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**Efficient Unitary Method for Simulation of Driven Quantum Systems**[1] SPENSER TALKINGTON, HONGWEN JIANG, UCLA — Density matrices evolved according the von Neumann equation are commonly used to simulate the dynamics of driven quantum systems. However, computational methods using density matrices are often too slow to explore the large parameter spaces of solid state quantum systems. We developed a unitary computation method to quickly perform simulations for closed quantum systems, where dissipation to the environment can be ignored. We applied the method to semiconductor quantum dot qubit systems with time-dependent driving, and predicted the dynamic evolutions. As an example, we implement our unitary method for a realistic four-state system [Z. Shi, et al., Nat. Commun. 5, 3020 (2014)], and find that it is two orders of magnitude faster than the corresponding density matrix method implemented in the popular quantum simulation software QuTiP. In addition, we performed a parameter space exploration.

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