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Quantum-classical implementation of two-site dynamical mean-field theory using quantum computers[1] TREVOR KEEN, Department of Physics and Astronomy, University of Tennessee, Knoxville, Tennessee 37996, USA, PAVEL LOUGOVSKI, Quantum Information Science Group, Computational Sciences and Engineering Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831, USA, STEVEN JOHNSTON, Department of Physics and Astronomy, University of Tennessee, Knoxville, Tennessee 37996, USA, THOMAS MAIER, Computational Sciences and Engineering Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831, USA — We report on a quantum-classical simulation of a two-site dynamical mean-field theory (DMFT) calculation of a Hubbard model. We employ IBM's superconducting qubit chip to compute the zero-temperature impurity Green's function in the time domain and utilize a classical computer to fit the measured Green's function and determine its frequency dependence. We find that Trotter errors lead to erroneous impurity parameters, which, along with noise from the quantum chip, prevent the DMFT algorithm from converging to the correct solution. To reduce this sensitivity to Trotter errors, we determine the impurity parameters by integrating the quasiparticle peaks in the spectral function. This allows us to iterate the DMFT loop to self-consistency for a strongly Mott insulating system at half-filling.

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