Oscillations of solitons in a trapped superfluid Fermi gas in the BCS-BEC crossover FRANCO DALFOVO, LEV PITAEVSKII, ROBIN SCOTT, SANDRO STRINGARI, CNR BEC Center and Department of Physics, University of Trento, Italy — We investigate the dynamics of dark/grey solitons in a two-component superfluid Fermi gas in the BCS-BEC crossover. We numerical solve the time-dependent Bogoliubov-de Gennes equations for a gas confined in a quasi-1D trap. A soliton is generated by preparing the gas in two distinct wells and then merging them in a single harmonic trap. By varying the initial relative phase, we control the soliton motion, thereby creating an atom interferometer. For relative phases close to π, solitons are found to oscillate back and forth in the trap. The frequency of the oscillation changes smoothly by varying the strength and sign of the interaction along the crossover. On the BEC side we reproduce the dynamics a bosonic molecular condensate, where the solitons behaves as a particle having twice the mass of a molecule. We compare the numerical results with analytic predictions obtained in the hydrodynamic limit in the local density approximation.

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