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Exact nonequilibrium dynamics of finite-temperature Tonks-Girardeau gases in arbitrary trapping potentials. YASAR ATAS, University of Queensland, DIMITRI GANGARDT, University of Birmingham, ISABELLE BOUCHOULE, Institut d'Optique, KAREN KHERUNTSYAN, University of Queensland — We develop an exact approach for calculating the out-of-equilibrium dynamics of finite-temperature Tonks-Giradeau gases in arbitrary trapping potentials. Using the Fredholm determinant approach and the Bose-Fermi mapping we show how the problem can be reduced to a single-particle basis, wherein the finite-temperature effects enter the solution via an effective "dressing" of the single-particle wavefunctions by the Fermi-Dirac occupation factors. We demonstrate the utility and computational efficiency of the approach in two nontrivial out-of-equilibrium scenarios: collective breathing-mode oscillations in a harmonic trap and collisional dynamics in the Newton's cradle setting involving real-time evolution in a periodic Bragg potential.

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