Current and Pending Support

Heiko Hergert

Current

Sponsor:	Department of Energy
Award Number:	DE-SC0018083
Project/Proposal Title:	Nuclear Computational Low Energy Initiative (NUCLEI)
Total Award Amount:	$1,821,000
Person-Months:	0.12 academic
Total Award Period Covered:	9/1/17 – 8/31/21
Location of Project:	Michigan State University
Brief Description of Project:	The SciDAC-4 NUCLEI collaboration brings together experts in theoretical nuclear physics, mathematics and computer science to advance the development of nuclear physics simulations. H. Hergert's group receives support for personnel and resources to perform many-body calculations of high interest to the NSCL/FRIB experimental program, the application of renormalization group methods in nuclear physics, and the continuing improvement of the simulation software (e.g., parallelization, implementation of uncertainty quantification etc.).
Overlap with Proposed Research:	None

Sponsor:	National Science Foundation
Award Number:	PHY-1614130
Project/Proposal Title:	A Novel Many-Body Method for the Description of Open-Shell Nuclei From First Principles
Total Award Amount:	$225,000
Person-Months:	1 summer
Total Award Period Covered:	8/15/16 – 7/31/19
Location of Project:	Michigan State University
Brief Description of Project:	This award supports the reformulation of the Multireference In-Medium Similarity Renormalization Group (MR-IMSRG) with the help of the Magnus expansion techniques, and the development of basic Equation-of-Motion (EoM) technology for calculating excited states and states in odd nuclei.
Overlap with Proposed Research:	None

Sponsor:	Department of Energy
Award Number:	DE-SC0017887
Project/Proposal Title:	Advanced Many-Body Methods for Nuclear Structure
Total Award Amount:	$750,000

Person-Months:	Y1: 1 summer, Y2: 1 summer, Y3-5: 2 summer
Total Award Period Covered:	9/1/17 – 8/31/22
Location of Project:	Michigan State University
Brief Description of Project:	This award supports the development of advanced extensions of the Multireference In-Medium Similarity Renormalization Group (MR-IMSRG) framework: (i) The consistent inclusion of continuum coupling effects in the computation of ground and excited states of nuclei at the limits of stability, (ii) the treatment of nuclei with strong collective correlations, e.g., intrinsic deformation, and (iii) the application of principal component decompositions and tensor factorization to control the memory requirements and computational scaling of the method.
Overlap with Proposed Research:	None

<u>Pending</u>

Sponsor:	Department of Energy
Project/Proposal Title:	From Quarks to Stars; A Quantum Computing Approach to the Nuclear Many-Body Problem
Total Award Amount:	$1,000,000
Person-Months:	0.12 academic
Total Award Period Covered:	10/1/19 – 9/30/22
Location of Project:	Michigan State University
Brief Description of Project:	This proposal aims at studying and applying recent developments of algorithms and methods from quantum computing and quantum information theory to studies of complex and strongly interacting nuclear many-particle systems. The proposal aims at developing new methods for studying systems that span from strong force simulations of quarks and gluons to many-body methods applied to the equation of state of dense matter. The proposal aims at developing interdisciplinary research projects that unites researchers in quantum computing and quantum information theory with theorists working on interacting many-particle methods applied to nuclear physics.
Overlap with Proposed Research:	this is the proposed project