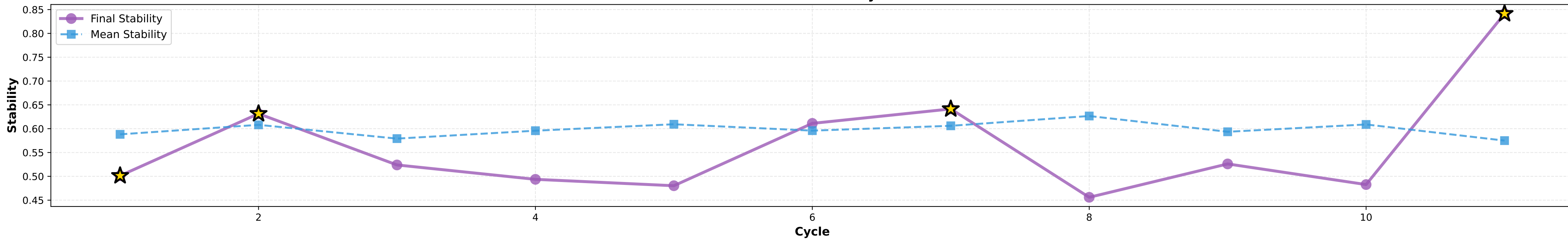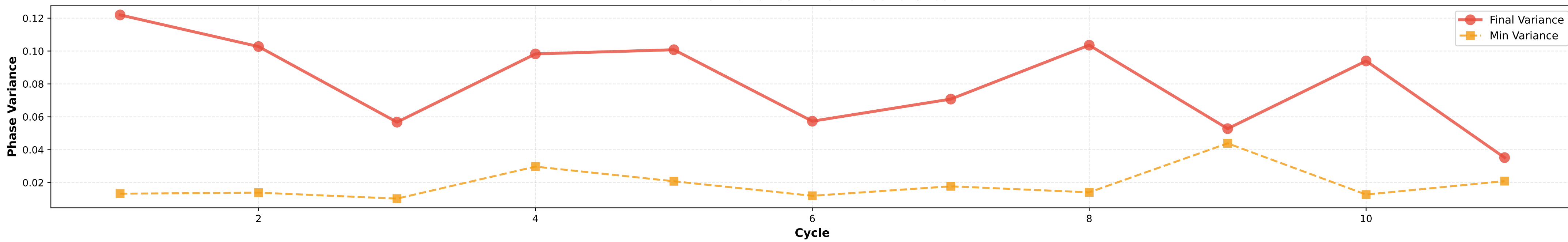# Cycle-by-Cycle Folding Dynamics
ATP-Driven Resonance Tuning in GroEL Cavity
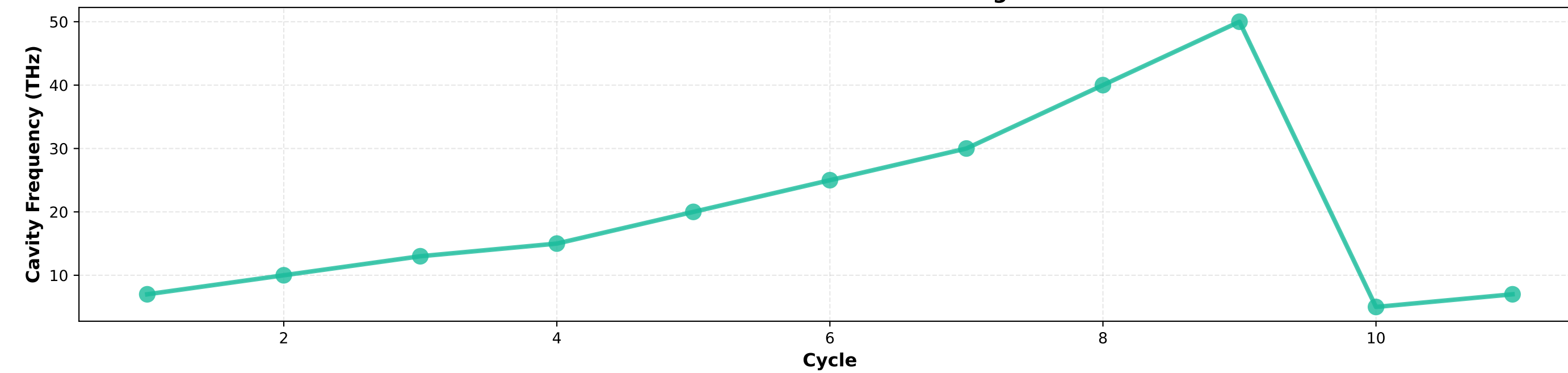
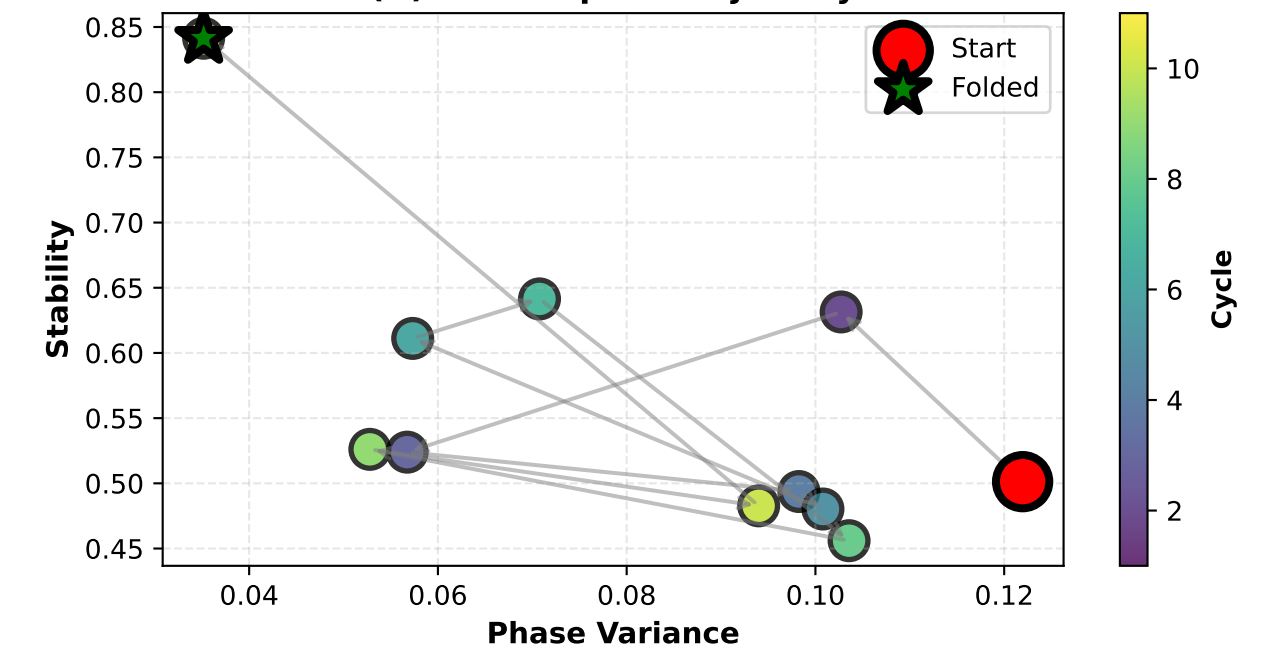**(A) Stability Evolution**
Gold Stars = Best Cycles

(B) Phase Coherence Evolution
Lower Variance = Better Coherence

(C) GroEL Cavity Frequency Modulation
ATP-Driven Resonance Tuning

(D) Phase Space Trajectory

CYCLE-BY-CYCLE STATISTICS:

OVERALL:
Total cycles: 11
Folded at cycle: 11
Final stability: 0.841
Final variance: 0.035

BEST CYCLES:
    Cycle 1: stability=0.501, variance=0.122
    Cycle 2: stability=0.631, variance=0.103
    Cycle 7: stability=0.641, variance=0.071
    Cycle 11: stability=0.841, variance=0.035

FREQUENCY MODULATION:
Min frequency: 5.0 THz
Max frequency: 50.0 THz
Range: 45.0 THz

CONVERGENCE:
Initial stability: 0.501
Final stability: 0.841
Improvement: 67.8%

Initial variance: 0.122
Final variance: 0.035
Reduction: 71.2%

PHASE-LOCK QUALITY:
Cycles to convergence: 11
Convergence rate: 100.0% of max cycles
Success: YES