Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Low-dimensional Manifolds for Efficient Representation of Open Quantum Systems NIKOLAS TEZAK[1], Edward L. Ginzton Laboratory, Stanford University, Stanford, USA, NINA AMINI, L2S, CentraleSupelec, France, HIDEO MABUCHI, Edward L. Ginzton Laboratory, Stanford University, Stanford, USA — Weakly nonlinear degrees of freedom in dissipative quantum systems tend to localize near manifolds of quasi-classical states. We present a family of methods for deriving optimal unitary model transformations based on representations of finite dimensionally generated Lie groups. The transformations are optimal in that they minimize the quantum relative entropy distance between a given state and the quasi-classical manifold. This naturally splits the description of quantum states into quasi-classical coordinates that specify the nearest quasi-classical state and a transformed quantum state that can be represented in fewer basis levels. We derive coupled equations of motion for the coordinates and the transformed state and demonstrate how this can be exploited for efficient numerical simulation. Our optimization objective naturally quantifies the non-classicality of states occurring in some given open system dynamics. This allows us to compare the intrinsic complexity of different open quantum systems.

[1]Now at Rigetti Quantum Computing, Berkeley, USA

Nikolas Tezak
Edward L. Ginzton Laboratory, Stanford University, Stanford, USA

Date submitted: 09 Nov 2016 Electronic form version 1.4