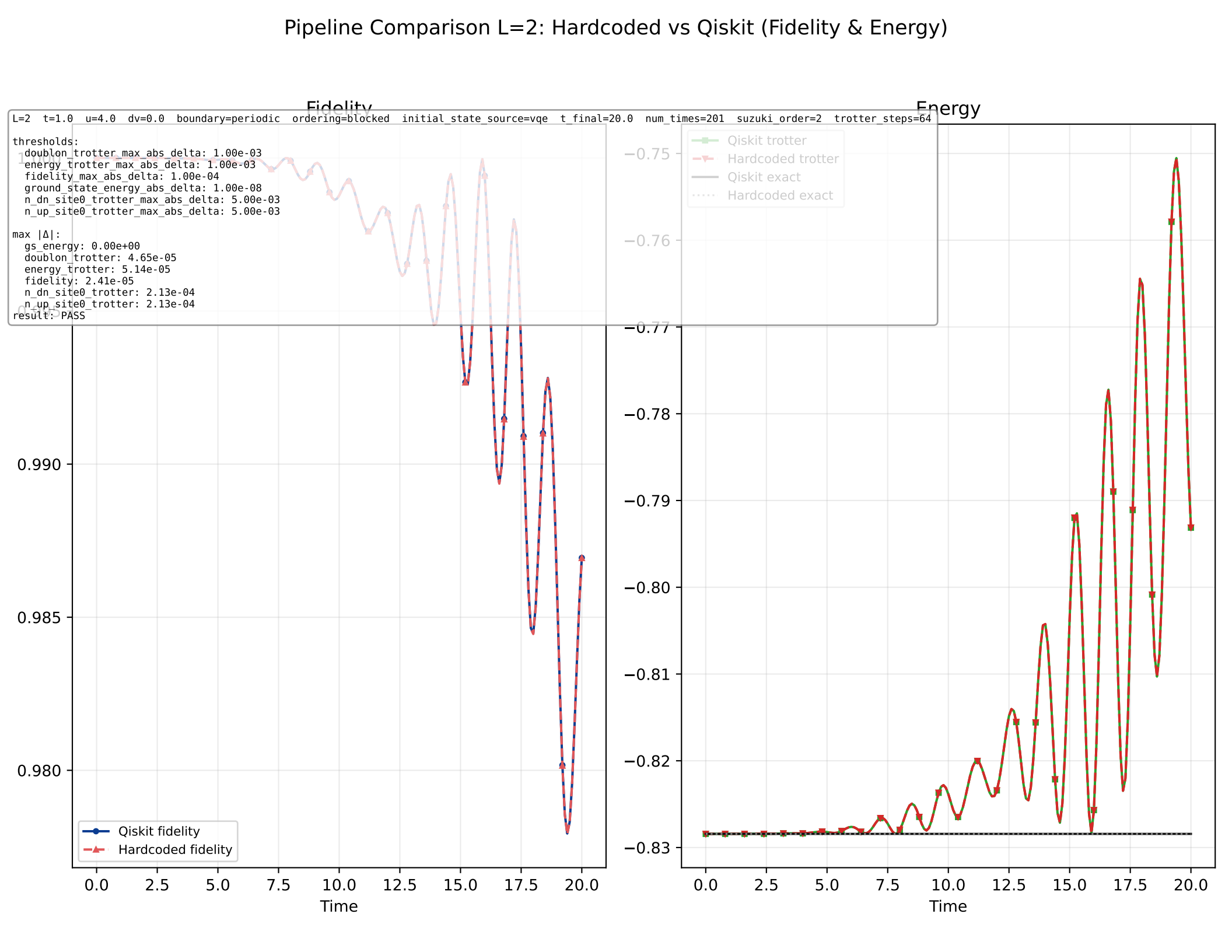
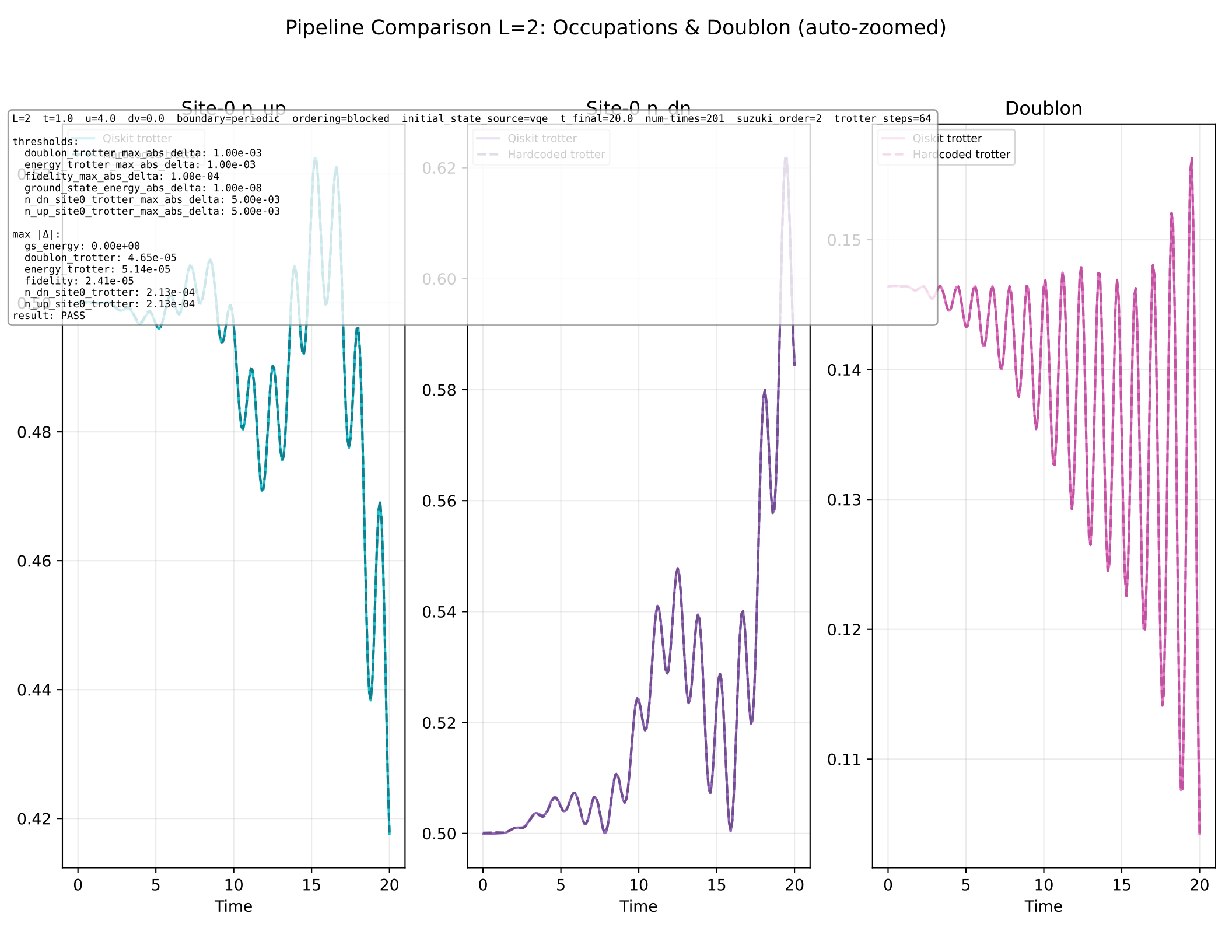
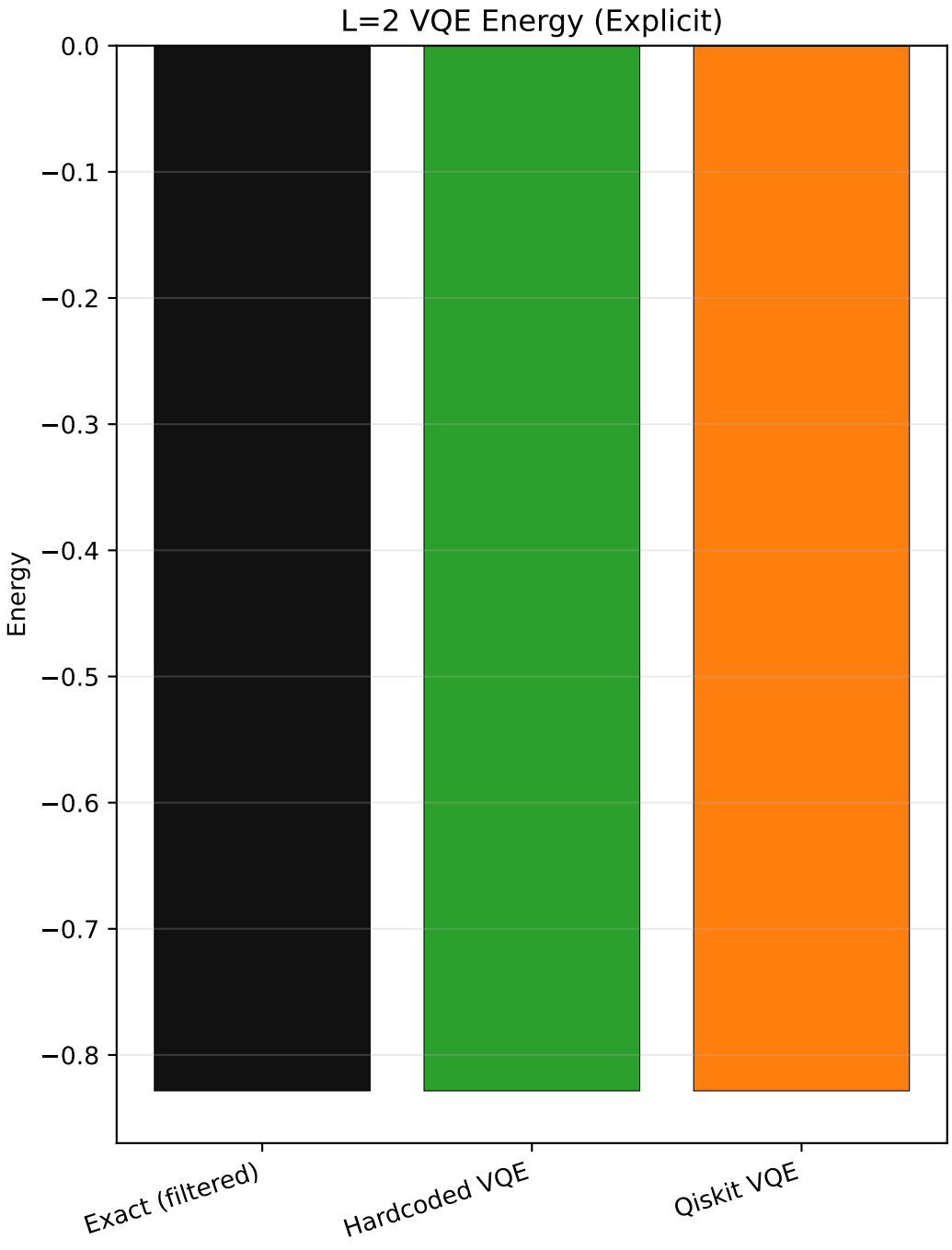
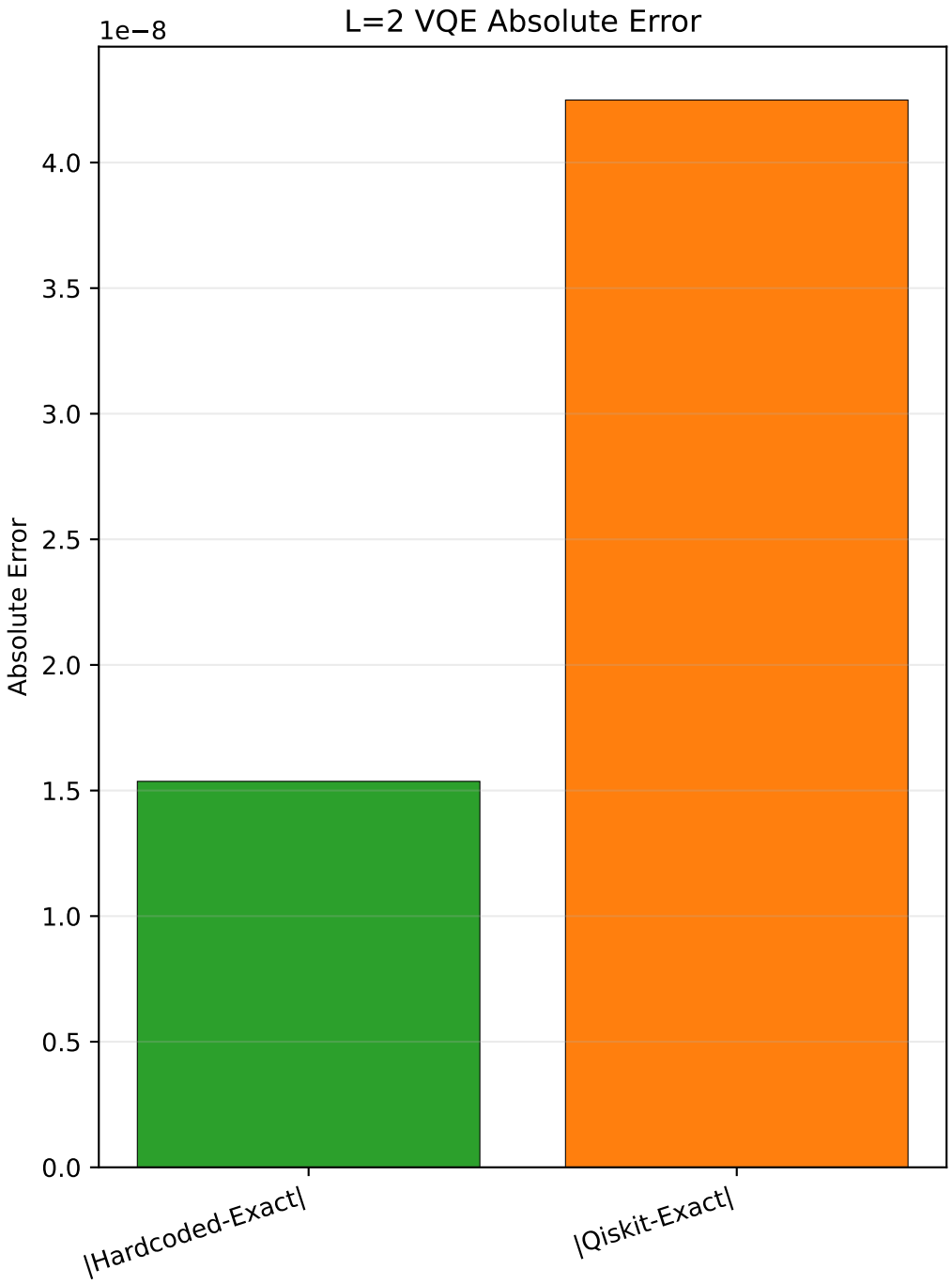

Pipeline Comparison L=2: Hardcoded vs Qiskit (Fidelity & Energy)
L=2 t=1.0 u=4.0 dv=0.0 boundary=periodic ordering=blocked initial_state_source=vqe t_final=20.0 num_times=201 suzuki_order=2 trotter_steps=64
thresholds:
doublon_trotter_max_abs_delta: 1.00e-03
energy_trotter_max_abs_delta: 1.00e-03
fidelity_max_abs_delta: 1.00e-04
ground_state_energy_abs_delta: 1.00e-08
n_dn_site0_trotter_max_abs_delta: 5.00e-03
n_up_site0_trotter_max_abs_delta: 5.00e-03
max |Δ|:
gs_energy: 0.00e+00
doublon_trotter: 4.65e-05
energy_trotter: 5.14e-05
fidelity: 2.41e-05
n_dn_site0_trotter: 2.13e-04
n_up_site0_trotter: 2.13e-04
result: PASS
Fidelity
Qiskit fidelity
Hardcoded fidelity
0.990
0.985
0.980
Time
Energy
Qiskit trotter
Hardcoded trotter
Qiskit exact
Hardcoded exact
−0.75
−0.76
−0.77
−0.78
−0.79
−0.80
−0.81
−0.82
−0.83
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
Time


Pipeline Comparison L=2: Occupations & Doublon (auto-zoomed)
L=2 t=1.0 u=4.0 dv=0.0 boundary=periodic ordering=blocked initial_state_source=vqe t_final=20.0 num_times=201 suzuki_order=2 trotter_steps=64
thresholds:
doublon_trotter_max_abs_delta: 1.00e-03
energy_trotter_max_abs_delta: 1.00e-03
fidelity_max_abs_delta: 1.00e-04
ground_state_energy_abs_delta: 1.00e-08
n_dn_site0_trotter_max_abs_delta: 5.00e-03
n_up_site0_trotter_max_abs_delta: 5.00e-03
max |Δ|:
gs_energy: 0.00e+00
doublon_trotter: 4.65e-05
energy_trotter: 5.14e-05
fidelity: 2.41e-05
n_dn_site0_trotter: 2.13e-04
n_up_site0_trotter: 2.13e-04
result: PASS
Site-0 n_up
Site-0 n_dn
Doublon
Qiskit trotter
Hardcoded trotter
Time

VQE is a separate quantity from the Trotter t=0 value; do not infer VQE energy from trajectory plots.

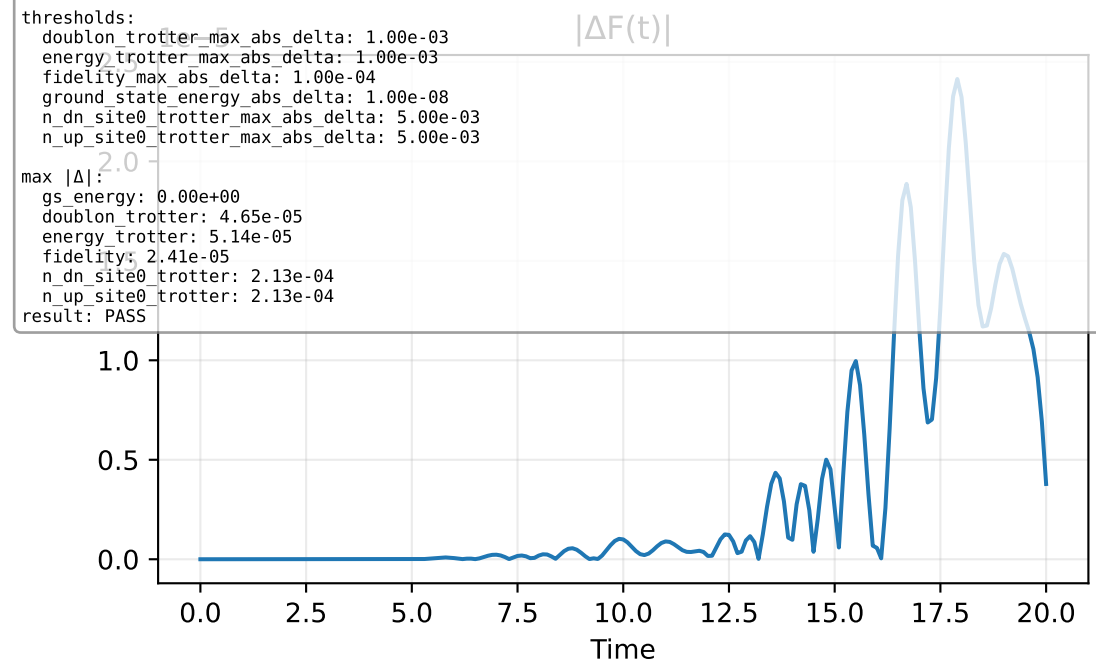


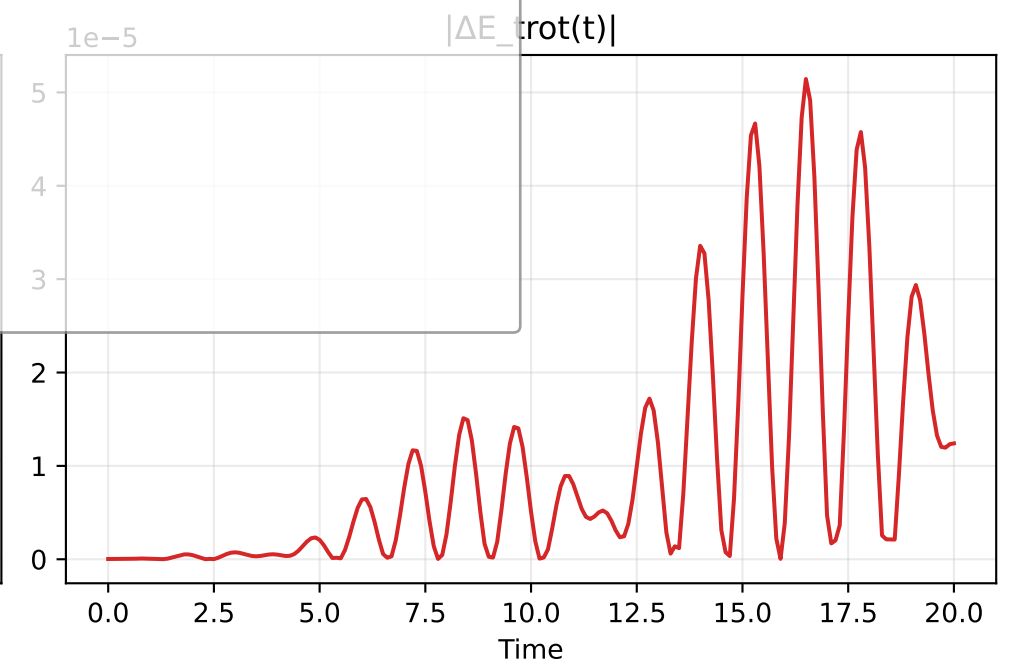


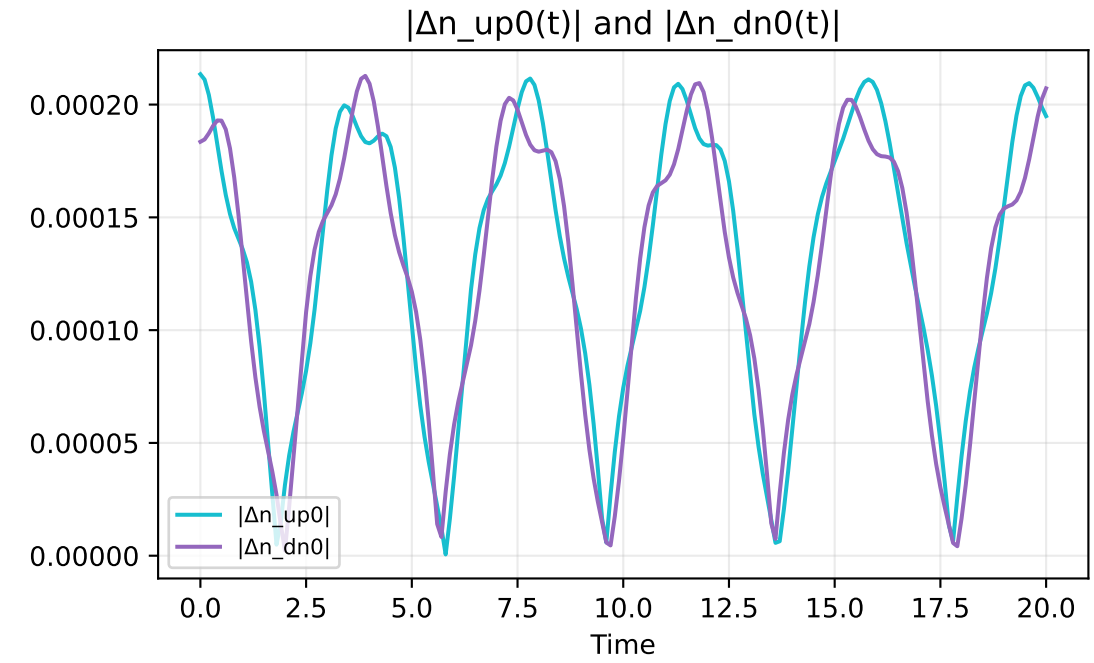
Delta Diagnostics L=2

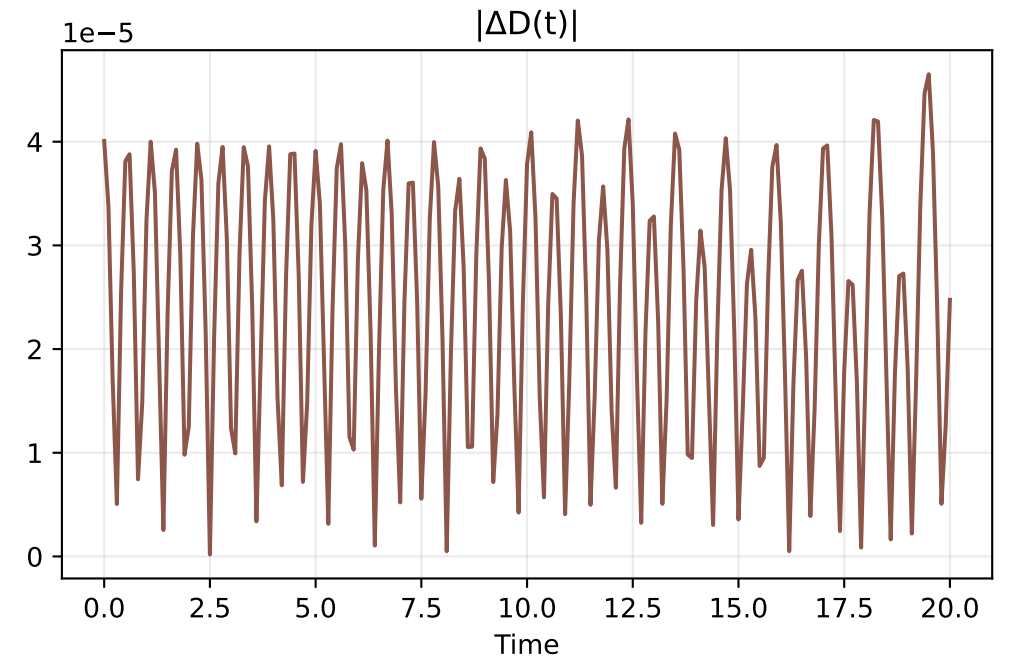
ΔX(t) = |X_hc(t) − X_qk(t)|, where X_pipeline(t) is that pipeline's stored trajectory value.

```
L=2  t=1.0  u=4.0  dv=0.0  boundary=periodic  ordering=blocked  initial_state_source=vqe  t_final=20.0  num_times=201  suzuki_order=2  trotter_steps=64

thresholds:
  doublon_trotter_max_abs_delta: 1.00e-03
  energy_trotter_max_abs_delta: 1.00e-03
  fidelity_max_abs_delta: 1.00e-04
  ground_state_energy_abs_delta: 1.00e-08
  n_dn_site0_trotter_max_abs_delta: 5.00e-03
  n_up_site0_trotter_max_abs_delta: 5.00e-03

max |Δ|:
  gs_energy: 0.00e+00
  doublon_trotter: 4.65e-05
  energy_trotter: 5.14e-05
  fidelity: 2.41e-05
  n_dn_site0_trotter: 2.13e-04
  n_up_site0_trotter: 2.13e-04
result: PASS
```









```
L=2 metrics summary

Delta metric definitions:
ΔF(t)      = |F_hc(t) - F_qk(t)|
ΔE_trot(t) = |E_trot_hc(t) - E_trot_qk(t)|
Δn_up0(t)  = |n_up0_hc(t) - n_up0_qk(t)|
Δn_dn0(t)  = |n_dn0_hc(t) - n_dn0_qk(t)|
ΔD(t)      = |D_hc(t) - D_qk(t)|
F_pipeline(t) is the pipeline's stored trajectory fidelity value (as computed internally vs that pipeline's exact
    evolution).

ground_state_energy_abs_delta = 0.0
fidelity max/mean/final = 2.4137975728866223e-05 / 3.2780993371204888e-06 / 3.783465616358228e-06
energy_trotter max/mean/final = 5.1436108605140696e-05 / 9.344796006301634e-06 / 1.2411196367745347e-05
n_up_site0_trotter max/mean/final = 0.00021346380603026738 / 0.000129601417068683 / 0.00019487823333519394
n_dn_site0_trotter max/mean/final = 0.0002127320858726911 / 0.00012600310926826942 / 0.00020719542794467305
doublon_trotter max/mean/final = 4.6510415792039295e-05 / 2.4404822266394123e-05 / 2.4752750301254567e-05

checks:
{'doublon_trotter_max_abs_delta': True,
 'energy_trotter_max_abs_delta': True,
 'fidelity_max_abs_delta': True,
 'ground_state_energy_abs_delta': True,
 'n_dn_site0_trotter_max_abs_delta': True,
 'n_up_site0_trotter_max_abs_delta': True}

PASS = True
```