



Award #: **1835267**

CSSI Element: A Quantum Electromagnetics Simulation Toolbox (QuEST) for Active Heterogeneous Media by Design

PI: Carlo Piermarocchi, Co-Pi: Shanker Balasubramaniam

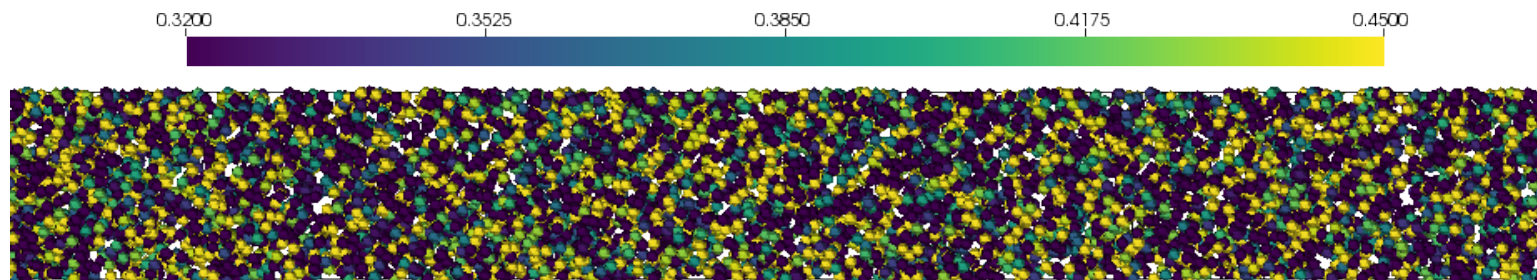
Students: Elliot Lu, Connor Glosser, Thomas Bertus

Institutions: Michigan State University

MICHIGAN STATE
UNIVERSITY

Goals:

- Software elements for nano-photonics
- Simulating light propagation in complex non-linear media



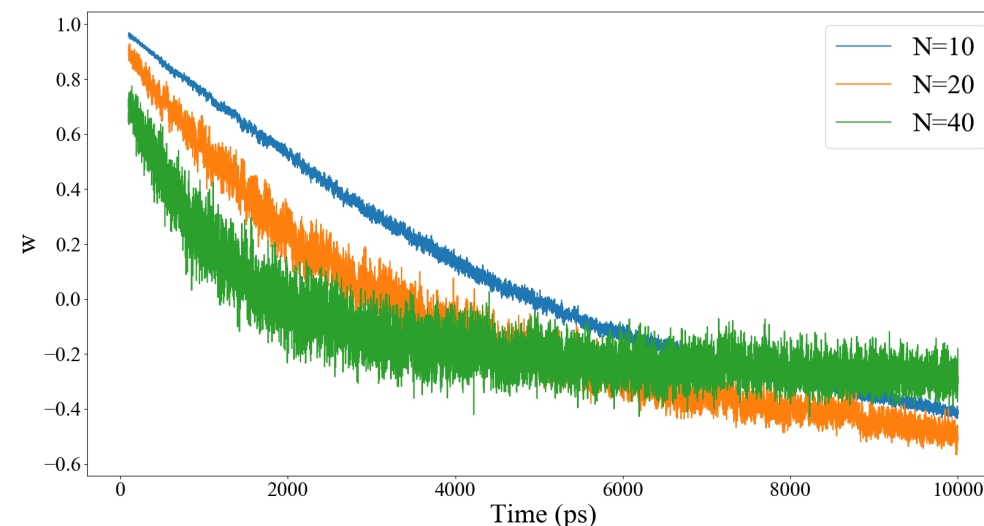
Intellectual Merits:

- Beyond homogeneous media: interacting quantum dots
- Time Domain Accelerated Algorithms: $O(N^2) \rightarrow O(N \ln N)$
- Localization/ Cooperative effects
- Materials Optimization

Broader Impacts:

- Interdisciplinary training in Software Engineering, Physics, and Materials Science
- Impacts beyond optics: ultrasound propagation, nanomagnetism

Maxwell-Bloch equations with 100,000 interacting dots



QuEST software : v0.2.1. (2018). doi:10.5281/zenodo.1246090

NSF CSSI PI Meeting, Seattle, WA, Feb. 13-14, 2020

Super-radiant cooperative effects