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Decoherence and tunneling of an interacting gas JAMES ANGLIN, LUIS RICO-PEREZ, DANIEL WOHLFARTH, TU Kaiserslautern — In quasi-steady escape of a confined interacting gas by quantum tunneling, collisional decoherence can reduce the escape rate through a many-body version of the Caldeira-Leggett effect. This explains why classical fluids fail to tunnel, even though they are composed of particles small enough to be quantum mechanical. We compute this effect in the Maxwell-Boltzmann regime by deriving a quantum generalization of the Boltzmann equation. We show that decoherence effectively makes tunneling of an interacting gas into an irreversible process: a uniquely quantum mechanical form of throttling. The rate of entropy production in tunneling is related in the semi-classical limit to the imaginary part of the single-particle action.

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