Nonequilibrium phenomena in superfluid systems: atomic nuclei, liquid helium, ultracold gases, and neutron stars

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Box-trapped fermions out of equilibrium: emergence of sound, driven polarons and Fermi's golden rule

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The realization of homogeneous quantum gases trapped in optical boxes has been a milestone in quantum simulation [1]. These textbook systems are proving to be powerful playground to study out of equilibrium physics in clean settings. I will present some of our recent works on driven uniform Fermi systems: the strong-drive spectroscopy of Fermi polarons [2], the measurement of the Lindhard response [3], and the observation of the emergence and breakdown of Fermi's golden rule in a driven universal Fermi gas. $\overline{\mathbb{Z}}$ [1] N. Navon, R.P. Smith, Z. Hadzibabic, Nature Phys. 17, 1334 (2021)

[2] F.J. Vivanco et al., Nature Phys. 21, 564 (2025)

[3] S. Huang et al., Phys. Rev. X 15, 011074 (2025)

[4] J. Chen et al., arXiv:2502.14867 (2025)

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