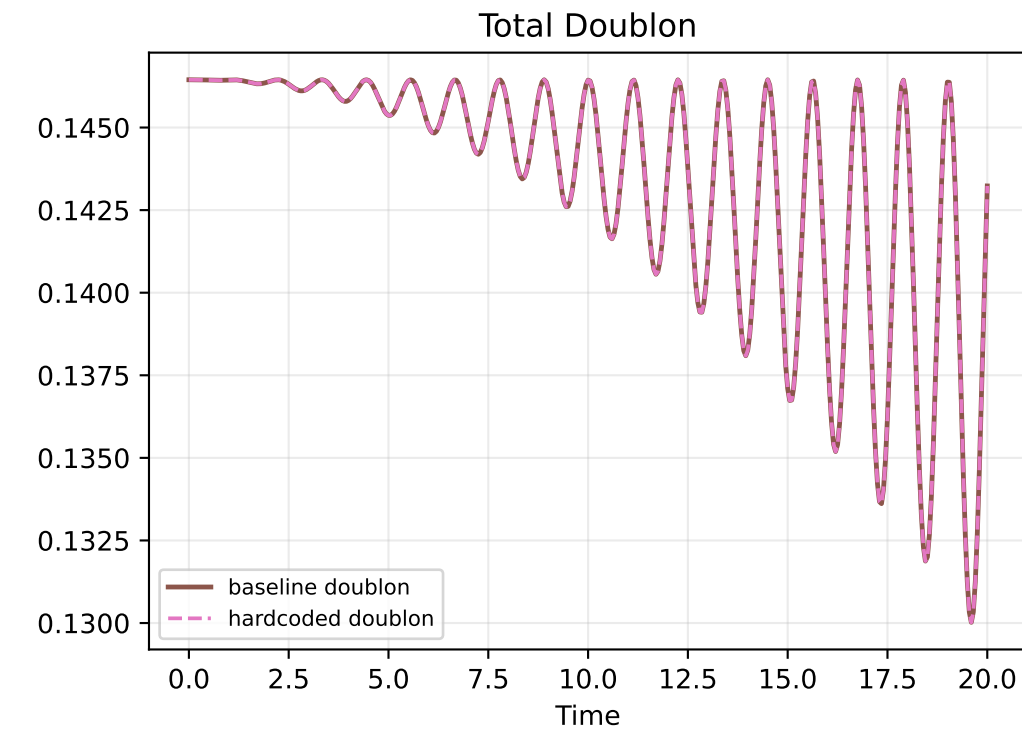
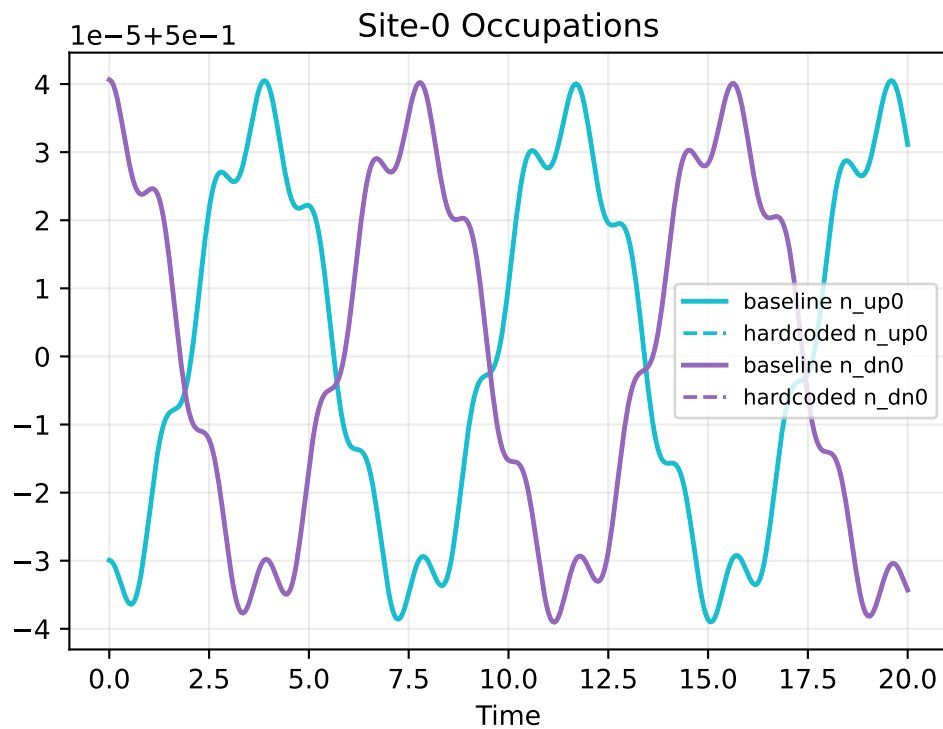
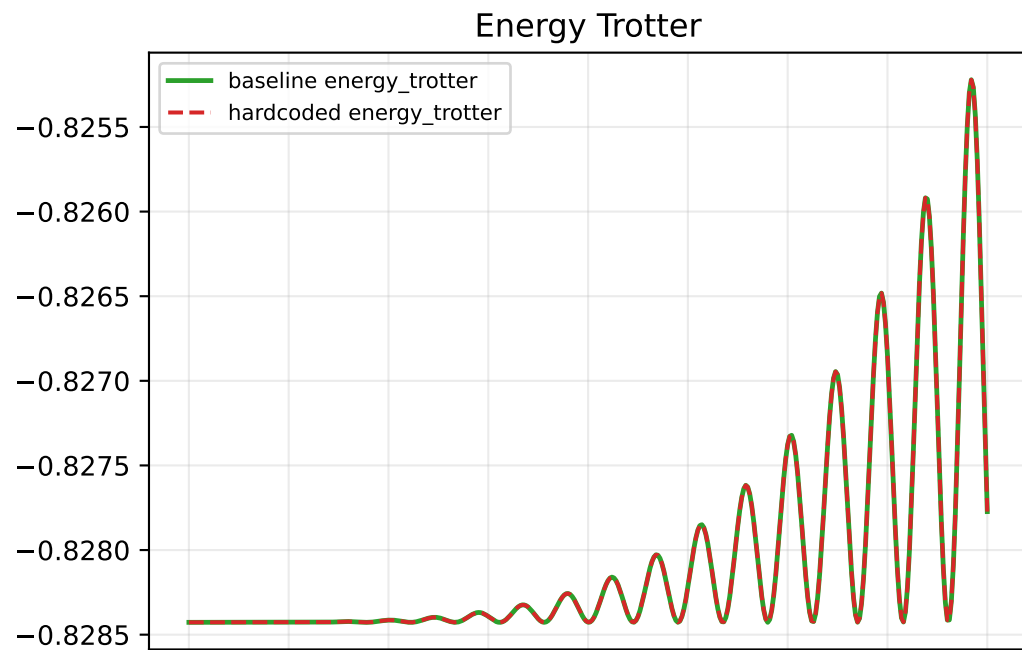
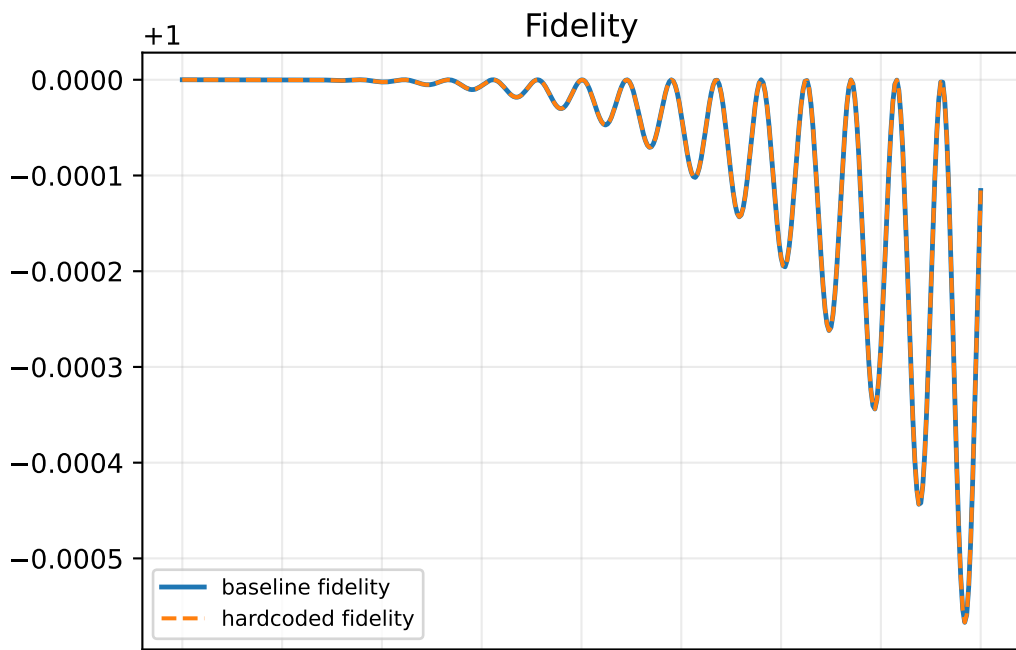
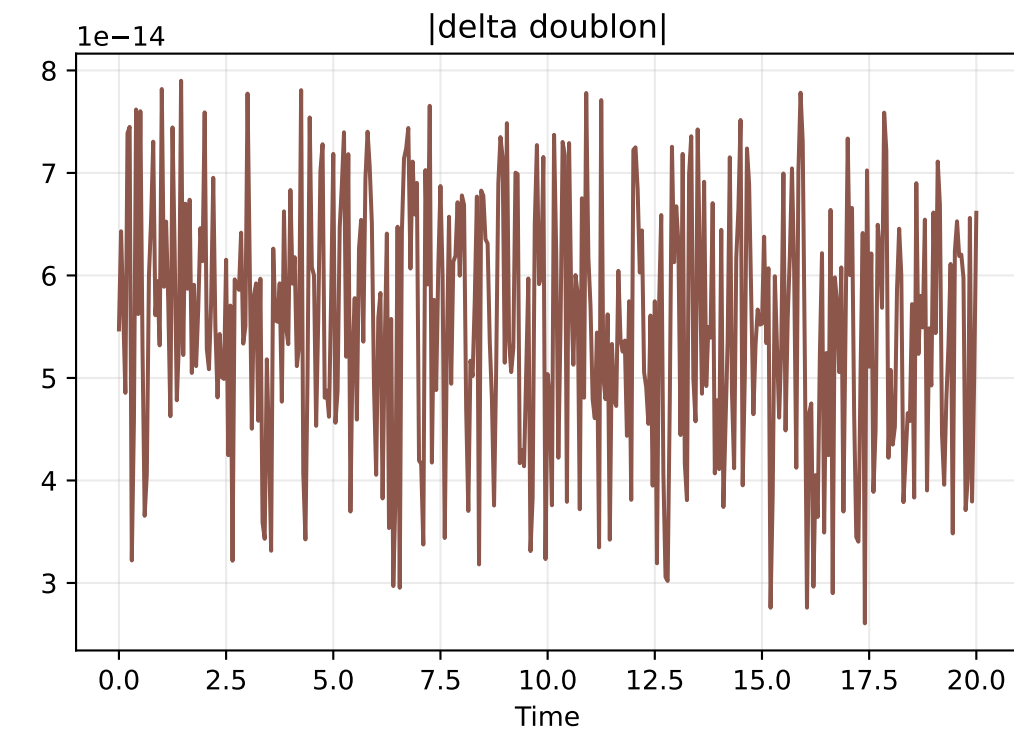
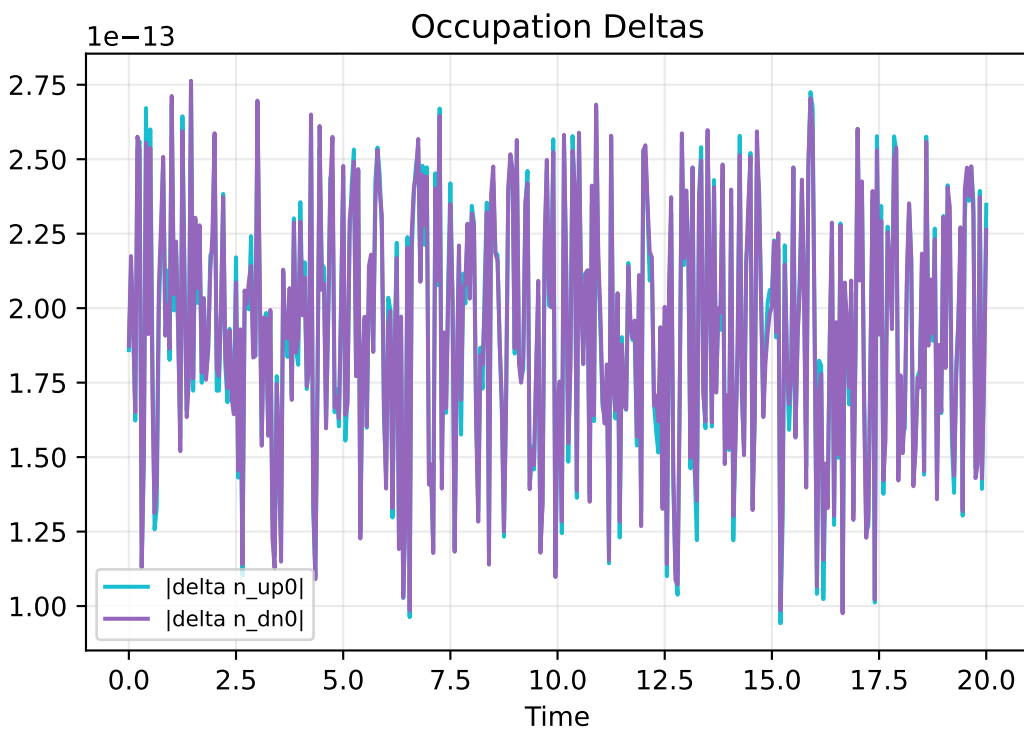
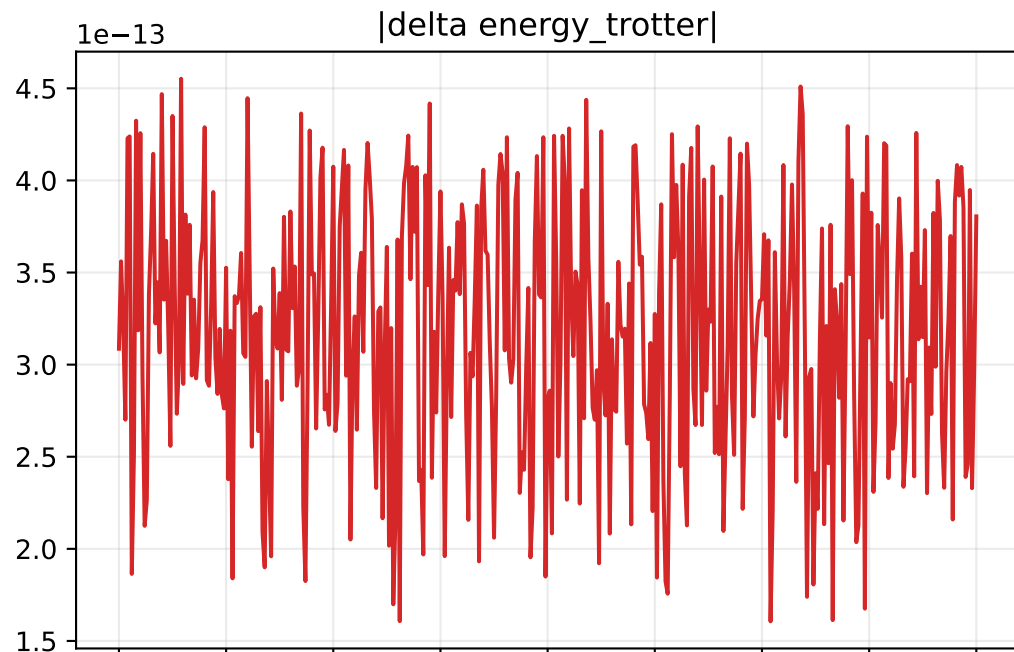
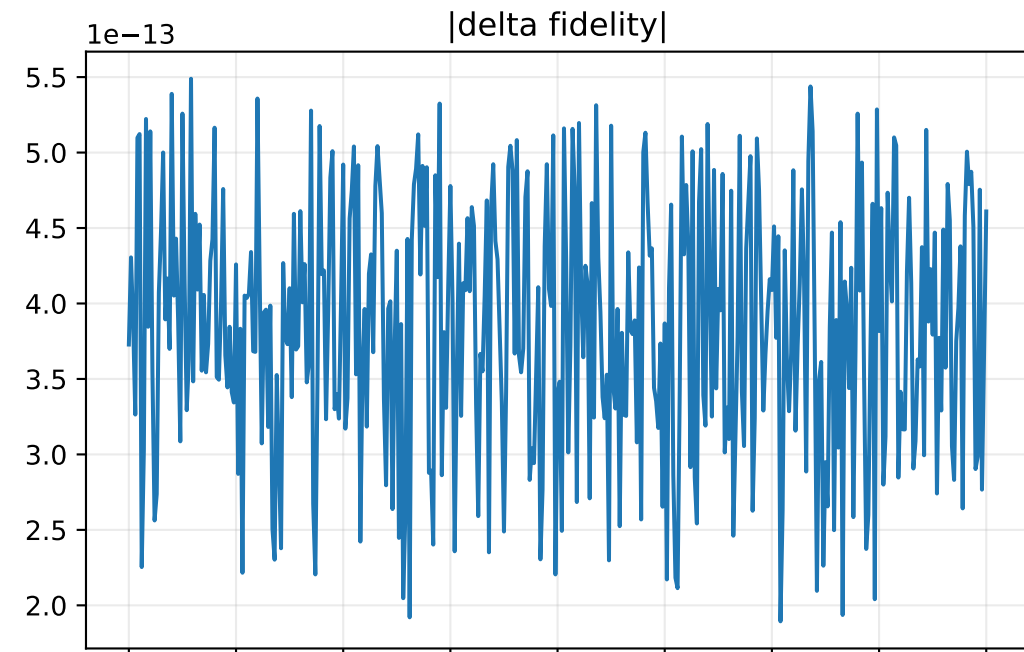


L=2 Hardcoded vs Frozen Qiskit Time Dynamics (iter1_final)



L=2 Delta Diagnostics (iter1_final)



L=2 metrics summary (iter1_final)

ground-state energy abs delta: 1.886020006836e-09

fidelity max/mean/final: 5.488942633747e-13 / 3.849085085020e-13 / 4.609645998244e-13

energy_trotter max/mean/final: 4.551914400963e-13 / 3.188710033066e-13 / 3.804734305390e-13

n_up_site0_trotter max/mean/final: 2.754463324095e-13 / 1.923451699937e-13 / 2.347011474058e-13

n_dn_site0_trotter max/mean/final: 2.763345108292e-13 / 1.927427461192e-13 / 2.262634524186e-13

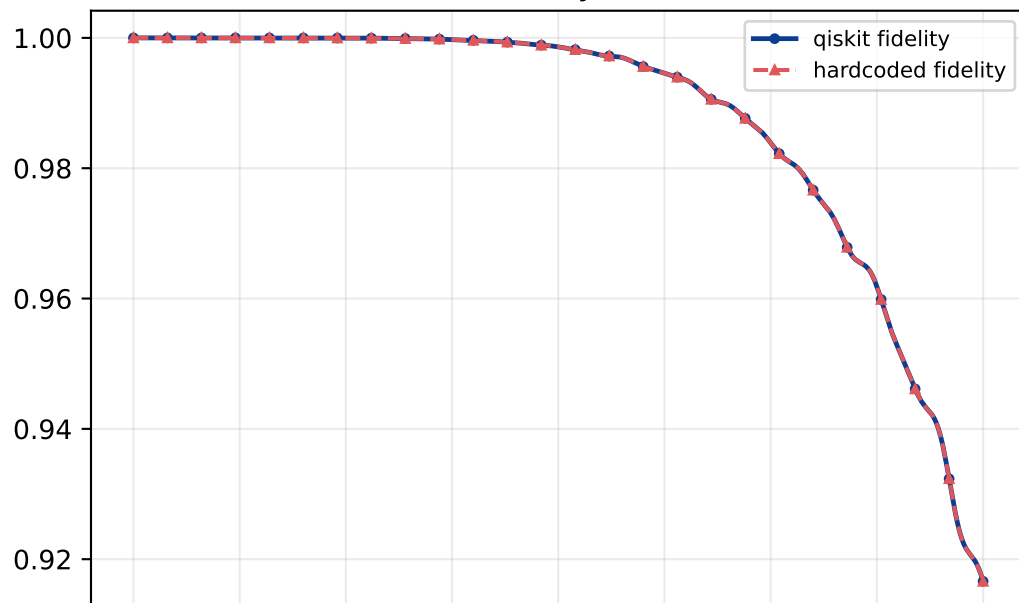
doublon_trotter max/mean/final: 7.899236820208e-14 / 5.527415599209e-14 / 6.611378111643e-14

Acceptance checks: {'ground_state_energy_abs_delta': True, 'fidelity_max_abs_delta': True, 'energy_trotter_max_abs_delta': True}

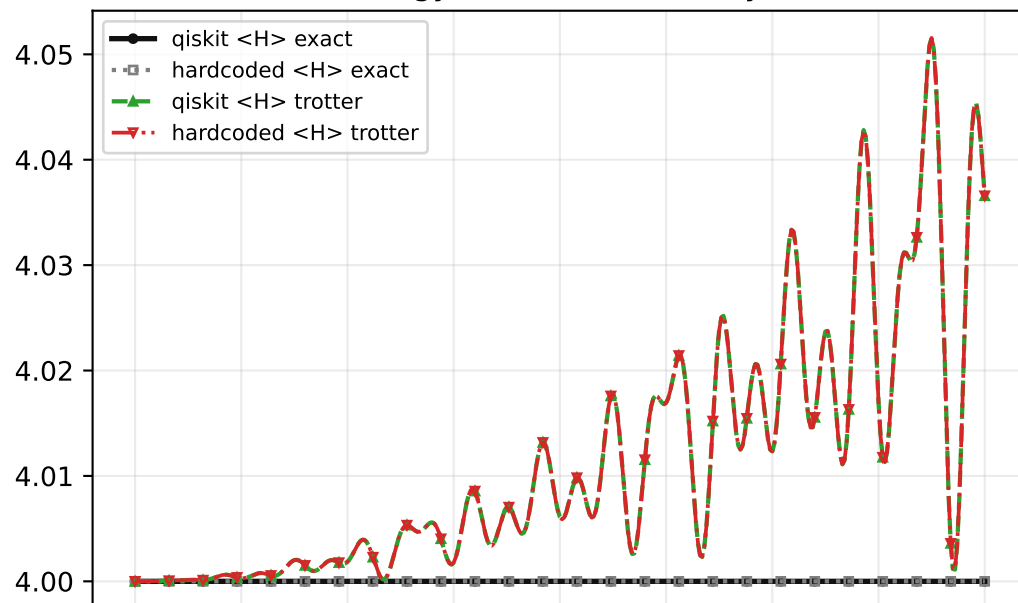
PASS: True

L=3 Time Dynamics: hardcoded vs Qiskit

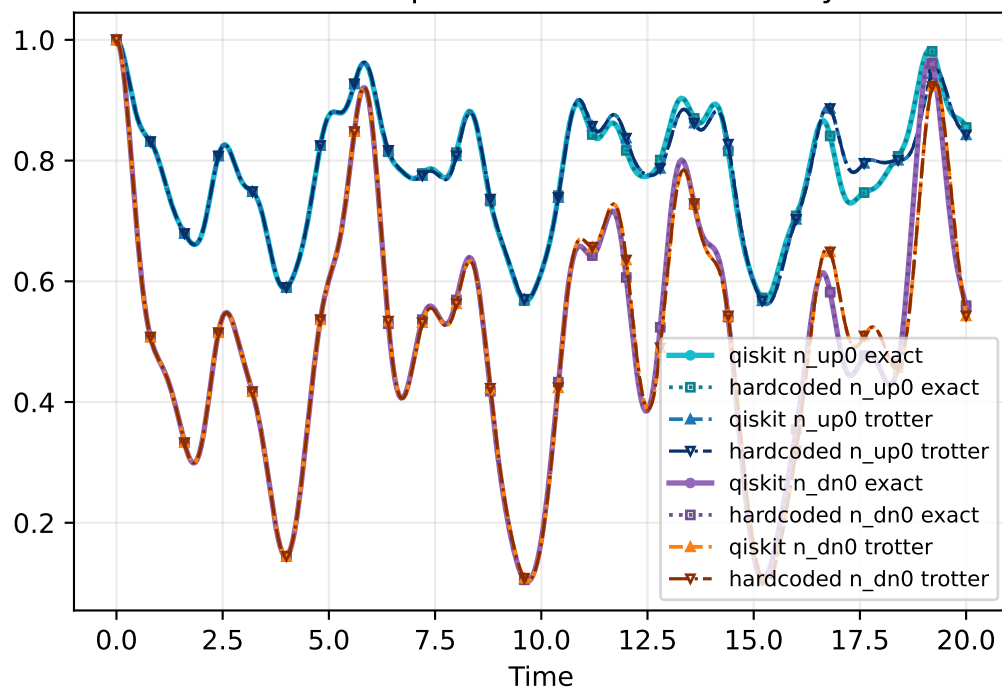
Fidelity(t)



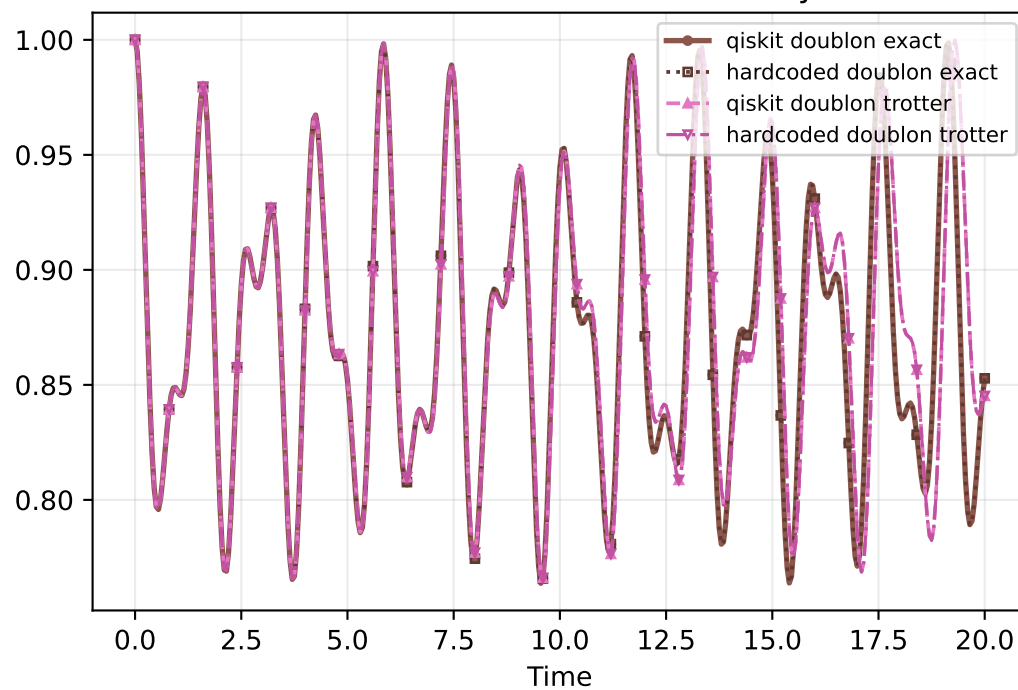
Energy with Exact Overlays



Site-0 Occupations with Exact Overlays

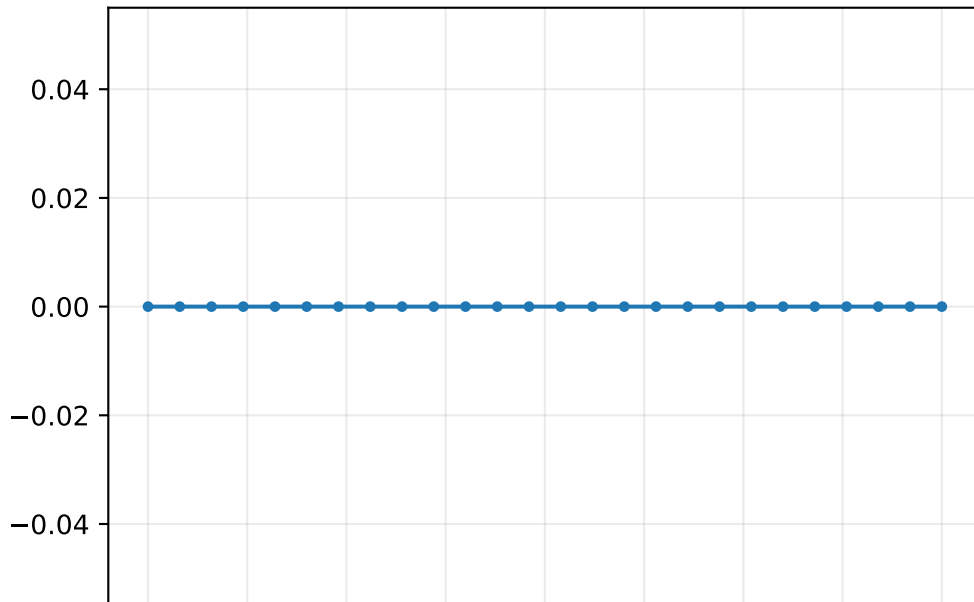


Total Doublon with Exact Overlays

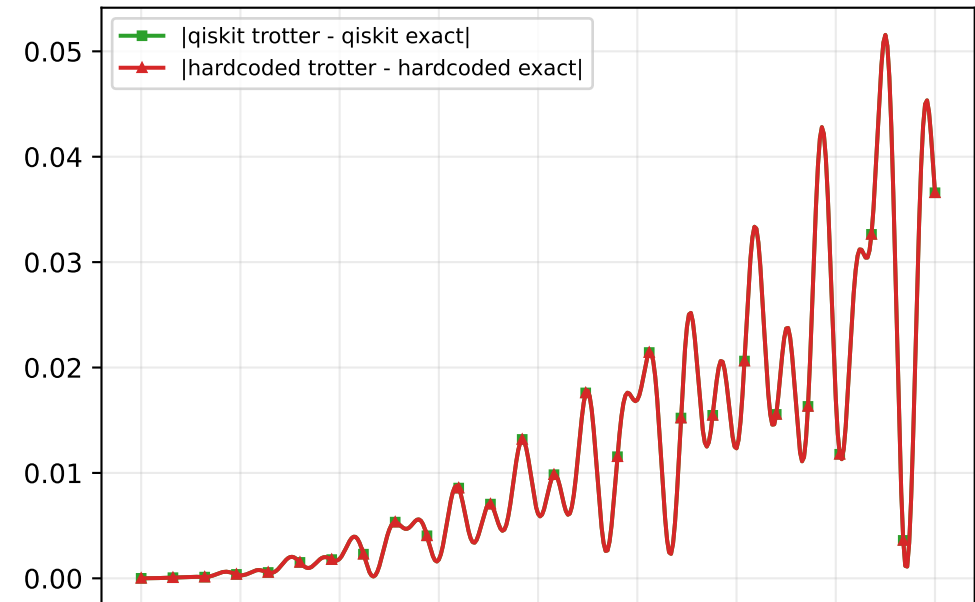


L=3 Delta Diagnostics

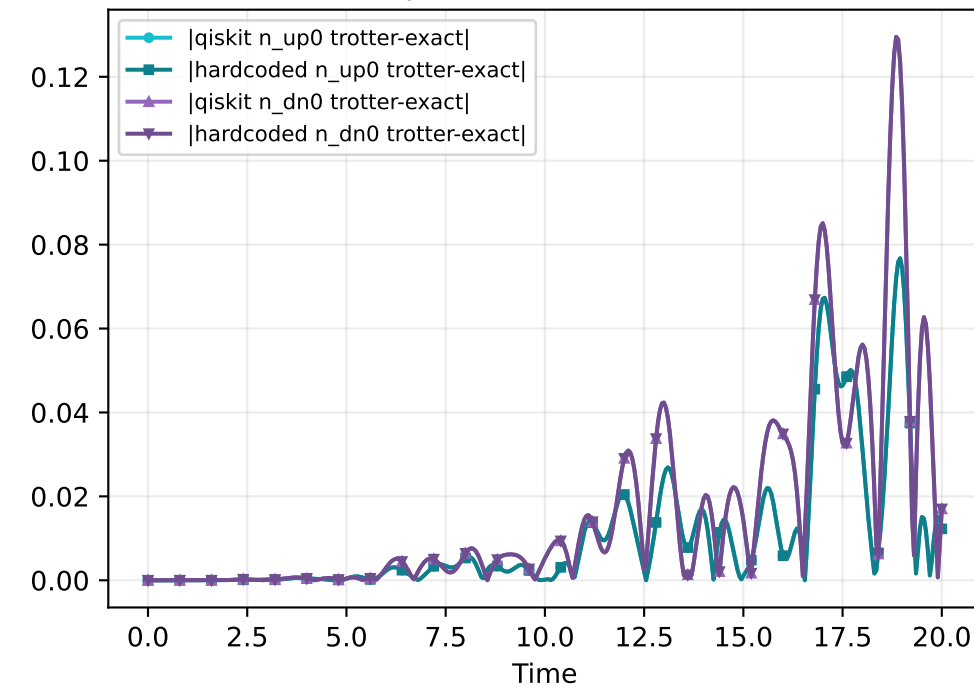
|delta fidelity|



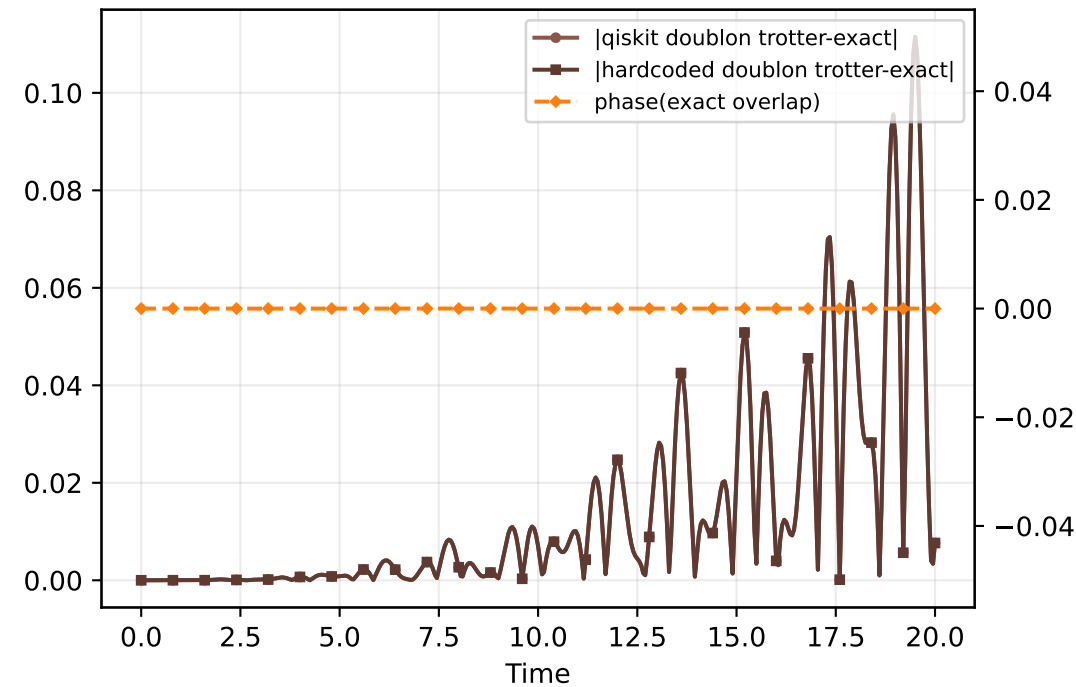
Energy Trotter-vs-Exact



Occupation Trotter-vs-Exact



Doublon Trotter-vs-Exact + Phase



L=3 validation summary

```
ground_state_energy_abs_delta = 0.000000000000e+00
fidelity max/mean/final delta = 0.000000000000e+00 / 0.000000000000e+00 / 0.000000000000e+00
energy_trotter max/mean/final delta = 0.000000000000e+00 / 0.000000000000e+00 / 0.000000000000e+00
n_up_site0_trotter max/mean/final delta = 0.000000000000e+00 / 0.000000000000e+00 / 0.000000000000e+00
n_dn_site0_trotter max/mean/final delta = 0.000000000000e+00 / 0.000000000000e+00 / 0.000000000000e+00
doublon_trotter max/mean/final delta = 0.000000000000e+00 / 0.000000000000e+00 / 0.000000000000e+00
```

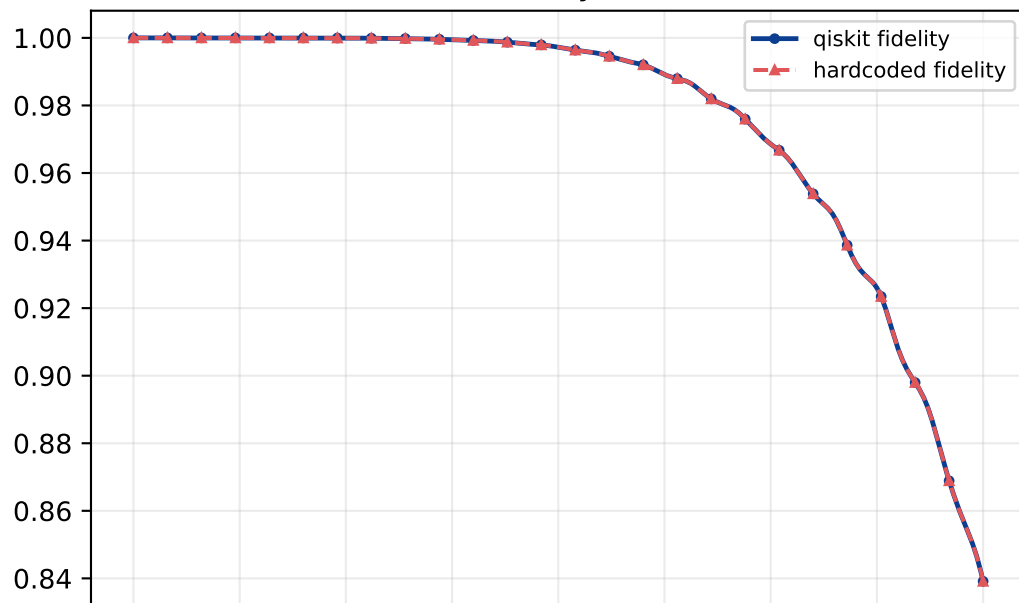
Checks: {'ground_state_energy_abs_delta': True, 'fidelity_max_abs_delta': True, 'energy_trotter_max_abs_delta': True, 'n_up_si
PASS: True

Locked settings:

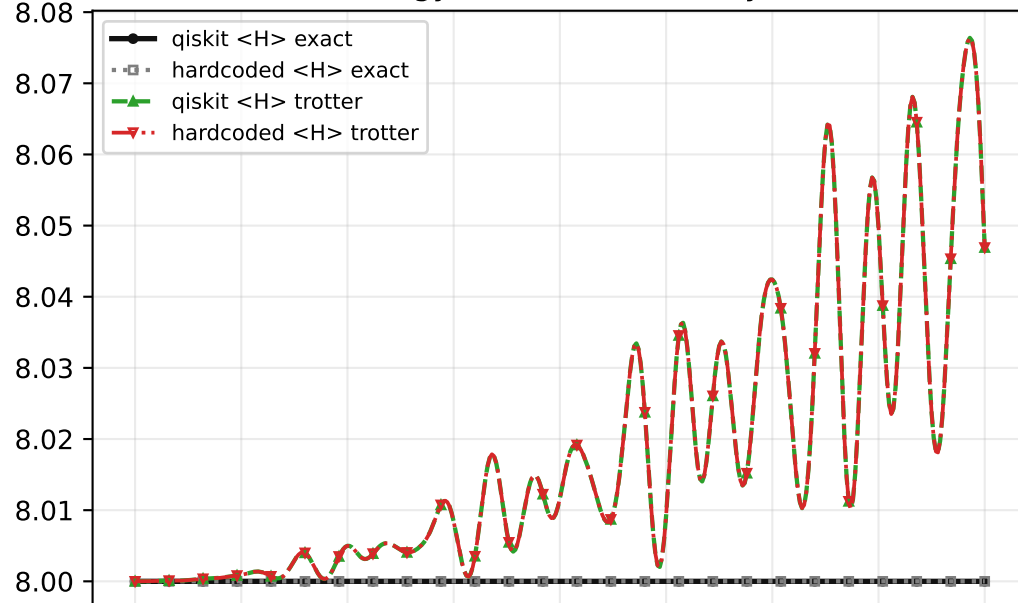
```
{
  "hopping_t": 1.0,
  "onsite_u": 4.0,
  "dv": 0.0,
  "boundary": "periodic",
  "ordering": "blocked",
  "t_final": 20.0,
  "num_times": 401,
  "suzuki_order": 2,
  "trotter_steps": 128
}
```

L=4 Time Dynamics: hardcoded vs Qiskit

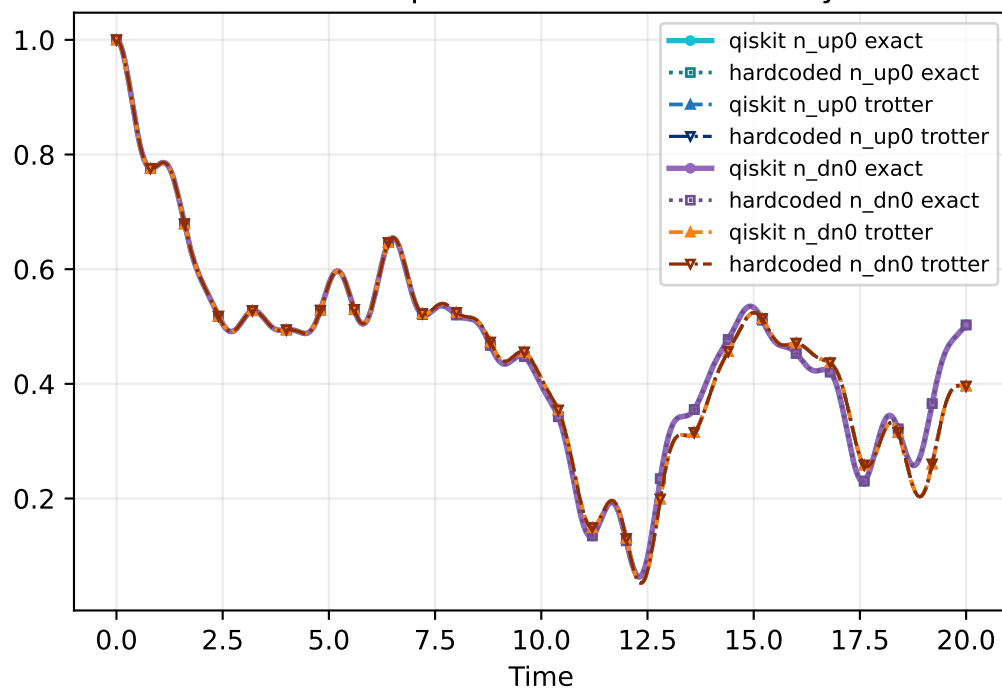
Fidelity(t)



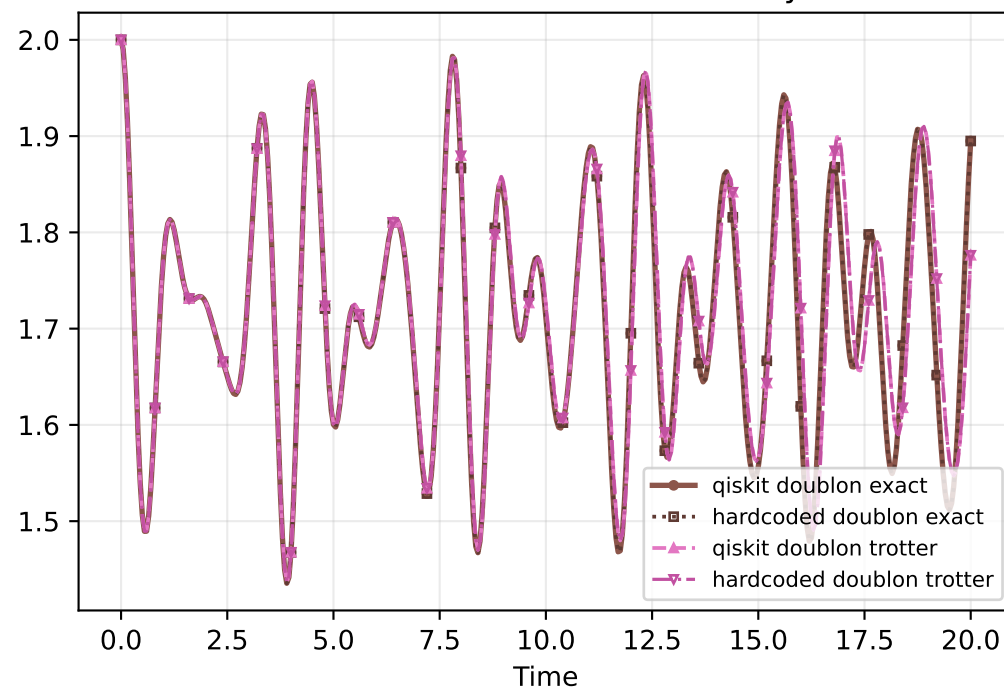
Energy with Exact Overlays



Site-0 Occupations with Exact Overlays

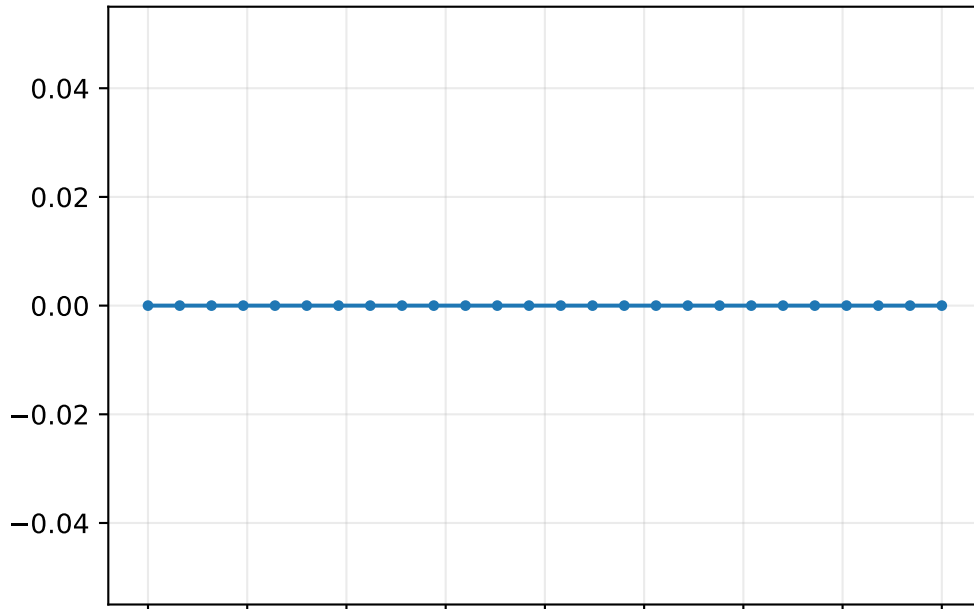


Total Doublon with Exact Overlays

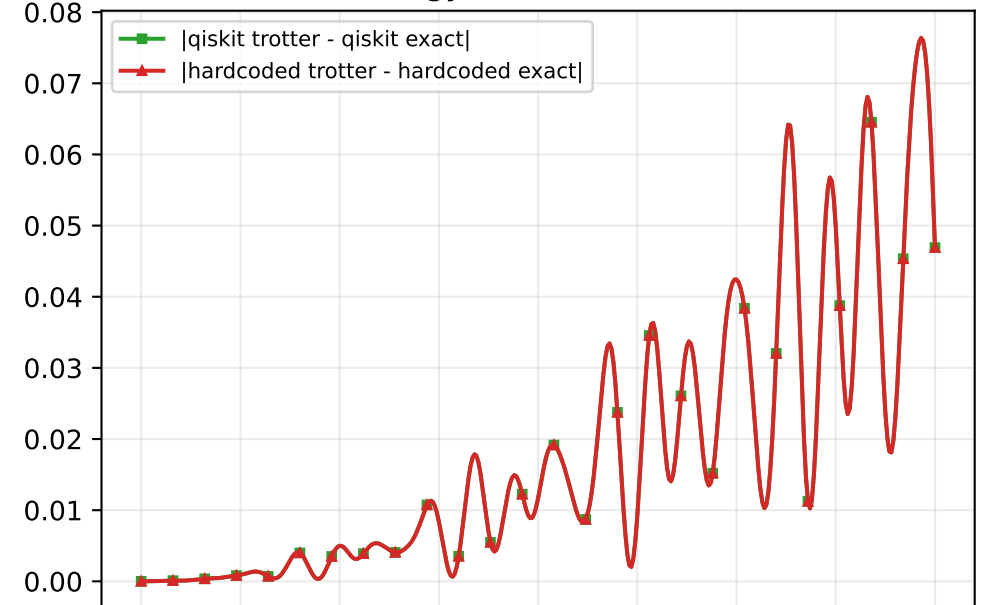


L=4 Delta Diagnostics

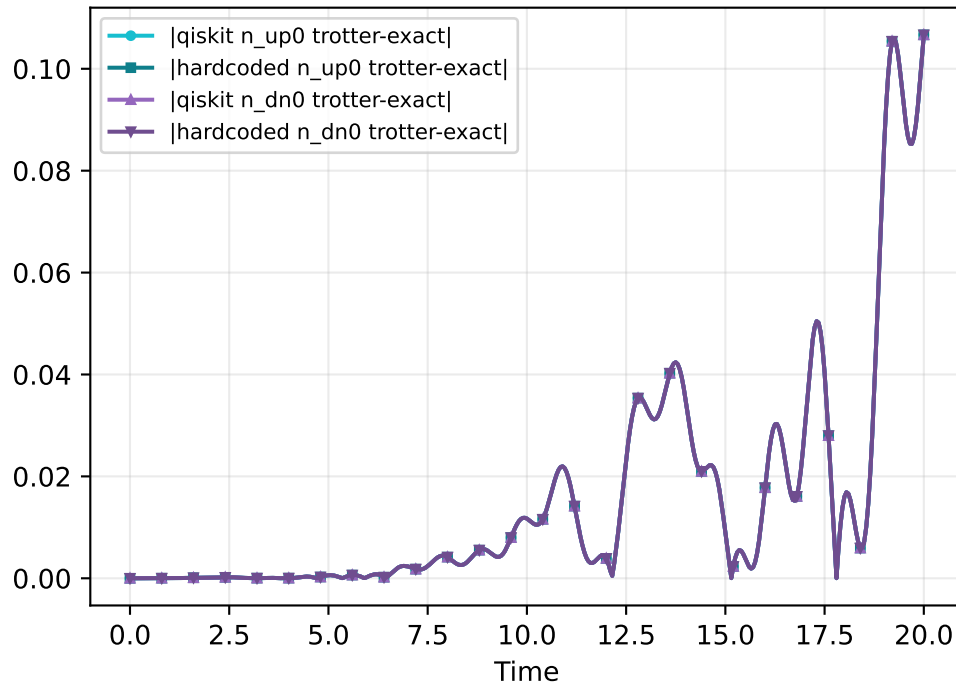
|delta fidelity|



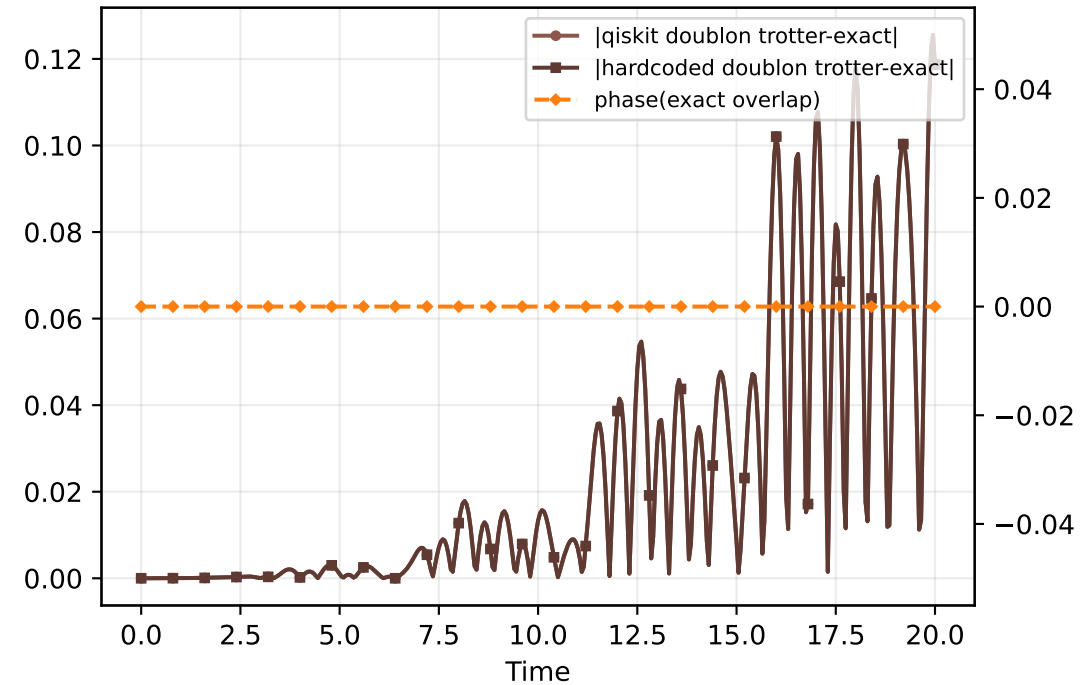
Energy Trotter-vs-Exact



Occupation Trotter-vs-Exact



Doublon Trotter-vs-Exact + Phase



L=4 validation summary

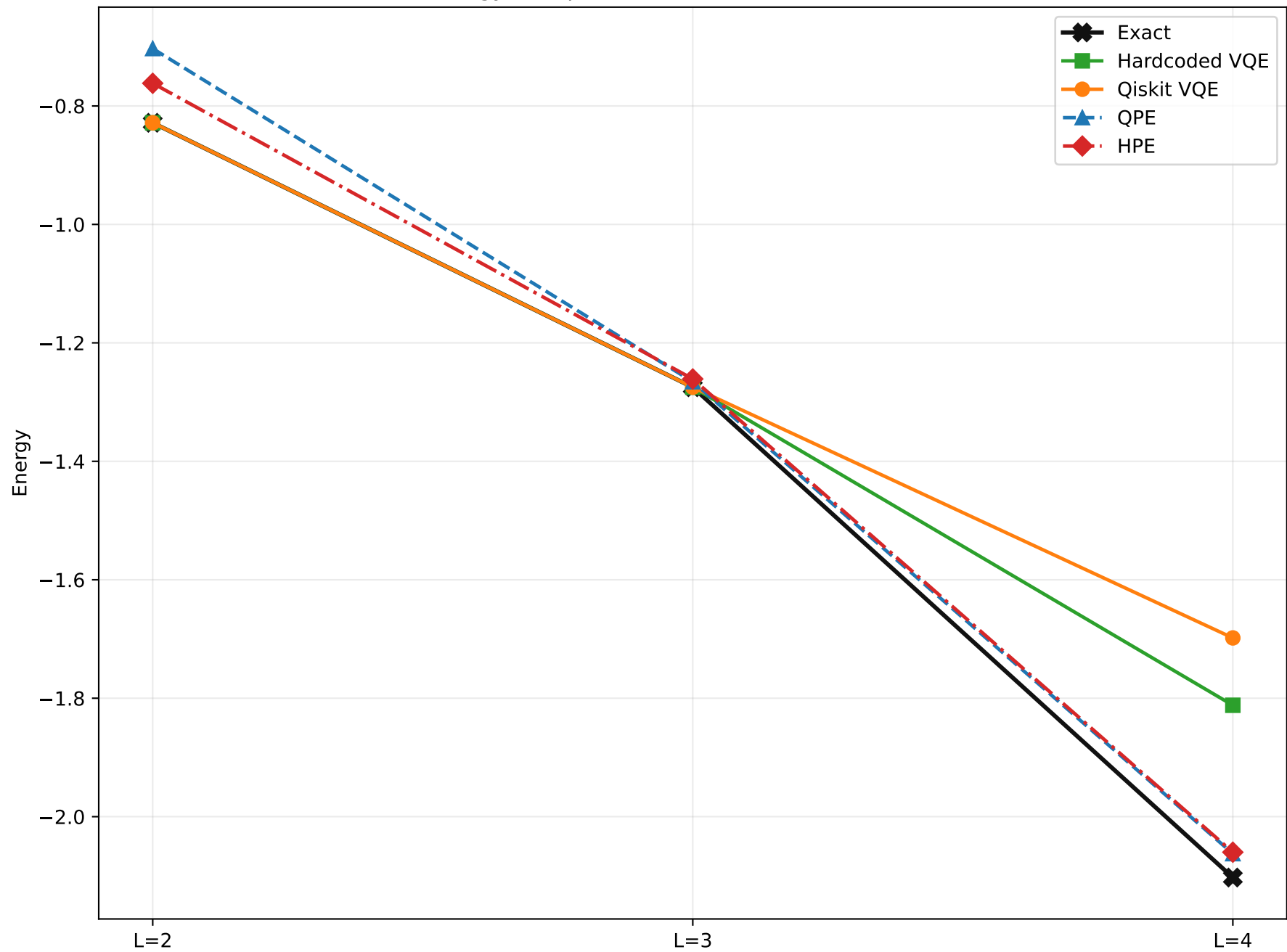
```
ground_state_energy_abs_delta = 0.000000000000e+00
fidelity max/mean/final delta = 0.000000000000e+00 / 0.000000000000e+00 / 0.000000000000e+00
energy_trotter max/mean/final delta = 0.000000000000e+00 / 0.000000000000e+00 / 0.000000000000e+00
n_up_site0_trotter max/mean/final delta = 0.000000000000e+00 / 0.000000000000e+00 / 0.000000000000e+00
n_dn_site0_trotter max/mean/final delta = 0.000000000000e+00 / 0.000000000000e+00 / 0.000000000000e+00
doublon_trotter max/mean/final delta = 0.000000000000e+00 / 0.000000000000e+00 / 0.000000000000e+00
```

Checks: {'ground_state_energy_abs_delta': True, 'fidelity_max_abs_delta': True, 'energy_trotter_max_abs_delta': True, 'n_up_si
PASS: True

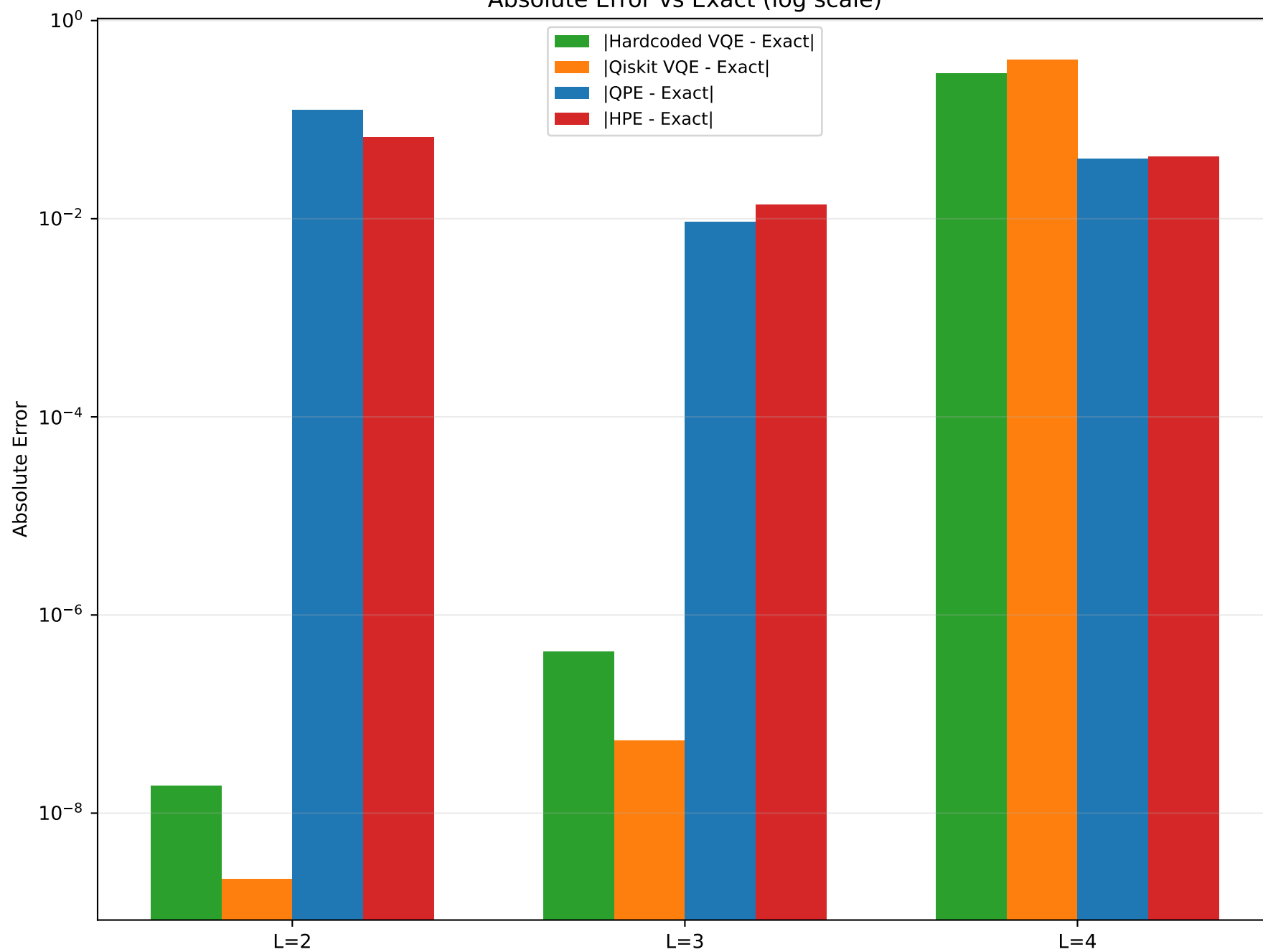
Locked settings:

```
{
  "hopping_t": 1.0,
  "onsite_u": 4.0,
  "dv": 0.0,
  "boundary": "periodic",
  "ordering": "blocked",
  "t_final": 20.0,
  "num_times": 401,
  "suzuki_order": 2,
  "trotter_steps": 128
}
```

Energy Comparison: VQE / QPE / HPE vs Exact



Absolute Error vs Exact (log scale)



Data table (energy values)

Columns: L, exact, hardcoded_vqe, qiskit_vqe, qpe, hpe

L=2	exact=-0.8284271247461902	hardcoded_vqe=-0.8284271058048679	qiskit_vqe=-0.8284271225858459	qpe=-0.703125	
L=3	exact=-1.2749172176353751	hardcoded_vqe=-1.2749167910984351	qiskit_vqe=-1.2749171630977223	qpe=-1.265625	
L=4	exact=-2.102748483462073	hardcoded_vqe=-1.8118908431778067	qiskit_vqe=-1.6981962214900943	qpe=-2.0625	hpe

Hardcoded vs Qiskit Overall Summary (L=2..4)

L=2 PASS: True (iter1)

gs delta: 1.886020006836e-09
fidelity max delta: 5.488942633747e-13
energy_trotter max delta: 4.551914400963e-13
n_up_site0_trotter max delta: 2.754463324095e-13
n_dn_site0_trotter max delta: 2.763345108292e-13
doublon_trotter max delta: 7.899236820208e-14

L=3/L=4 all-pass: True

L=3 PASS=True max coeff delta=0.000e+00

fidelity: 0.000000000000e+00
energy_trotter: 0.000000000000e+00
n_up_site0_trotter: 0.000000000000e+00
n_dn_site0_trotter: 0.000000000000e+00
doublon_trotter: 0.000000000000e+00

L=4 PASS=True max coeff delta=0.000e+00

fidelity: 0.000000000000e+00
energy_trotter: 0.000000000000e+00
n_up_site0_trotter: 0.000000000000e+00
n_dn_site0_trotter: 0.000000000000e+00
doublon_trotter: 0.000000000000e+00

PDF Artifacts:

- hardcoded_vs_qiskit_l2_match_report_iter0.pdf
- hardcoded_vs_qiskit_l2_match_report_iter1.pdf
- hardcoded_vs_qiskit_l2_match_final_report.pdf
- hardcoded_vs_qiskit_l3_time_dynamics_report.pdf
- hardcoded_vs_qiskit_l4_time_dynamics_report.pdf
- hardcoded_vs_qiskit_vqe_energy_comparison.pdf