Abstract Submitted
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Moving solitons in a one-dimensional fermionic superuid - an exact solution DMITRY EFIMKIN, University of Maryland, VICTOR GALITSKI, Joint Quantum Institute, University of Maryland — A fully analytical theory of a traveling soliton in a one-dimensional fermionic superuid is developed within the framework of time-dependent self-consistent Bogoliubov-de Gennes equations, which are solved exactly. The soliton manifests itself in a kink-like profile of the superconducting order parameter and hosts a pair of Andreev bound states. They adjust to soliton's motion and play an important role in its stabilization. A phase jump across the soliton and its energy decrease with soliton's velocity and vanish at the critical velocity, corresponding to the Landau criterion, where the soliton starts emitting quasiparticles and becomes unstable. The "inertial" and "gravitational" masses of the soliton are calculated and the former is shown to be orders of magnitude larger than the latter. This results in a slow motion of the soliton in a harmonic trap.

Reference: Dmitry K. Efimkin and Victor Galitski – ArXiv: 1408.6511 (2014).

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