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

layout	benchmark	g	d	s basic	s sabre	s look	swap (%)	d basic	d swap	d look	d (%)
full_10_2	ghz	7	7	0	0	0	nan	7	7	7	0
full_10_2	dj	36	11	0	0	0	nan	11	11	11	0
full_10_2	graphstate	50	22	0	3	0	-100	22	22	22	0
full_10_2	qft	71	38	0	0	0	nan	38	38	38	0
full_10_2	wstate	73	45	0	0	0	nan	45	45	45	0
full_10_2	qftentangled	78	42	0	0	0	nan	42	42	42	0
full_10_2	vqe	83	21	0	0	0	nan	21	21	21	0
full_10_2	qaoa	95	31	0	3	0	-100	31	42	31	-26.19
full_10_2	realamprandom	130	37	0	0	0	nan	37	37	37	0
full_10_2	twolocalrandom	130	37	0	0	0	nan	37	37	37	0
full_10_2	su2random	150	41	0	15	0	-100	41	64	41	-35.94
full_10_2	qnn	154	58	0	39	0	-100	58	133	58	-56.39
full_10_2	portfolioqaoa	195	72	0	0	0	nan	72	72	72	0
full_10_2	random	223	97	0	12	0	-100	97	126	97	-23.02
full_10_2	portfoliovqe	310	107	0	0	0	nan	107	107	107	0
full_7_3	ghz	7	7	0	0	0	nan	7	7	7	0
full_7_3	dj	36	11	0	3	0	-100	11	14	11	-21.43
full_7_3	graphstate	50	22	0	0	0	nan	22	22	22	0
full_7_3	qft	71	38	0	0	0	nan	38	38	38	0
full_7_3	wstate	73	45	0	0	0	nan	45	45	45	0
full_7_3	qftentangled	78	42	0	15	0	-100	42	74	42	-43.24
full_7_3	vqe	83	21	0	0	0	nan	21	21	21	0
full_7_3	qaoa	95	31	0	0	0	nan	31	31	31	0
full_7_3	realamprandom	130	37	0	42	0	-100	37	108	37	-65.74
full_7_3	twolocalrandom	130	37	0	15	0	-100	37	71	37	-47.89
full_7_3	su2random	150	41	0	0	0	nan	41	41	41	0
full_7_3	qnn	154	58	0	12	0	-100	58	90	58	-35.56
full_7_3	portfolioqaoa	195	72	0	0	0	nan	72	72	72	0
full_7_3	random	223	97	0	6	0	-100	97	140	97	-30.71
full_7_3	portfoliovqe	310	107	0	48	0	-100	107	172	107	-37.79
grid_4_5	ghz	7	7	3	0	9	nan	10	7	8	14.29
grid_4_5	dj	36	11	21	3	3	0	37	14	12	-14.29
grid_4_5	graphstate	50	22	18	3	9	200	41	25	20	-20
grid_4_5	qft	71	38	36	15	27	80	82	54	52	-3.7
grid_4_5	wstate	73	45	12	0	9	nan	51	45	40	-11.11
grid_4_5	qftentangled	78	42	36	18	15	-16.67	78	57	45	-21.05
grid_4_5	vqe	83	21	18	0	15	nan	39	21	29	38.1
grid_4_5	qaoa	95	31	18	6	27	350	59	50	45	-10
grid_4_5	realamprandom	130	37	81	42	48	14.29	160	97	59	-39.18
grid_4_5	twolocalrandom	130	37	81	42	48	14.29	160	101	59	-41.58
grid_4_5	su2random	150	41	81	42	48	14.29	174	106	63	-40.57
grid_4_5	qnn	154	58	54	30	54	80	151	103	80	-22.33
grid_4_5	portfolioqaoa	195	72	81	42	69	64.29	220	138	104	-24.64
grid_4_5	random	223	97	39	12	27	125	169	106	111	4.72
grid_4_5	portfoliovqe	310	107	81	39	48	23.08	239	175	115	-34.29
grid_9_3	ghz	7	7	6	3	6	100	13	10	8	-20
grid_9_3	dj	36	11	9	3	0	-100	21	17	11	-35.29
grid_9_3	graphstate	50	22	15	3	6	100	37	32	20	-37.5
grid_9_3	qft	71	38	39	12	21	75	74	53	41	-22.64
grid_9_3	wstate	73	45	18	0	12	nan	54	45	41	-8.89
grid_9_3	qftentangled	78	42	45	21	27	28.57	87	76	45	-40.79
grid_9_3	vqe	83	21	15	0	12	nan	35	21	27	28.57
grid_9_3	qaoa	95	31	9	9	21	133.33	37	48	48	0
grid_9_3	realamprandom	130	37	96	24	42	75	145	89	64	-28.09
grid_9_3	twolocalrandom	130	37	96	36	42	16.67	145	93	64	-31.18
grid_9_3	su2random	150	41	96	24	42	75	155	96	68	-29.17
grid_9_3	qnn	154	58	63	30	48	60	132	97	78	-19.59
grid_9_3	portfolioqaoa	195	72	96	39	69	76.92	199	141	121	-14.18
grid_9_3	random	223	97	30	12	27	125	114	106	111	4.72
grid_9_3	portfoliovqe	310	107	96	42	57	35.71	209	181	111	-38.67
line_5_4	ghz	7	7	0	9	18	100	7	13	9	-30.77

Continued on next page

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

layout	benchmark	g	d	s basic	s sabre	s look	swap (%)	d basic	d swap	d look	d (%)
line_5_4	dj	36	11	36	6	6	0	40	17	14	-17.65
line_5_4	graphstate	50	22	12	9	12	33.33	32	25	21	-16
line_5_4	qft	71	38	72	24	24	0	92	57	42	-26.32
line_5_4	wstate	73	45	0	0	15	nan	45	45	33	-26.67
line_5_4	qftentangled	78	42	72	24	36	50	96	73	50	-31.51
line_5_4	vqe	83	21	0	0	15	nan	21	21	24	14.29
line_5_4	qaoa	95	31	48	12	18	50	106	42	39	-7.14
line_5_4	realamprandom	130	37	180	72	93	29.17	206	128	59	-53.91
line_5_4	twolocalrandom	130	37	180	72	93	29.17	206	113	59	-47.79
line_5_4	su2random	150	41	180	69	93	34.78	219	123	63	-48.78
line_5_4	qnn	154	58	120	48	84	75	172	127	80	-37.01
line_5_4	portfolioqaoa	195	72	180	66	93	40.91	255	166	90	-45.78
line_5_4	random	223	97	63	12	30	150	160	106	99	-6.6
line_5_4	portfoliovqe	310	107	180	69	90	30.43	242	187	126	-32.62
ring_10_2	ghz	7	7	0	3	9	200	7	10	8	-20
ring_10_2	dj	36	11	36	3	3	0	40	17	12	-29.41
ring_10_2	graphstate	50	22	12	6	9	50	32	25	20	-20
ring_10_2	qft	71	38	72	15	24	60	92	60	42	-30
ring_10_2	wstate	73	45	0	0	9	nan	45	45	40	-11.11
ring_10_2	qftentangled	78	42	72	21	30	42.86	96	75	49	-34.67
ring_10_2	vqe	83	21	0	0	15	nan	21	21	29	38.1
ring_10_2	qaoa	95	31	48	12	27	125	106	47	45	-4.26
ring_10_2	realamprandom	130	37	180	51	60	17.65	206	109	66	-39.45
ring_10_2	twolocalrandom	130	37	180	51	60	17.65	206	109	66	-39.45
ring_10_2	su2random	150	41	180	48	60	25	219	110	70	-36.36
ring_10_2	qnn	154	58	120	39	66	69.23	172	122	84	-31.15
ring_10_2	portfolioqaoa	195	72	180	66	87	31.82	255	166	110	-33.73
ring_10_2	random	223	97	63	12	66	450	160	106	121	14.15
ring_10_2	portfoliovqe	310	107	180	51	93	82.35	242	204	125	-38.73
ring_5_4	ghz	7	7	nan	nan	9	nan	nan	nan	10	nan
ring_5_4	dj	36	11	nan	nan	3	nan	nan	nan	12	nan
ring_5_4	graphstate	50	22	nan	nan	9	nan	nan	nan	22	nan
ring_5_4	qft	71	38	nan	nan	18	nan	nan	nan	43	nan
ring_5_4	wstate	73	45	nan	nan	9	nan	nan	nan	39	nan
ring_5_4	qftentangled	78	42	nan	nan	30	nan	nan	nan	49	nan
ring_5_4	vqe	83	21	nan	nan	6	nan	nan	nan	24	nan
ring_5_4	qaoa	95	31	nan	nan	24	nan	nan	nan	45	nan
ring_5_4	qnn	154	58	nan	nan	66	nan	nan	nan	84	nan
ring_7_3	ghz	7	7	0	0	9	nan	7	7	8	14.29
ring_7_3	dj	36	11	24	3	3	0	30	18	12	-33.33
ring_7_3	graphstate	50	22	6	6	9	50	24	22	20	-9.09
ring_7_3	qft	71	38	51	18	24	33.33	77	57	42	-26.32
ring_7_3	wstate	73	45	0	0	9	nan	45	45	40	-11.11
ring_7_3	qftentangled	78	42	51	21	30	42.86	81	76	49	-35.53
ring_7_3	vqe	83	21	0	0	15	nan	21	21	29	38.1
ring_7_3	qaoa	95	31	24	9	27	200	54	48	45	-6.25
ring_7_3	realamprandom	130	37	120	48	60	25	129	102	66	-35.29
ring_7_3	twolocalrandom	130	37	120	48	60	25	129	107	66	-38.32
ring_7_3	su2random	150	41	120	51	60	17.65	138	117	70	-40.17
ring_7_3	qnn	154	58	93	48	66	37.5	122	127	84	-33.86
ring_7_3	portfolioqaoa	195	72	120	51	87	70.59	157	177	110	-37.85
ring_7_3	random	223	97	60	12	66	450	157	106	121	14.15
ring_7_3	portfoliovqe	310	107	120	48	93	93.75	179	193	125	-35.23
t_horizontal_5_4	ghz	7	7	9	3	6	100	16	10	9	-10
t_horizontal_5_4	dj	36	11	24	3	3	0	37	16	12	-25
t_horizontal_5_4	graphstate	50	22	12	6	9	50	35	25	20	-20
t_horizontal_5_4	qft	71	38	48	15	24	60	82	60	42	-30
t_horizontal_5_4	wstate	73	45	18	0	6	nan	58	45	39	-13.33
t_horizontal_5_4	qftentangled	78	42	60	24	33	37.5	90	73	48	-34.25
t_horizontal_5_4	vqe	83	21	12	0	12	nan	33	21	25	19.05
t_horizontal_5_4	qaoa	95	31	33	9	24	166.67	100	48	45	-6.25

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

layout	benchmark	g	d	s basic	s sabre	s look	swap (%)	d basic	d swap	d look	d (%)
t_horizontal_5_4	realamprandom	130	37	117	51	60	17.65	185	106	66	-37.74
t_horizontal_5_4	twolocalrandom	130	37	117	72	60	-16.67	185	126	66	-47.62
t_horizontal_5_4	su2random	150	41	117	48	60	25	198	115	70	-39.13
t_horizontal_5_4	qnn	154	58	81	48	66	37.5	172	127	84	-33.86
t_horizontal_5_4	portfolioqaoa	195	72	117	60	87	45	252	179	110	-38.55
t_horizontal_5_4	random	223	97	36	12	66	450	151	106	121	14.15
t_horizontal_5_4	portfoliovqe	310	107	117	48	93	93.75	239	193	125	-35.23
t_vertical_5_4	ghz	7	7	9	0	6	nan	16	7	9	28.57
t_vertical_5_4	dj	36	11	24	3	3	0	37	17	12	-29.41
t_vertical_5_4	graphstate	50	22	12	6	9	50	35	22	20	-9.09
t_vertical_5_4	qft	71	38	48	15	24	60	82	60	42	-30
t_vertical_5_4	wstate	73	45	18	0	6	nan	58	45	39	-13.33
t_vertical_5_4	qftentangled	78	42	60	21	33	57.14	90	75	48	-36
t_vertical_5_4	vqe	83	21	12	0	12	nan	33	21	25	19.05
t_vertical_5_4	qaoa	95	31	33	9	24	166.67	100	48	45	-6.25
t_vertical_5_4	realamprandom	130	37	117	51	60	17.65	185	106	66	-37.74
t_vertical_5_4	twolocalrandom	130	37	117	48	60	25	185	107	66	-38.32
t_vertical_5_4	su2random	150	41	117	48	60	25	198	110	70	-36.36
t_vertical_5_4	qnn	154	58	81	45	66	46.67	172	133	84	-36.84
t_vertical_5_4	portfolioqaoa	195	72	117	66	87	31.82	252	166	110	-33.73
t_vertical_5_4	random	223	97	36	12	66	450	151	106	121	14.15
t_vertical_5_4	portfoliovqe	310	107	117	57	93	63.16	239	205	125	-39.02

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

layout	benchmark	g	d	s basic	s sabre	s look	swap (%)	d basic	d swap	d look	d (%)
full_10_2	ghz	12	12	0	6	0	-100	12	15	12	-20
full_10_2	dj	79	17	0	3	0	-100	17	20	17	-15
full_10_2	graphstate	100	26	0	6	0	-100	23	30	23	-23.33
full_10_2	wstate	163	90	0	0	0	nan	90	90	90	0
full_10_2	vqe	168	26	0	0	0	nan	26	26	26	0
full_10_2	qaoa	190	34	0	6	0	-100	34	47	34	-27.66
full_10_2	qft	270	78	0	18	0	-100	78	133	78	-41.35
full_10_2	qftentangled	282	82	0	18	0	-100	82	156	82	-47.44
full_10_2	realamprandom	335	57	0	105	0	-100	57	213	57	-73.24
full_10_2	twolocalrandom	335	57	0	81	0	-100	57	196	57	-70.92
full_10_2	su2random	375	61	0	99	0	-100	61	236	61	-74.15
full_10_2	qnn	459	108	0	90	0	-100	108	310	108	-65.16
full_10_2	portfolioqaoa	615	132	0	111	0	-100	132	426	132	-69.01
full_10_2	random	646	155	0	93	0	-100	155	320	155	-51.56
full_10_2	portfoliovqe	1145	217	0	15	0	-100	217	288	217	-24.65
full_7_3	ghz	12	12	0	9	0	-100	12	21	12	-42.86
full_7_3	dj	79	17	48	9	9	0	70	26	22	-15.38
full_7_3	graphstate	100	26	18	3	12	300	53	24	23	-4.17
full_7_3	wstate	163	90	0	6	0	-100	90	93	90	-3.23
full_7_3	vqe	168	26	0	3	0	-100	26	38	26	-31.58
full_7_3	qaoa	190	34	48	6	15	150	138	50	42	-16
full_7_3	qft	270	78	168	45	150	233.33	236	159	140	-11.95
full_7_3	qftentangled	282	82	168	57	150	163.16	240	181	144	-20.44
full_7_3	realamprandom	335	57	471	99	141	42.42	632	224	130	-41.96
full_7_3	twolocalrandom	335	57	471	195	141	-27.69	632	264	130	-50.76
full_7_3	su2random	375	61	471	126	141	11.9	657	220	135	-38.64
full_7_3	qnn	459	108	294	180	249	38.33	531	338	214	-36.69
full_7_3	portfolioqaoa	615	132	471	156	231	48.08	845	478	239	-50
full_7_3	random	646	155	159	114	132	15.79	419	320	179	-44.06
full_7_3	portfoliovqe	1145	217	471	105	255	142.86	878	450	308	-31.56
grid_4_5	ghz	12	12	6	6	24	300	18	18	16	-11.11
grid_4_5	dj	79	17	144	21	18	-14.29	88	44	24	-45.45
grid_4_5	graphstate	100	26	51	15	36	140	70	35	24	-31.43
grid_4_5	wstate	163	90	24	15	42	180	96	99	65	-34.34
grid_4_5	vqe	168	26	36	3	45	1400	61	35	33	-5.71
grid_4_5	qaoa	190	34	105	21	33	57.14	174	59	38	-35.59
grid_4_5	qft	270	78	507	108	195	80.56	335	176	130	-26.14
grid_4_5	qftentangled	282	82	414	108	180	66.67	285	213	122	-42.72
grid_4_5	realamprandom	335	57	1323	258	375	45.35	786	246	138	-43.9
grid_4_5	twolocalrandom	335	57	1323	258	375	45.35	786	254	138	-45.67
grid_4_5	su2random	375	61	1323	261	375	43.68	815	267	142	-46.82
grid_4_5	qnn	459	108	876	186	390	109.68	636	291	220	-24.4
grid_4_5	portfolioqaoa	615	132	1323	261	450	72.41	956	356	262	-26.4
grid_4_5	random	646	155	477	186	375	101.61	643	325	222	-31.69
grid_4_5	portfoliovqe	1145	217	1323	261	342	31.03	994	465	265	-43.01
grid_9_3	ghz	12	12	12	9	24	166.67	24	21	16	-23.81
grid_9_3	dj	79	17	90	21	12	-42.86	82	46	22	-52.17
grid_9_3	graphstate	100	26	42	15	48	220	57	33	26	-21.21
grid_9_3	wstate	163	90	21	0	27	nan	102	90	46	-48.89
grid_9_3	vqe	168	26	9	6	54	800	31	35	43	22.86
grid_9_3	qaoa	190	34	63	12	78	550	145	56	49	-12.5
grid_9_3	qft	270	78	279	96	180	87.5	288	211	120	-43.13
grid_9_3	qftentangled	282	82	282	99	198	100	288	177	135	-23.73
grid_9_3	realamprandom	335	57	690	231	321	38.96	591	248	151	-39.11
grid_9_3	twolocalrandom	335	57	690	273	321	17.58	591	299	151	-49.5
grid_9_3	su2random	375	61	690	273	321	17.58	619	310	157	-49.35
grid_9_3	qnn	459	108	456	180	240	33.33	537	275	174	-36.73
grid_9_3	portfolioqaoa	615	132	690	249	384	54.22	803	384	248	-35.42
grid_9_3	random	646	155	285	171	225	31.58	455	312	185	-40.71
grid_9_3	portfoliovqe	1145	217	690	222	387	74.32	951	479	284	-40.71
line_5_4	ghz	12	12	0	9	27	200	12	21	15	-28.57

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

layout	benchmark	g	d	s basic	s sabre	s look	swap (%)	d basic	d swap	d look	d (%)
line_5_4	dj	79	17	216	21	21	0	94	54	30	-44.44
line_5_4	graphstate	100	26	72	24	57	137.5	68	36	32	-11.11
line_5_4	wstate	163	90	0	0	27	nan	90	90	76	-15.56
line_5_4	vqe	168	26	0	0	27	nan	26	26	33	26.92
line_5_4	qaoa	190	34	168	30	75	150	228	53	44	-16.98
line_5_4	qft	270	78	780	168	195	16.07	342	181	106	-41.44
line_5_4	qftentangled	282	82	780	195	195	0	346	217	110	-49.31
line_5_4	realamprandom	335	57	2160	369	396	7.32	876	278	112	-59.71
line_5_4	twolocalrandom	335	57	2160	360	396	10	876	268	112	-58.21
line_5_4	su2random	375	61	2160	360	396	10	904	291	116	-60.14
line_5_4	qnn	459	108	1440	249	327	31.33	657	258	155	-39.92
line_5_4	portfolioqaoa	615	132	2160	360	408	13.33	985	380	176	-53.68
line_5_4	random	646	155	582	312	435	39.42	708	342	225	-34.21
line_5_4	portfoliovqe	1145	217	2160	360	408	13.33	1007	402	255	-36.57
ring_10_2	ghz	12	12	0	9	36	300	12	21	17	-19.05
ring_10_2	dj	79	17	78	21	24	14.29	64	43	21	-51.16
ring_10_2	graphstate	100	26	30	12	39	225	45	28	29	3.57
ring_10_2	wstate	163	90	0	12	48	300	90	96	62	-35.42
ring_10_2	vqe	168	26	0	9	66	633.33	26	40	40	0
ring_10_2	qaoa	190	34	120	24	60	150	154	42	48	14.29
ring_10_2	qft	270	78	330	141	165	17.02	233	205	103	-49.76
ring_10_2	qftentangled	282	82	330	147	165	12.24	237	239	107	-55.23
ring_10_2	realamprandom	335	57	885	399	516	29.32	522	351	215	-38.75
ring_10_2	twolocalrandom	335	57	885	405	516	27.41	522	402	215	-46.52
ring_10_2	su2random	375	61	885	402	537	33.58	543	381	224	-41.21
ring_10_2	qnn	459	108	663	288	432	50	440	360	232	-35.56
ring_10_2	portfolioqaoa	615	132	885	387	594	53.49	606	496	292	-41.13
ring_10_2	random	646	155	402	237	381	60.76	493	375	244	-34.93
ring_10_2	portfoliovqe	1145	217	885	411	636	54.74	636	588	298	-49.32
ring_5_4	ghz	12	12	nan	nan	45	nan	nan	nan	21	nan
ring_5_4	dj	79	17	nan	nan	12	nan	nan	nan	23	nan
ring_5_4	graphstate	100	26	nan	nan	39	nan	nan	nan	30	nan
ring_5_4	wstate	163	90	0	12	45	275	90	93	55	-40.86
ring_5_4	vqe	168	26	0	12	57	375	26	43	35	-18.6
ring_5_4	qaoa	190	34	nan	nan	78	nan	nan	nan	55	nan
ring_5_4	qftentangled	282	82	nan	nan	195	nan	nan	nan	137	nan
ring_7_3	ghz	12	12	0	15	51	240	12	24	25	4.17
ring_7_3	dj	79	17	126	15	24	60	79	35	19	-45.71
ring_7_3	graphstate	100	26	48	18	39	116.67	63	33	29	-12.12
ring_7_3	wstate	163	90	0	6	66	1000	90	96	62	-35.42
ring_7_3	vqe	168	26	0	9	66	633.33	26	40	43	7.5
ring_7_3	qaoa	190	34	81	21	75	257.14	158	64	56	-12.5
ring_7_3	qft	270	78	540	135	159	17.78	319	188	116	-38.3
t_horizontal_5_4	ghz	12	12	18	0	21	nan	30	12	17	41.67
t_horizontal_5_4	dj	79	17	150	21	15	-28.57	88	51	26	-49.02
t_horizontal_5_4	graphstate	100	26	60	21	36	71.43	66	38	23	-39.47
t_horizontal_5_4	wstate	163	90	45	0	27	nan	116	90	72	-20
t_horizontal_5_4	vqe	168	26	51	0	33	nan	71	26	37	42.31
t_horizontal_5_4	qaoa	190	34	129	21	78	271.43	206	50	50	0
t_horizontal_5_4	qft	270	78	486	162	195	20.37	331	198	106	-46.46
t_horizontal_5_4	qftentangled	282	82	510	156	195	25	313	225	110	-51.11
t_horizontal_5_4	realamprandom	335	57	1614	363	414	14.05	840	263	143	-45.63
t_horizontal_5_4	twolocalrandom	335	57	1614	366	414	13.11	840	265	143	-46.04
t_horizontal_5_4	su2random	375	61	1614	372	414	11.29	868	292	147	-49.66
t_horizontal_5_4	qnn	459	108	1056	249	402	61.45	662	258	194	-24.81
t_horizontal_5_4	portfolioqaoa	615	132	1614	366	489	33.61	979	367	238	-35.15
t_horizontal_5_4	random	646	155	522	273	402	47.25	660	419	231	-44.87
t_horizontal_5_4	portfoliovqe	1145	217	1614	366	441	20.49	1001	444	276	-37.84
t_vertical_5_4	ghz	12	12	27	9	30	233.33	39	18	19	5.56
t_vertical_5_4	dj	79	17	135	30	15	-50	85	49	25	-48.98
t_vertical_5_4	graphstate	100	26	63	21	39	85.71	76	34	24	-29.41

Continued on next page

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

layout	benchmark	g	d	s basic	s sabre	s look	swap (%)	d basic	d swap	d look	d (%)
t_vertical_5_4	wstate	163	90	72	0	45	nan	137	90	66	-26.67
t_vertical_5_4	vqe	168	26	66	3	51	1600	73	35	38	8.57
t_vertical_5_4	qaoa	190	34	114	27	81	200	196	82	56	-31.71
t_vertical_5_4	qft	270	78	498	144	195	35.42	273	187	106	-43.32
t_vertical_5_4	qftentangled	282	82	510	153	195	27.45	309	228	110	-51.75
t_vertical_5_4	realamprandom	335	57	1515	378	447	18.25	835	243	154	-36.63
t_vertical_5_4	twolocalrandom	335	57	1515	423	447	5.67	835	304	154	-49.34
t_vertical_5_4	su2random	375	61	1515	384	447	16.41	863	310	160	-48.39
t_vertical_5_4	qnn	459	108	1002	258	423	63.95	662	304	204	-32.89
t_vertical_5_4	portfolioqaoa	615	132	1515	396	504	27.27	976	462	255	-44.81
t_vertical_5_4	random	646	155	525	246	381	54.88	710	351	228	-35.04
t_vertical_5_4	portfoliovqe	1145	217	1515	396	507	28.03	997	536	282	-47.39

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

layout	benchmark	g	d	s basic	s sabre	s look	swap (%)	d basic	d swap	d look	d (%)
full_10_2	ghz	17	17	0	6	0	-100	17	20	17	-15
full_10_2	dj	118	22	66	9	9	0	95	33	29	-12.12
full_10_2	graphstate	150	29	30	6	24	300	51	40	34	-15
full_10_2	vqe	253	31	0	6	0	-100	31	41	31	-24.39
full_10_2	wstate	253	135	0	12	0	-100	135	141	135	-4.26
full_10_2	qaoa	285	34	63	6	69	1050	164	50	65	30
full_10_2	qft	591	118	378	48	321	568.75	485	307	241	-21.5
full_10_2	qftentangled	608	122	378	72	321	345.83	489	329	245	-25.53
full_10_2	realamprandom	615	77	1146	177	315	77.97	1399	372	210	-43.55
full_10_2	twolocalrandom	615	77	1146	138	315	128.26	1399	327	210	-35.78
full_10_2	su2random	675	81	1146	189	315	66.67	1433	452	215	-52.43
full_10_2	qnn	914	158	720	90	369	310	1103	527	302	-42.69
full_10_2	portfolioqaoa	1260	192	1146	141	393	178.72	1766	777	351	-54.83
full_10_2	random	1992	412	534	246	597	142.68	1200	957	529	-44.72
full_10_2	portfoliovqe	2505	327	1146	189	534	182.54	1903	984	504	-48.78
full_7_3	ghz	17	17	0	6	0	-100	17	20	17	-15
full_7_3	dj	118	22	96	9	15	66.67	116	36	30	-16.67
full_7_3	graphstate	150	29	36	9	27	200	67	35	32	-8.57
full_7_3	vqe	253	31	0	12	0	-100	31	56	31	-44.64
full_7_3	wstate	253	135	0	12	0	-100	135	141	135	-4.26
full_7_3	qaoa	285	34	108	15	51	240	223	50	53	6
full_7_3	qft	591	118	501	117	300	156.41	588	295	213	-27.8
full_7_3	qftentangled	608	122	501	150	300	100	592	399	217	-45.61
grid_4_5	ghz	17	17	12	18	33	83.33	29	32	25	-21.88
grid_4_5	dj	118	22	324	45	27	-40	128	75	38	-49.33
grid_4_5	graphstate	150	29	147	24	111	362.5	94	31	38	22.58
grid_4_5	vqe	253	31	48	12	78	550	75	60	49	-18.33
grid_4_5	wstate	253	135	39	3	57	1800	147	138	102	-26.09
grid_4_5	qaoa	285	34	357	39	141	261.54	369	58	70	20.69
grid_4_5	qft	591	118	1698	312	525	68.27	734	324	214	-33.95
grid_4_5	qftentangled	608	122	1575	300	561	87	687	315	223	-29.21
grid_4_5	realamprandom	615	77	5277	645	759	17.67	1840	412	198	-51.94
grid_4_5	twolocalrandom	615	77	5277	696	759	9.05	1840	446	198	-55.61
grid_4_5	su2random	675	81	5277	672	759	12.95	1881	422	202	-52.13
grid_4_5	qnn	914	158	3384	447	858	91.95	1386	414	355	-14.25
grid_4_5	portfolioqaoa	1260	192	5277	663	1170	76.47	2077	585	418	-28.55
grid_4_5	random	1992	412	2250	1041	1533	47.26	2103	1056	629	-40.44
grid_4_5	portfoliovqe	2505	327	5277	648	768	18.52	2244	756	412	-45.5
grid_9_3	ghz	17	17	18	9	42	366.67	35	20	25	25
grid_9_3	dj	118	22	234	48	24	-50	122	67	34	-49.25
grid_9_3	graphstate	150	29	108	30	87	190	86	38	33	-13.16
grid_9_3	vqe	253	31	48	9	66	633.33	60	45	47	4.44
grid_9_3	wstate	253	135	57	18	72	300	156	147	107	-27.21
grid_9_3	qaoa	285	34	198	36	243	575	247	51	71	39.22
grid_9_3	qft	591	118	1164	270	450	66.67	680	292	203	-30.48
grid_9_3	qftentangled	608	122	1128	279	357	27.96	650	327	192	-41.28
grid_9_3	realamprandom	615	77	3018	666	834	25.23	1603	439	240	-45.33
grid_9_3	twolocalrandom	615	77	3018	672	834	24.11	1603	453	240	-47.02
grid_9_3	su2random	675	81	3018	672	831	23.66	1641	489	242	-50.51
grid_9_3	qnn	914	158	2061	444	771	73.65	1277	456	343	-24.78
grid_9_3	portfolioqaoa	1260	192	3018	663	1074	61.99	1843	655	412	-37.1
grid_9_3	random	1992	412	1647	783	1140	45.59	1913	1177	576	-51.06
grid_9_3	portfoliovqe	2505	327	3018	636	1107	74.06	2112	835	471	-43.59
line_5_4	ghz	17	17	0	12	42	250	17	23	20	-13.04
line_5_4	dj	118	22	546	66	36	-45.45	146	102	45	-55.88
line_5_4	graphstate	150	29	186	36	138	283.33	95	33	49	48.48
line_5_4	vqe	253	31	0	69	42	-39.13	31	83	43	-48.19
line_5_4	wstate	253	135	0	0	42	nan	135	135	121	-10.37
line_5_4	qaoa	285	34	438	75	210	180	391	56	71	26.79
line_5_4	qft	591	118	2877	426	519	21.83	742	316	170	-46.2
line_5_4	qftentangled	608	122	2877	414	543	31.16	746	311	177	-43.09

Continued on next page

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

layout	benchmark	g	d	s basic	s sabre	s look	swap (%)	d basic	d swap	d look	d (%)
line_5_4	realamprandom	615	77	8190	888	936	5.41	1996	418	162	-61.24
line_5_4	twolocalrandom	615	77	8190	876	936	6.85	1996	416	162	-61.06
line_5_4	su2random	675	81	8190	897	936	4.35	2039	461	165	-64.21
line_5_4	qnn	914	158	5460	591	732	23.86	1442	431	234	-45.71
line_5_4	portfolioqaoa	1260	192	8190	888	948	6.76	2165	531	260	-51.04
line_5_4	random	1992	412	3348	1623	1926	18.67	2915	1128	656	-41.84
line_5_4	portfoliovqe	2505	327	8190	891	948	6.4	2297	695	378	-45.61
ring_10_2	ghz	17	17	0	21	111	428.57	17	26	40	53.85
ring_10_2	dj	118	22	336	33	60	81.82	122	71	28	-60.56
ring_10_2	graphstate	150	29	111	27	108	300	84	32	31	-3.12
ring_10_2	vqe	253	31	0	33	192	481.82	31	63	59	-6.35
ring_10_2	wstate	253	135	0	15	177	1080	135	138	78	-43.48
ring_10_2	qaoa	285	34	291	36	141	291.67	303	54	60	11.11
ring_10_2	qft	591	118	2034	384	504	31.25	707	389	186	-52.19
ring_10_2	qftentangled	608	122	2034	360	624	73.33	711	344	216	-37.21
ring_10_2	realamprandom	615	77	5427	1155	1332	15.32	1879	565	302	-46.55
ring_10_2	twolocalrandom	615	77	5427	1131	1332	17.77	1879	601	302	-49.75
ring_10_2	su2random	675	81	5427	1155	1338	15.84	1922	661	305	-53.86
ring_10_2	qnn	914	158	3576	708	1116	57.63	1356	558	349	-37.46
ring_10_2	portfolioqaoa	1260	192	5427	1065	1701	59.72	2060	793	534	-32.66
ring_10_2	random	1992	412	2127	1050	1407	34	2042	1129	580	-48.63
ring_10_2	portfoliovqe	2505	327	5427	1098	1590	44.81	2195	1030	520	-49.51
ring_5_4	ghz	17	17	0	27	51	88.89	17	41	30	-26.83
ring_5_4	dj	118	22	153	36	27	-25	113	71	33	-53.52
ring_5_4	graphstate	150	29	78	18	102	466.67	72	38	32	-15.79
ring_5_4	vqe	253	31	0	39	63	61.54	31	76	44	-42.11
ring_5_4	wstate	253	135	0	48	72	50	135	150	79	-47.33
ring_5_4	qaoa	285	34	171	51	93	82.35	250	83	43	-48.19
ring_7_3	ghz	17	17	0	18	84	366.67	17	32	28	-12.5
ring_7_3	dj	118	22	168	39	42	7.69	116	66	29	-56.06
ring_7_3	graphstate	150	29	84	24	96	300	85	43	35	-18.6
ring_7_3	vqe	253	31	0	24	138	475	31	63	53	-15.87
ring_7_3	wstate	253	135	0	15	108	620	135	144	81	-43.75
ring_7_3	qaoa	285	34	228	51	177	247.06	267	76	71	-6.58
ring_7_3	realamprandom	615	77	2679	999	1224	22.52	1444	740	319	-56.89
ring_7_3	twolocalrandom	615	77	2679	882	1224	38.78	1444	595	319	-46.39
t_horizontal_5_4	ghz	17	17	27	39	39	0	44	53	28	-47.17
t_horizontal_5_4	dj	118	22	384	42	27	-35.71	137	65	40	-38.46
t_horizontal_5_4	graphstate	150	29	147	42	147	250	96	37	45	21.62
t_horizontal_5_4	vqe	253	31	63	6	54	800	79	34	47	38.24
t_horizontal_5_4	wstate	253	135	63	21	45	114.29	166	141	111	-21.28
t_horizontal_5_4	qaoa	285	34	348	54	234	333.33	337	56	67	19.64
t_horizontal_5_4	qft	591	118	1842	381	519	36.22	729	309	170	-44.98
t_horizontal_5_4	qftentangled	608	122	1788	390	543	39.23	698	320	177	-44.69
t_horizontal_5_4	realamprandom	615	77	5859	885	1020	15.25	1927	446	234	-47.53
t_horizontal_5_4	twolocalrandom	615	77	5859	876	1020	16.44	1927	424	234	-44.81
t_horizontal_5_4	su2random	675	81	5859	993	1020	2.72	1970	538	237	-55.95
t_horizontal_5_4	qnn	914	158	4041	606	1065	75.74	1458	481	355	-26.2
t_horizontal_5_4	portfolioqaoa	1260	192	5859	822	1359	65.33	2156	636	420	-33.96
t_horizontal_5_4	random	1992	412	2613	1407	1815	29	2408	1130	644	-43.01
t_horizontal_5_4	portfoliovqe	2505	327	5859	975	1047	7.38	2288	893	431	-51.74
t_vertical_5_4	ghz	17	17	45	51	54	5.88	62	59	29	-50.85
t_vertical_5_4	dj	118	22	318	48	27	-43.75	131	69	38	-44.93
t_vertical_5_4	graphstate	150	29	150	30	138	360	107	35	41	17.14
t_vertical_5_4	vqe	253	31	150	12	99	725	94	54	48	-11.11
t_vertical_5_4	wstate	253	135	126	45	84	86.67	200	153	97	-36.6
t_vertical_5_4	qaoa	285	34	336	63	234	271.43	351	62	89	43.55
t_vertical_5_4	qft	591	118	1680	396	615	55.3	642	352	222	-36.93
t_vertical_5_4	qftentangled	608	122	1764	411	621	51.09	653	393	234	-40.46
t_vertical_5_4	realamprandom	615	77	5304	1047	1098	4.87	1919	564	261	-53.72
t_vertical_5_4	twolocalrandom	615	77	5304	1011	1098	8.61	1919	593	261	-55.99

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

layout	benchmark	g	d	s basic	s sabre	s look	swap (%)	d basic	d swap	d look	d (%)
t_vertical_5_4	su2random	675	81	5304	1086	1098	1.1	1962	658	265	-59.73
t_vertical_5_4	qnn	914	158	3669	600	1077	79.5	1449	509	344	-32.42
t_vertical_5_4	portfolioqaoa	1260	192	5304	879	1440	63.82	2150	641	430	-32.92
t_vertical_5_4	random	1992	412	2475	1203	1800	49.63	2366	1214	658	-45.8
t_vertical_5_4	portfoliovqe	2505	327	5304	942	1251	32.8	2280	834	456	-45.32