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Dynamics of particle density and noise correlators of a cold Fermi system expanding from a harmonic trap PAVEL NAGORNYKH, VICTOR GALITSKI, Joint Quantum Institute and Physics Department, University of Maryland, College Park — We have studied dynamics of an atomic Fermi system with a finite number of particles N after it is released from a harmonic trapping potential. We consider two different initial states: the Fermi sea state and the projected BCS (PBCS) state described by the projection of the grand-canonical BCS wave function onto the subspace with a fixed number of particles. In the former case, we derive exact and simple analytic expressions for the particle density $n(\mathbf{r}, t)$ and density-density correlation functions $\langle n(\mathbf{r}, t)n(\mathbf{r}', t)\rangle$ taking into account the level quantization and possible anisotropy of the trap. In the latter case of the PBCS state, we obtain analytic expressions for the density and its correlators in the leading order with respect to the ratio of the trap frequency and the superconducting gap (the ratio assumed small). We discuss several interesting dynamic features, which may be used to distinguish between the Fermi sea and BCS states.

Pavel Nagornykh
Joint Quantum Institute and Physics Department,
University of Maryland, College Park

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