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Characterizing the Dynamics of Quantum Equilibration, Dissipation, and Fluctuation via Nuclear Collisions[1] KYLE GODBEY, Texas AM University, CEDRIC SIMENEL, Australian National University, SAIT UMAR, Vanderbilt University — In an effort to better understand the complex nature of quantum equilibration and dissipation processes in interacting many-body systems, we have performed a systematic analysis of a large number of independent microscopic studies of collisions between atomic nuclei. Universal timescales are uncovered for each of the processes which suggest a limit to the possible interplay between mechanisms. The quickest processes are that of neutron-to-proton equilibration, kinetic energy dissipation, and angular momentum dissipation – all on the order of 10^{-21}s. This is much faster than the characteristic timescale of mass equilibration, which has a general equilibration time of 2×10^{-20}s, indicating that mass equilibration is not a primary driver of dissipation processes. Instead, it is the initial neutron-to-proton equilibration (itself a transfer of particles) that generates much of the dissipation.

[1] C. Simenel, K. Godbey, and A.S. Umar, Phys. Rev. Lett. 124, 212504

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Kyle Godbey
Texas A&M University

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