DNP20-2020-000921
C

Abstract for an Invited Paper
for the DNP20 Meeting of
the American Physical Society

**Towards quantum computations of atomic nuclei**

GAUTE HAGEN, Oak Ridge National Lab

In this talk I will present an overview of recent advances of quantum computing in nuclear physics. The atomic nucleus presents us with a strongly interacting quantum many-body problem with a computational complexity that increases exponentially with number of protons and neutrons for exact solutions. Solving for the quantum properties of atomic nuclei thus becomes prohibitively costly as its size increase. Approximations that scale polynomial with system size have made significant progress in describing properties of nuclei as heavy as tin, and I will present recent results from coupled-cluster computations. Using quantum devices to perform computations of nuclei is anticipated to provide a quantum advantage over classical computations. Recently, quantum many-body problems in chemistry, condensed matter, and subatomic physics have been addressed with quantum computing using a few to tens of qubits. In nuclear physics quantum simulations have so far been limited to proof of concept computations of properties of small systems, and I will give an overview on some recent activities.