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Shockwaves in a strongly interacting Fermi gas[1]

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We study the hydrodynamics of a strongly interacting, ultracold atomic Fermi gas near the superfluid phase transition. Specifically, we focus on the formation of shockwaves caused by splitting and colliding a cigar-shaped atomic sample. Separation of the sample is accomplished with a digital micro-mirror device (DMD), which can be used to generate arbitrary shaped potentials. The shockwaves, characterized by sharp, nearly discontinuous edges, are well modeled by the Navier-Stokes equation with the presence of shear viscosity. Additionally, we are able to determine from the data the velocity field, which approaches supersonic flow in the limit of large initial cloud separation. We study properties of the shockwave versus temperature in the superfluid and normal fluid phases.

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