Executed Command

Reference: pipelines/PIPELINE_RUN_GUIDE.md
Script: pipelines/compare_hardcoded_vs_qiskit_pipeline.py

```
/opt/anaconda3/bin/python3 Fermi-Hamil-JW-VQE-TROTTER-
    PIPELINE/pipelines/compare_hardcoded_vs_qiskit_pipeline.py --l-values 2 --run-pipelines --enable-drive
    --drive-pattern dimer_bias --drive-omega 2.0 --drive-tbar 2.0 --t-final 2.0 --num-times 21 --trotter-steps
    32 --drive-amplitudes 0.0,0.2 --with-drive-amplitude-comparison-pdf --artifacts-dir
    artifacts/amp_compare_smoke --skip-qpe
```

```
Amplitude Comparison Settings  (L=2)

  A0 (trivial / safe-test amplitude) : 0.0
  A1 (active amplitude)              : 0.2

  Drive knobs forwarded to sub-pipelines:
    drive_pattern        : dimer_bias
    drive_omega          : 2.0
    drive_tbar           : 2.0
    drive_phi            : 0.0
    drive_include_identity : False
    drive_time_sampling  : midpoint
    drive_t0             : 0.0
    exact_steps_multiplier : 1

  Common knobs:
    ordering             : blocked
    t_final              : 2.0
    num_times            : 21
    trotter_steps        : 32
    suzuki_order         : 2
    initial_state_source : vqe

  Safe-test threshold : 1.00e-10

  Three runs per pipeline per L:
    1. drive DISABLED   (baseline)
   2. --drive-A 0.0  (trivial amplitude; safe-test reference)
   3. --drive-A 0.2  (active amplitude)
```
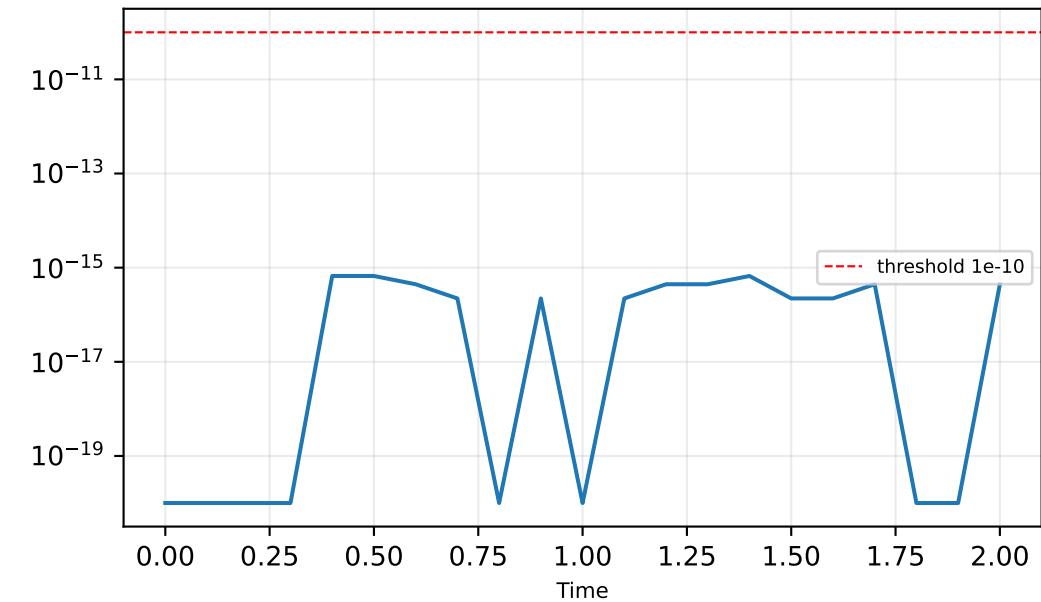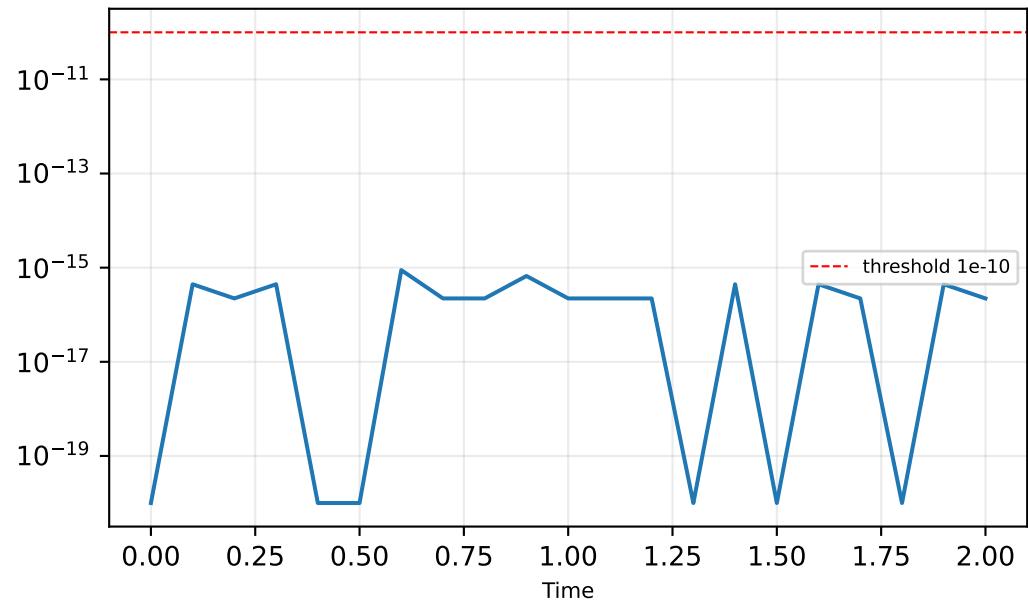
Safe-test L=2: drive-disabled vs drive-enabled A0=0.0 — ✓ PASSED
HC max|ΔF|=6.66e-16 HC max|ΔE|=0.00e+00 QK max|ΔF|=8.88e-16 QK max|ΔE|=4.44e-16
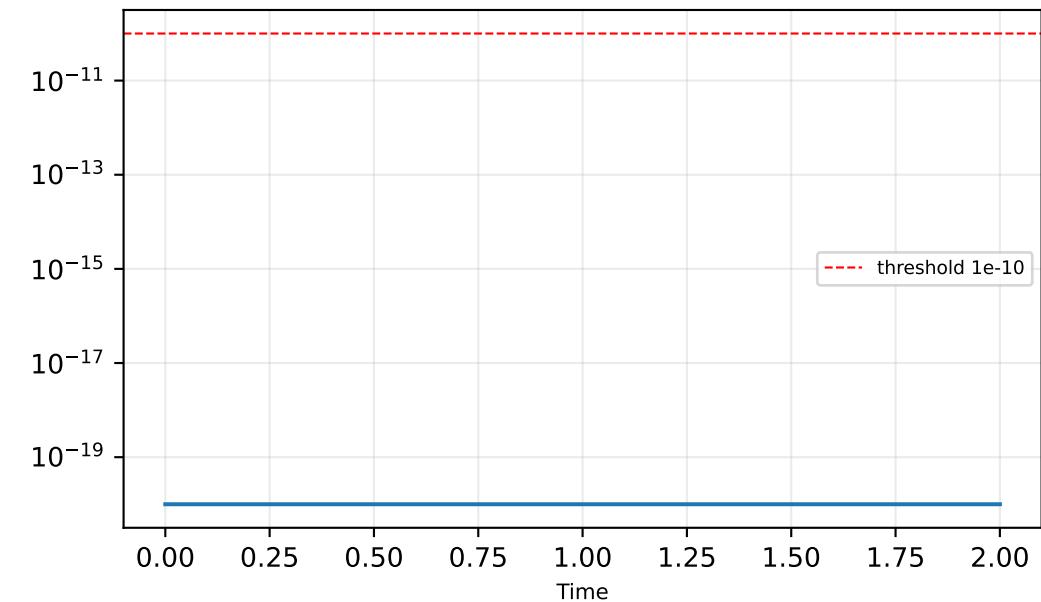
HC |ΔFidelity| (no-drive vs A0=0.0)

threshold 1e-10

QK |ΔFidelity| (no-drive vs A0=0.0)

threshold 1e-10

HC |ΔE_trot| (no-drive vs A0=0.0)

threshold 1e-10
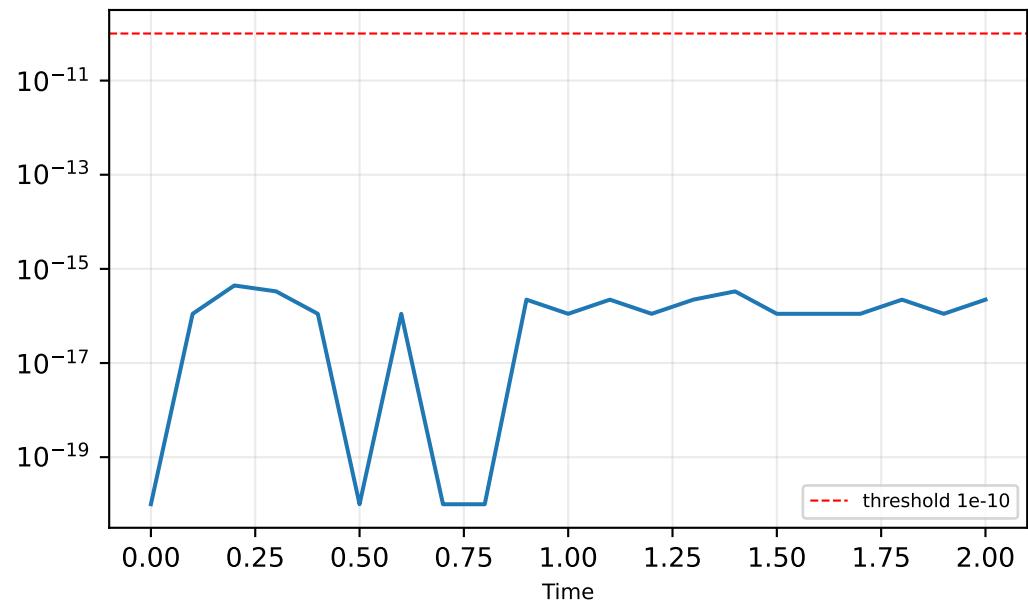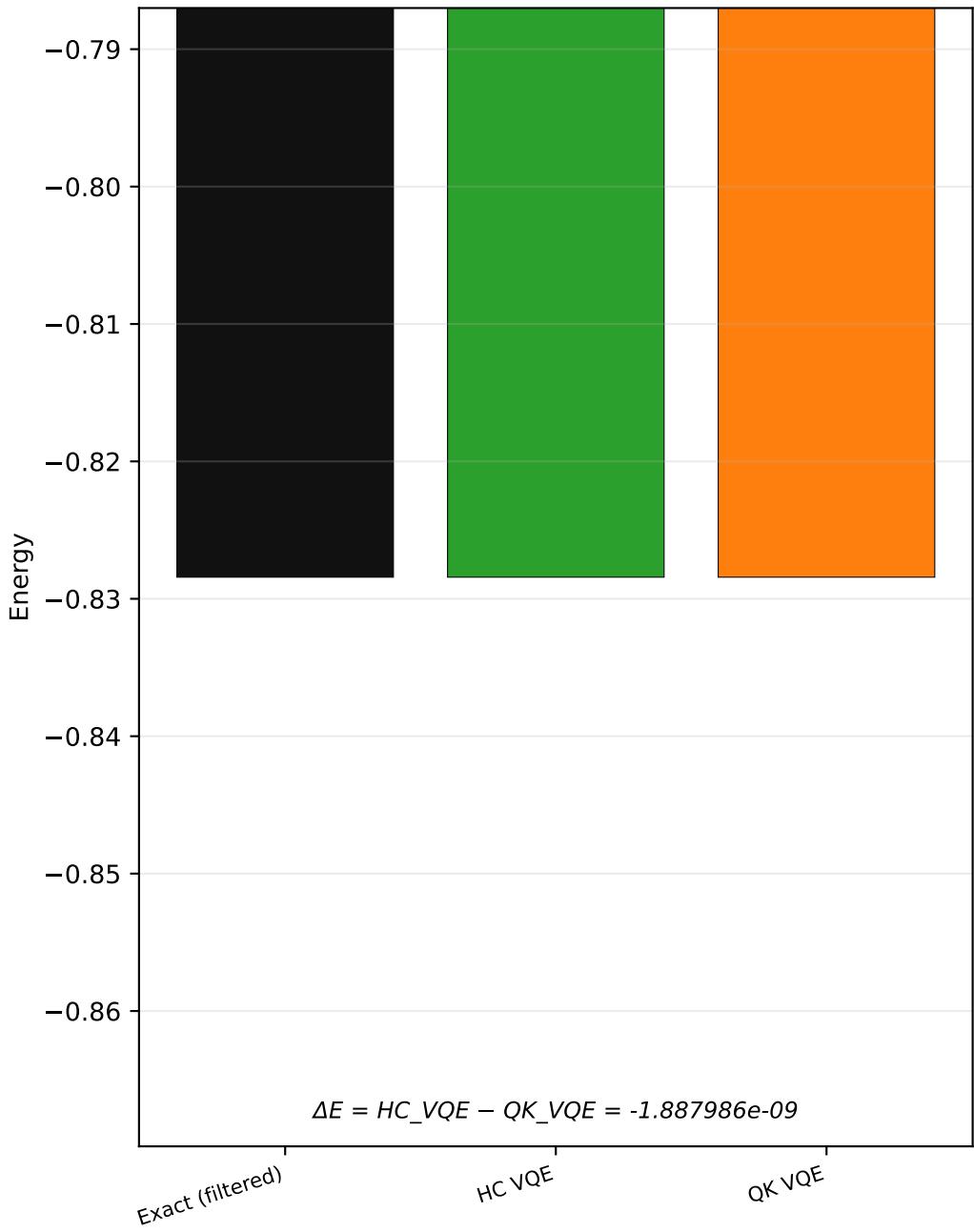
QK |ΔE_trot| (no-drive vs A0=0.0)

threshold 1e-10
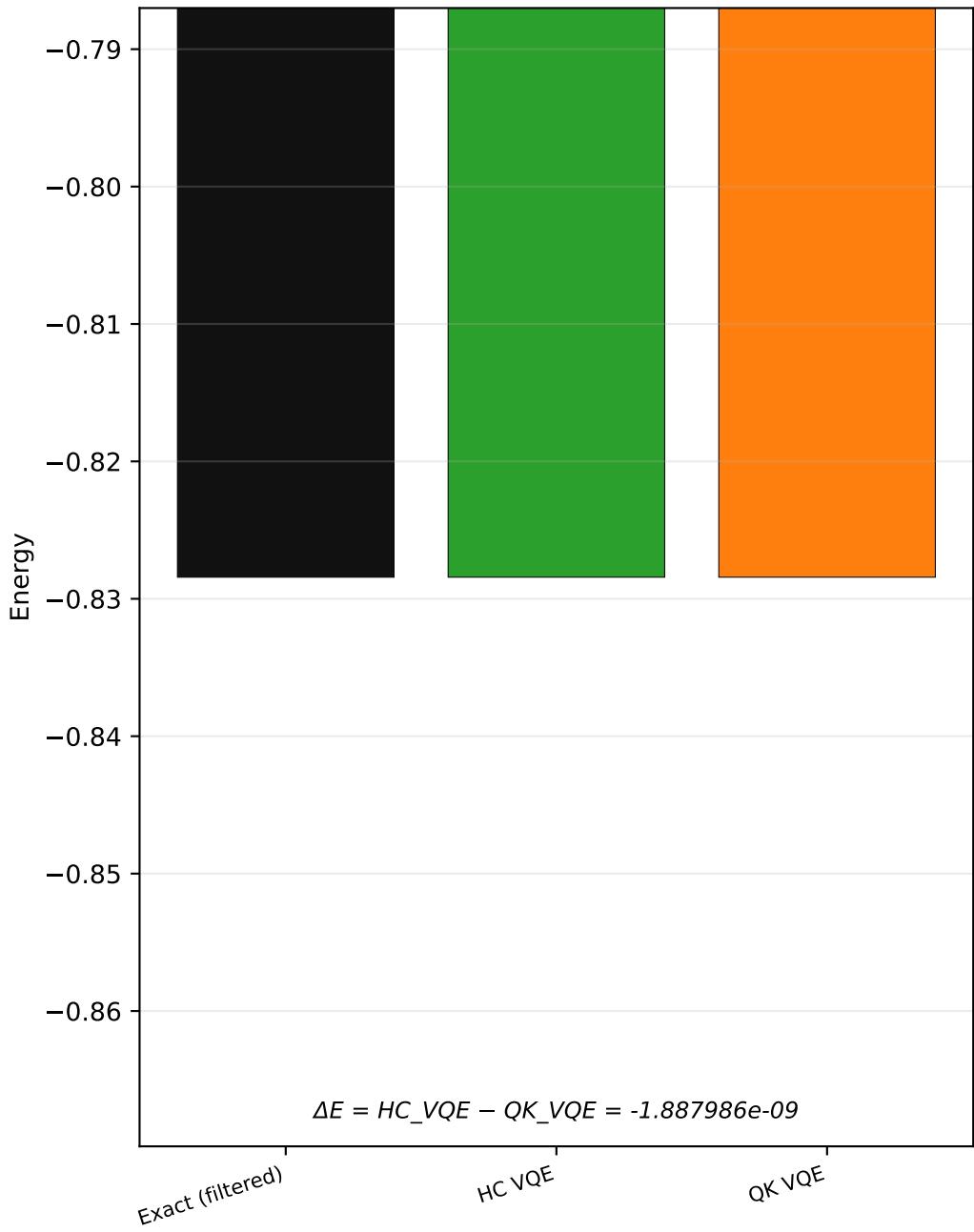
VQE Energy Comparison L=2
ΔE = VQE_hardcoded − VQE_qiskit (shown below each bar chart)

```
Amplitude Comparison Summary  L=2

  A0 = 0.0   (trivial / safe-test amplitude)
  A1 = 0.2   (active amplitude)

Safe-test (no-drive vs drive-enabled A0=0):
  passed          : True
  threshold       : 1.00e-10
  HC max|ΔFid|    : 6.661338e-16
  HC max|ΔE_trot| : 0.000000e+00
  QK max|ΔFid|    : 8.881784e-16
  QK max|ΔE_trot| : 4.440892e-16

VQE energies at A0:
  exact_filtered  : -0.8284271247
  HC VQE energy   : -0.8284271245
  QK VQE energy   : -0.8284271226
  delta_vqe_hc_minus_qk_at_A0 : -1.887986e-09

VQE energies at A1:
  exact_filtered  : -0.8284271247
  HC VQE energy   : -0.8284271245
  QK VQE energy   : -0.8284271226
  delta_vqe_hc_minus_qk_at_A1 : -1.887986e-09
```