46	-15.32	1879	565	302	83.93	46.55
realamprandom	615	77	grid_9_3	3018	666	834	72.37	-25.23	1603	439	240	85.03	45.33
realamprandom	615	77	grid_4_5	5277	645	759	85.62	-17.67	1840	412	198	89.24	51.94
realamprandom	615	77	line_5_4	8190	888	936	88.57	-5.41	1996	418	162	91.88	61.24
realamprandom	615	77	t_horizontal_5_4	5859	885	1020	82.59	-15.25	1927	446	234	87.86	47.53
realamprandom	615	77	t_vertical_5_4	5304	1047	1098	79.3	-4.87	1919	564	261	86.4	53.72
realamprandom	615	77	ring_7_3	2679	999	1224	54.31	-22.52	1444	740	319	77.91	56.89
twolocalrandom	615	77	full_10_2	1146	138	315	72.51	-128.26	1399	327	210	84.99	35.78
twolocalrandom	615	77	ring_10_2	5427	1131	1332	75.46	-17.77	1879	601	302	83.93	49.75
twolocalrandom	615	77	grid_9_3	3018	672	834	72.37	-24.11	1603	453	240	85.03	47.02
twolocalrandom	615	77	grid_4_5	5277	696	759	85.62	-9.05	1840	446	198	89.24	55.61
twolocalrandom	615	77	line_5_4	8190	876	936	88.57	-6.85	1996	416	162	91.88	61.06
twolocalrandom	615	77	t_horizontal_5_4	5859	876	1020	82.59	-16.44	1927	424	234	87.86	44.81
twolocalrandom	615	77	t_vertical_5_4	5304	1011	1098	79.3	-8.61	1919	593	261	86.4	55.99
twolocalrandom	615	77	ring_7_3	2679	882	1224	54.31	-38.78	1444	595	319	77.91	46.39
su2random	675	81	full_10_2	1146	189	315	72.51	-66.67	1433	452	215	85	52.43
su2random	675	81	ring_10_2	5427	1155	1338	75.35	-15.84	1922	661	305	84.13	53.86
su2random	675	81	grid_9_3	3018	672	831	72.47	-23.66	1641	489	242	85.25	50.51
su2random	675	81	grid_4_5	5277	672	759	85.62	-12.95	1881	422	202	89.26	52.13
su2random	675	81	line_5_4	8190	897	936	88.57	-4.35	2039	461	165	91.91	64.21
su2random	675	81	t_horizontal_5_4	5859	993	1020	82.59	-2.72	1970	538	237	87.97	55.95
su2random	675	81	t_vertical_5_4	5304	1086	1098	79.3	-1.1	1962	658	265	86.49	59.73
qnn	914	158	full_10_2	720	90	369	48.75	-310	1103	527	302	72.62	42.69
qnn	914	158	ring_10_2	3576	708	1116	68.79	-57.63	1356	558	349	74.26	37.46
qnn	914	158	grid_9_3	2061	444	771	62.59	-73.65	1277	456	343	73.14	24.78
qnn	914	158	grid_4_5	3384	447	858	74.65	-91.95	1386	414	355	74.39	14.25
qnn	914	158	line_5_4	5460	591	732	86.59	-23.86	1442	431	234	83.77	45.71
qnn	914	158	t_horizontal_5_4	4041	606	1065	73.65	-75.74	1458	481	355	75.65	26.2
qnn	914	158	t_vertical_5_4	3669	600	1077	70.65	-79.5	1449	509	344	76.26	32.42
portfolioqaoa	1260	192	full_10_2	1146	141	393	65.71	-178.72	1766	777	351	80.12	54.83
portfolioqaoa	1260	192	ring_10_2	5427	1065	1701	68.66	-59.72	2060	793	534	74.08	32.66
portfolioqaoa	1260	192	grid_9_3	3018	663	1074	64.41	-61.99	1843	655	412	77.65	37.1
portfolioqaoa	1260	192	grid_4_5	5277	663	1170	77.83	-76.47	2077	585	418	79.87	28.55
portfolioqaoa	1260	192	line_5_4	8190	888	948	88.42	-6.76	2165	531	260	87.99	51.04
portfolioqaoa	1260	192	t_horizontal_5_4	5859	822	1359	76.8	-65.33	2156	636	420	80.52	33.96
portfolioqaoa	1260	192	t_vertical_5_4	5304	879	1440	72.85	-63.82	2150	641	430	80	32.92
random	1992	412	full_10_2	534	246	597	-11.8	-142.68	1200	957	529	55.92	44.72
random	1992	412	ring_10_2	2127	1050	1407	33.85	-34	2042	1129	580	71.6	48.63
random	1992	412	grid_9_3	1647	783	1140	30.78	-45.59	1913	1177	576	69.89	51.06
random	1992	412	grid_4_5	2250	1041	1533	31.87	-47.26	2103	1056	629	70.09	40.44
random	1992	412	line_5_4	3348	1623	1926	42.47	-18.67	2915	1128	656	77.5	41.84
random	1992	412	t_horizontal_5_4	2613	1407	1815	30.54	-29	2408	1130	644	73.26	43.01
random	1992	412	t_vertical_5_4	2475	1203	1800	27.27	-49.63	2366	1214	658	72.19	45.8
portfoliovqe	2505	327	full_10_2	1146	189	534	53.4	-182.54	1903	984	504	73.52	48.78
portfoliovqe	2505	327	ring_10_2	5427	1098	1590	70.7	-44.81	2195	1030	520	76.31	49.51

Continued on next page

Table 3: Additional swap gates and circuit depth, n = 15

benchmark	g	d	layout	s_B	s_S	s_L	Δs_B	Δs_S	d_B	d_S	d_L	Δd_B	Δd_S
portfoliovqe	2505	327	grid_9_3	3018	636	1107	63.32	-74.06	2112	835	471	77.7	43.59
portfoliovqe	2505	327	grid_4_5	5277	648	768	85.45	-18.52	2244	756	412	81.64	45.5
portfoliovqe	2505	327	line_5_4	8190	891	948	88.42	-6.4	2297	695	378	83.54	45.61
portfoliovqe	2505	327	t_horizontal_5_4	5859	975	1047	82.13	-7.38	2288	893	431	81.16	51.74
portfoliovqe	2505	327	t_vertical_5_4	5304	942	1251	76.41	-32.8	2280	834	456	80	45.32