

HH ADAPT-VQE Validation Report

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Artifacts scanned: 4

Passing runs: 4/4

Algorithm:

```
hardcoded ADAPT-VQE on the Hubbard-Holstein model (problem=hh)
pool type: hva (HH layerwise + lifted UCCSD termwise generators)
optimizer: COBYLA over full selected-operator parameter vector per depth
convergence target: |Delta E| < 1e-4 vs exact_ground_energy_sector
```

Gate model used in this report (term-wise Pauli exponential estimate):

```
For exp(-i theta P) with Pauli support k:
CNOT = 2*(k-1), RZ = 1, H = 2*(#X + #Y), S/Sdg = 2*(#Y)
```

Notes:

These are decomposition estimates inferred from selected generators.

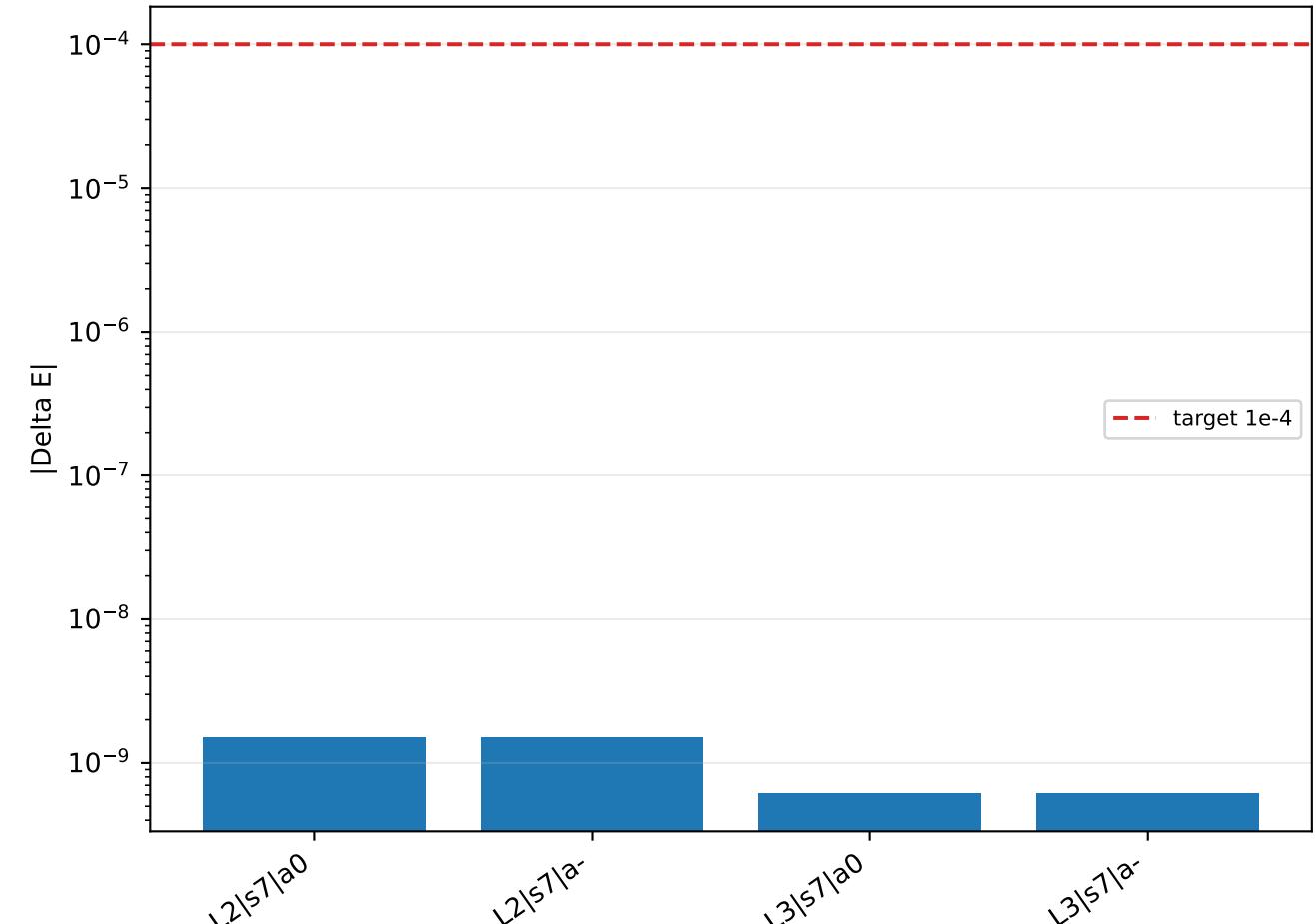
If a generator contains multiple Pauli terms, this is a term-wise upper-bound style estimate.

Run Summary Table

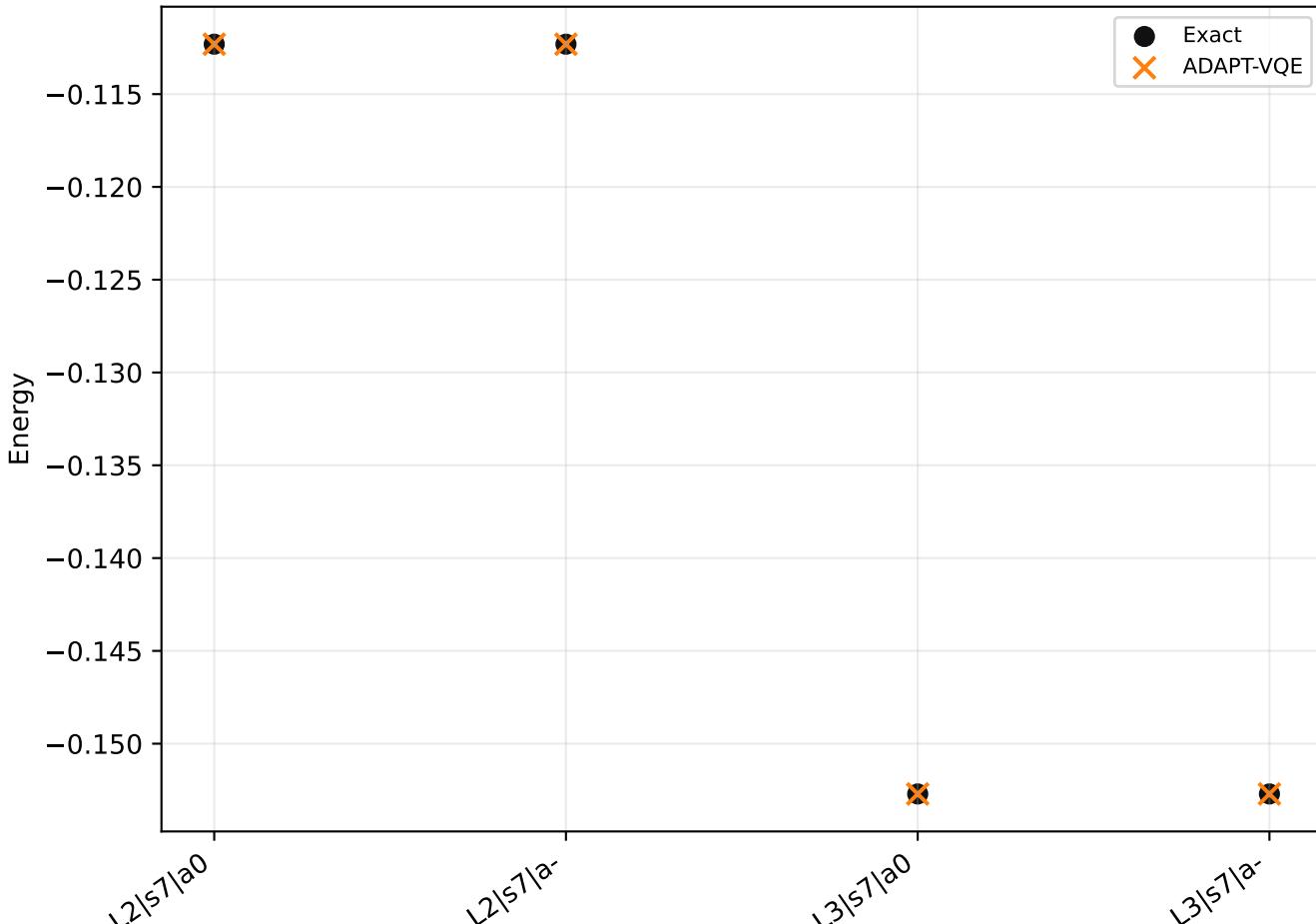
run_id	success	L	seed	method	pool	energy	exact	abs_delta_e	depth	nfev	elapsed_s	ham_q	ham_terms	traj_f_final	traj_f_min
L2 s7 a0	True	2	7hardcoded_adapt_vqe	hva	-0.112310561	-0.112310563	1.5e-09	12	2004	2.735	6	13	1	1	
L2 s7 a-	True	2	7hardcoded_adapt_vqe	hva	-0.112310561	-0.112310563	1.5e-09	12	2004	2.798	6	13	1	1	
L3 s7 a0	True	3	7hardcoded_adapt_vqe	hva	-0.152708569	-0.152708569	6.1e-10	30	9600	206.4	9	21	1	1	
L3 s7 a-	True	3	7hardcoded_adapt_vqe	hva	-0.152708569	-0.152708569	6.1e-10	30	9600	213.1	9	21	1	1	

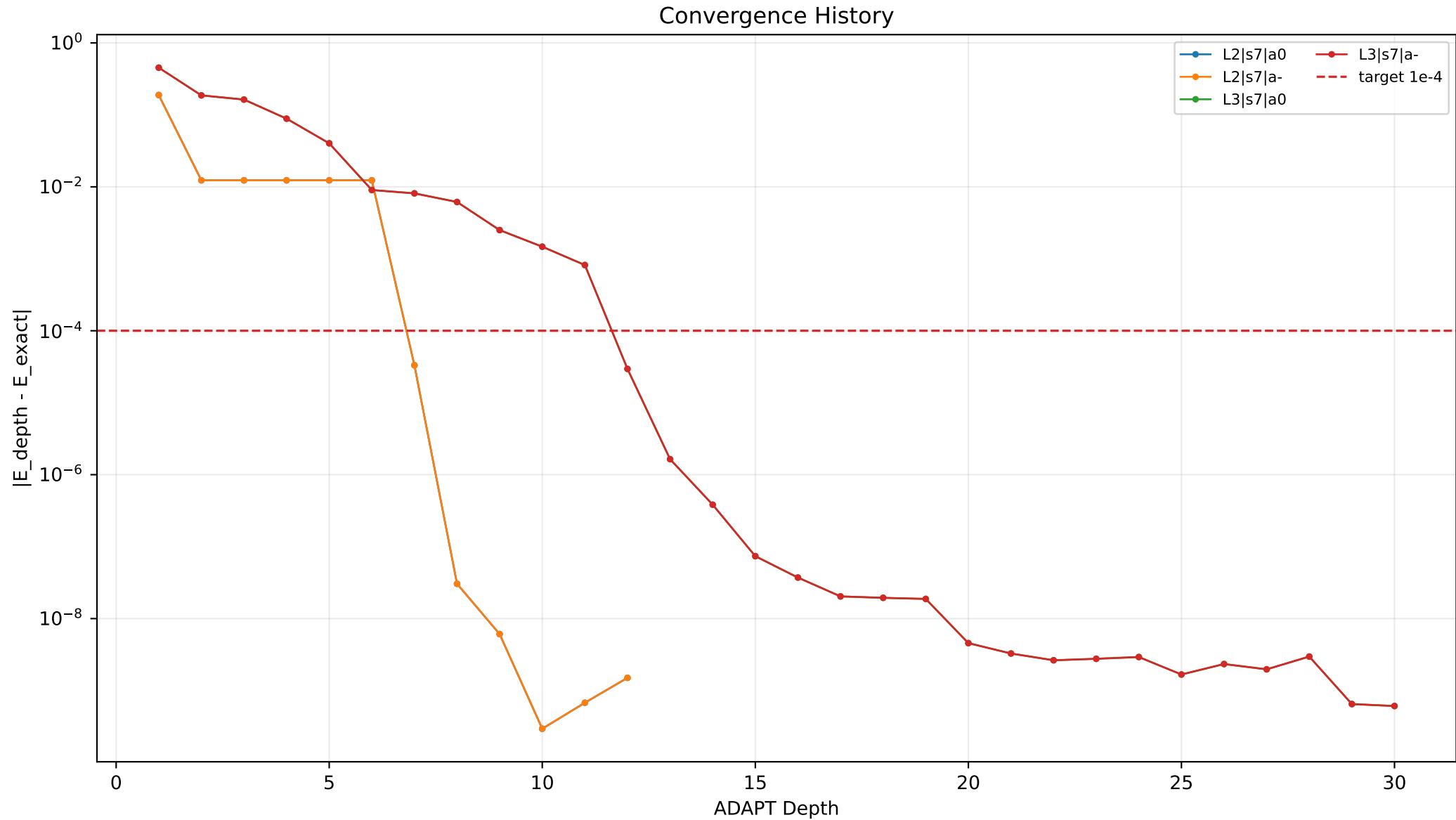
Accuracy Plots

Energy Error by Run



ADAPT-VQE Energy vs Exact





Generator Type and Estimated Gate Counts

run_id	depth	sing	dbl	hva/other	exp_terms	CNOT	RZ	H	S/Sdg	max_supp	mean_supp	unresolved
L2 s7 a0	12	4	8	0	12	56	12	80	40	4	3.33	0
L2 s7 a-	12	4	8	0	12	56	12	80	40	4	3.33	0
L3 s7 a0	30	8	22	0	30	198	30	208	92	6	4.3	0
L3 s7 a-	30	8	22	0	30	198	30	208	92	6	4.3	0

Selected Generators and Parameters

```
L2|s7|a0  method=hardcoded_adapt_vqe_hva_hh  pool=hva  depth=12
 01. uccsd_sing(alpha:0->1)_0          theta=1.921422
 02. uccsd_sing(beta:2->3)_0          theta=1.4934
 03. uccsd_sing(beta:2->3)_1          theta=-0.5270703
 04. uccsd_sing(alpha:0->1)_1          theta=0.090176
 05. uccsd_dbl(ab:0,2->1,3)_1          theta=1.022519
 06. uccsd_dbl(ab:0,2->1,3)_2          theta=1.210541
 07. uccsd_dbl(ab:0,2->1,3)_0          theta=-1.428435
 08. uccsd_dbl(ab:0,2->1,3)_3          theta=-0.02589117
 09. uccsd_dbl(ab:0,2->1,3)_4          theta=-0.02694877
 10. uccsd_dbl(ab:0,2->1,3)_5          theta=0.000629042
 11. uccsd_dbl(ab:0,2->1,3)_7          theta=-0.0001284064
 12. uccsd_dbl(ab:0,2->1,3)_6          theta=-1.950573e-05
```

```
artifact: /Users/jakestrobel/Downloads/Testing-For-Trying-Again-main_copy-testforatestcuziknothing/Adapt-VQE-Pipeline/hh_adapt_vqe_validation
```

```
L2|s7|a-  method=hardcoded_adapt_vqe_hva_hh  pool=hva  depth=12
 01. uccsd_sing(alpha:0->1)_0          theta=1.921422
 02. uccsd_sing(beta:2->3)_0          theta=1.4934
 03. uccsd_sing(beta:2->3)_1          theta=-0.5270703
 04. uccsd_sing(alpha:0->1)_1          theta=0.090176
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 06. uccsd_dbl(ab:0,2->1,3)_2          theta=1.210541
 07. uccsd_dbl(ab:0,2->1,3)_0          theta=-1.428435
 08. uccsd_dbl(ab:0,2->1,3)_3          theta=-0.02589117
 09. uccsd_dbl(ab:0,2->1,3)_4          theta=-0.02694877
 10. uccsd_dbl(ab:0,2->1,3)_5          theta=0.000629042
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```

```
artifact: /Users/jakestrobel/Downloads/Testing-For-Trying-Again-main_copy-testforatestcuziknothing/Adapt-VQE-Pipeline/hh_adapt_vqe_validation
```

```
L3|s7|a0  method=hardcoded_adapt_vqe_hva_hh  pool=hva  depth=30
```

Selected Generators and Parameters

01. uccsd_sing(alpha:1->2)_0	theta=1.794322
02. uccsd_sing(beta:3->4)_0	theta=1.567177
03. uccsd_sing(beta:3->5)_0	theta=0.8239369
04. uccsd_sing(beta:3->5)_1	theta=0.5950933
05. uccsd_sing(alpha:0->2)_0	theta=-0.6789546
06. uccsd_sing(alpha:0->2)_1	theta=-0.8988324
07. uccsd_dbl(ab:1,3->2,5)_0	theta=-0.8915918
08. uccsd_dbl(ab:1,3->2,5)_3	theta=-0.505628
09. uccsd_dbl(ab:1,3->2,4)_1	theta=0.8827061
10. uccsd_dbl(ab:0,3->2,4)_0	theta=-0.6768489
11. uccsd_dbl(ab:0,3->2,5)_1	theta=0.2599078
12. uccsd_dbl(ab:1,3->2,5)_6	theta=0.4336424
13. uccsd_dbl(ab:0,3->2,4)_2	theta=0.09100262
14. uccsd_dbl(ab:0,3->2,5)_2	theta=-0.01855669
15. uccsd_dbl(ab:0,3->2,4)_5	theta=0.008375228
16. uccsd_dbl(ab:1,3->2,5)_2	theta=-0.001940452
17. uccsd_dbl(ab:0,3->2,5)_3	theta=-0.001256237
18. uccsd_sing(beta:3->4)_1	theta=-0.0001634703
19. uccsd_dbl(ab:0,3->2,4)_4	theta=0.0006045465
20. uccsd_dbl(ab:0,3->2,5)_4	theta=-0.0004931942
21. uccsd_dbl(ab:1,3->2,5)_7	theta=5.382738e-05
22. uccsd_sing(alpha:1->2)_1	theta=7.73521e-05
23. uccsd_dbl(ab:0,3->2,4)_1	theta=-0.0001902344
24. uccsd_dbl(ab:0,3->2,5)_0	theta=-0.0002991311
25. uccsd_dbl(ab:1,3->2,4)_7	theta=6.760252e-05
26. uccsd_dbl(ab:1,3->2,4)_6	theta=-0.0002696416
27. uccsd_dbl(ab:1,3->2,4)_5	theta=3.749873e-06
28. uccsd_dbl(ab:1,3->2,5)_4	theta=-0.0001302871
29. uccsd_dbl(ab:1,3->2,4)_2	theta=3.966461e-05
30. uccsd_dbl(ab:1,3->2,4)_4	theta=1.581655e-05

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 04. uccsd_sing(beta:3->5)_1           theta=0.5950933
 05. uccsd_sing(alpha:0->2)_0           theta=-0.6789546
 06. uccsd_sing(alpha:0->2)_1           theta=-0.8988324
 07. uccsd_dbl(ab:1,3->2,5)_0           theta=-0.8915918
 08. uccsd_dbl(ab:1,3->2,5)_3           theta=-0.505628
 09. uccsd_dbl(ab:1,3->2,4)_1           theta=0.8827061
 10. uccsd_dbl(ab:0,3->2,4)_0           theta=-0.6768489
 11. uccsd_dbl(ab:0,3->2,5)_1           theta=0.2599078
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 24. uccsd_dbl(ab:0,3->2,5)_0           theta=-0.0002991311
 25. uccsd_dbl(ab:1,3->2,4)_7           theta=6.760252e-05
 26. uccsd_dbl(ab:1,3->2,4)_6           theta=-0.0002696416
 27. uccsd_dbl(ab:1,3->2,4)_5           theta=3.749873e-06
 28. uccsd_dbl(ab:1,3->2,5)_4           theta=-0.0001302871
 29. uccsd_dbl(ab:1,3->2,4)_2           theta=3.966461e-05
 30. uccsd_dbl(ab:1,3->2,4)_4           theta=1.581655e-05
```

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Selected Generators and Parameters