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On applications of quantum computing to plasma simulations[1] I. Y. DODIN, E. A. STARTSEV, PPPL — Quantum computing is gaining increased attention as a potential way to speed up simulations of physical systems, and it is also of interest to apply it to simulations of classical plasmas. However, quantum information science is traditionally aimed at modeling linear Hamiltonian systems of a particular form that is found in quantum mechanics, so extending the existing results to plasma applications remains a challenge. Here, we report a preliminary exploration of the long-term opportunities and likely obstacles in this area (arXiv:2005.14369). First, we show that many plasma-wave problems are naturally representable in a quantumlike form and thus are naturally fit for quantum computers. Second, we consider more general plasma problems that include non-Hermitian dynamics (instabilities, irreversible dissipation) and nonlinearities. We show that by extending the configuration space, such systems can also be represented in a quantumlike form and thus can be simulated with quantum computers too, albeit that requires more computational resources compared to the first case. Third, we outline potential applications of hybrid quantum–classical computers, which include analysis of global eigenmodes and also an alternative approach to nonlinear simulations.

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