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Imaginary Time Mean-Field and Shell Model on Quantum Computers

We present quantum algorithms for two appoaches to nuclear structure: Firstly, the quantum imaginary time approach to state preparation which we use to produce solutions to nuclear density functional theory in the case of simplified Skyrme interactions: Secondly, a variational quantum eigensolver approach to the nucelar shell model, where we make use of particular physics-inspired ansatz choices to target ground and low-lying excited states in Ni-58. Simulated quantum calculations are presented, along with discussion of possible implementation on real hardware, and future perspectives on large-scale calculations.

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