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Observation of a ferromagnetic instability in repulsively interacting Fermi gases of ^{6}Li FRANCESCO SCAZZA, INO-CNR and LENS, GIACOMO VALTOLINA, INO-CNR, LENS and Scuola Normale Superiore di Pisa, ANDREA AMICO, LENS and University of Florence, ALESSIA BURCHIANTI, INO-CNR and LENS, CHIARA FORT, LENS and University of Florence, MATTEO ZACCANTI, INO-CNR and LENS, MASSIMO INGUSCIO, LENS, University of Florence and INRIM, GIACOMO ROATI, INO-CNR and LENS — The fine control of interaction strengths and optical trapping potentials in ultracold atomic ensembles provide unique opportunities to explore strongly correlated fermion phenomena, such as superfluidity and magnetism. In our setup, we produce ^{6}Li quantum gases in the vicinity of a broad Feshbach resonance and we subsequently superimpose to the samples a thin optical barrier to engineer either a Josephson weak link or a ferromagnetic domain wall. This technique recently enabled the experimental study of the Josephson dynamics of superfluid Fermi gases flowing through an insulating barrier, spanning a wide range of interaction strengths across the BEC-BCS crossover. On the other hand, by preparing adjacent and fully spin-polarized domains, we are able to experimentally address the upper branch of a repulsively interacting Fermi gas and its magnetic properties. Here, we report on the investigation of the onset and the stability of the ferromagnetic state. Measurements of spin diffusion dynamics in the system reveal a total suppression of spin conductance above a critical interaction strength, accompanied by a softening of the collective spin-dipole mode, indicating the existence of a ferromagnetic instability.

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