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Efficient excited state preparation for linear response CHENYI GU, University of Tennessee, Knoxville, ALESSANDRO ROGGERO, Institute for Nuclear Theory, University of Washington, Seattle, ALESSANDRO BARONI, Los Alamos National Laboratory, Los Alamos, THOMAS PAPENBROCK, University of Tennessee, Knoxville, JOSEPH CARLSON, Los Alamos National Laboratory, Los Alamos — Quantum computing holds a huge potential in simulating the dynamics of quantum systems. We are interested in the preparation of excited states, which is a necessary step in studying quantum dynamics problems, and we describe two different strategies. The first strategy approximates the Hermitian excitation operator O by $\sin(\gamma O)/\gamma$, valid for small γ, using the time evolution operator and one additional qubit. The second strategy performs the excitation operation in an exact way using the linear combination of unitary (LCU) algorithm. We apply these two strategies to a toy version of the nuclear $n(p,d)\gamma$ reaction.

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