

Quantum Physics

Scalable quantum field simulations of conditioned systems

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We demonstrate a technique for performing stochastic simulations of conditional master equations. The method is scalable for many quantum-field problems and therefore allows first-principles simulations of multimode bosonic fields undergoing continuous measurement, such as those controlled by measurement-based feedback. As examples, we demonstrate a 53-fold speed increase for the simulation of the feedback cooling of a single trapped particle, and the feedback cooling of a quantum field with 32 modes, which would be impractical using previous brute force methods.

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