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Controllable friction of dark solitons in Bose-Fermi mixtures HILARY HURST, Joint Quantum Institute and Condensed Matter Theory Center, University of Maryland, College Park, DMITRY EFIMKIN, The Center for Complex Quantum Systems, The University of Texas at Austin, Austin, Texas, VICTOR GALITSKI, Joint Quantum Institute and Condensed Matter Theory Center, University of Maryland, College Park — We study controllable friction in a system consisting of a dark soliton in a one-dimensional Bose gas and a non-interacting, degenerate Fermi gas. The fermions act as impurity atoms, not part of the original condensate, that scatter off of the soliton. We study semi-classical dynamics of the dark soliton by treating it as a particle with negative mass, and calculate its friction coefficient. Surprisingly, the amount of friction depends on the ratio of interspecies (impurity-condensate) to intraspecies (condensate-condensate) interaction strengths. By tuning this ratio, one can access a regime where the friction coefficient vanishes. We compare our results to experimental regimes and conclude that tunable friction has measurable physical consquences in experiments with Bose-Fermi mixtures.

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