Contribution ID: **55**   Type: **Contributed talk**

Simulation of nuclear physics on near-term quantum computers using basis light-front quantization

Thursday 2 December 2021 11:30 (20 minutes)

The light-front quantization provides a natural framework for digital quantum simulation of quantum field theory. In our previous work (2002.04016, 2105.10941), we demonstrated this by developing quantum algorithms based on simulating time evolution and adiabatic state preparation. Aiming for near-term devices, in my talk I will explain how to formulate the relativistic bound state problem as an instance of the Variational Quantum Eigensolver (VQE) algorithm using the Basis Light-Front Quantization (BLFQ) technique (2011.13443, 2009.07885). Having much in common with ab initio quantum chemistry and nuclear theory, the BLFQ formulation provides an ideal framework for benchmarking NISQ devices and testing existing algorithms on physically relevant problems such as the calculation of hadronic spectra and parton distribution functions.

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Session Classification: Parallel Session