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The dynamics of dark solitons in a trapped superfluid Fermi gas

I study soliton dynamics in a trapped superfluid Fermi gas across the Bose-Einstein condensate to Bardeen-Cooper-Schrieffer (BEC-BCS) crossover by solving the time-dependent Bogoliubov-de Gennes equations. I find that solitons can perform stable oscillations across the crossover, given that their speed does not approach the Landau critical speed for pair-breaking. Furthermore, the oscillation period dramatically increases as the soliton becomes shallower on the BCS side of the resonance. I propose an experimental protocol to test these predictions. Finally, I show that soliton collisions are only elastic in the BEC limit, and may destroy the solitons in the BCS regime.

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