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Simulating real-time dynamics of hard probes in nuclear matter on a quantum computer FELIX RINGER, Lawrence Berkeley National Laboratory, JAMES MULLIGAN, UC Berkeley, MATEUSZ PLOSKON, Lawrence Berkeley National Laboratory, XIAOJUN YAO, MIT, WIBE A. DE JONG, MEKENA METCALF, Lawrence Berkeley National Laboratory — We present a framework to simulate the dynamics of hard probes such as heavy quarks or jets in a hot, strongly-coupled quark-gluon plasma (QGP) on a quantum computer [1]. Hard probes in the QGP can be treated as open quantum systems governed in the Markovian limit by the Lindblad equation. However, due to large computational costs, most current phenomenological calculations of hard probes evolving in the QGP use semiclassical approximations of the quantum evolution. Quantum computation can mitigate these costs, and offers the potential for a fully quantum treatment with exponential speedup over classical techniques. We report a simplified demonstration of our framework on IBM Q quantum devices, and apply recently developed error mitigation techniques. Our work demonstrates the feasibility of simulating open quantum systems on current and near-term quantum devices, which is of broad relevance to applications in both hot and cold nuclear matter. [1] https://arxiv.org/abs/2010.03571

Felix Ringer
Lawrence Berkeley National Laboratory

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