

AI Integration Statement

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AI Integration in Documentation

The research presented in this manuscript benefited from structured integration of artificial intelligence (AI) tools throughout the simulation, analysis, and writing pipeline. These tools were used to enhance efficiency, precision, and reproducibility across all stages of development.

Simulation Automation

AI-assisted frameworks were deployed to automate parameter sweeps for the generalized quantum evolution model—the Lawrence Equation—across phase deformation (α) and decoherence strength (γ). These tools enabled efficient extraction of collapse time surfaces $\tau(\gamma, \alpha)$ and the identification of dynamic transition regimes. Feedback-driven exploration guided the search for critical thresholds and structure-forming behaviors in complex quantum systems.

Documentation and Communication

Advanced large language models (LLMs) supported drafting, structuring, and polishing of technical text, figure descriptions, and submission metadata. AI assistance helped streamline LaTeX formatting, enforce consistency, and

maintain clarity across all written materials. Metadata and supporting documentation were generated using structured prompt templates with author supervision.

Scientific Integrity

All AI-generated content, including simulation code and narrative text, was created under the direct supervision of the author. Final theoretical claims, interpretations, and conclusions reflect the author's independent reasoning and responsibility. Simulation data and source code are available upon request for verification and reproducibility.