Probing ultracold Fermi gases after a quench to strong repulsive interactions

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I will present our recent experimental investigations on ultracold Fermi gases with strong repulsive interactions, employing time-resolved radio-frequency spectroscopy and in-situ imaging of density and spin fluctuations.
In a first study, we focus on strongly spin-imbalanced mixtures, extracting the properties of the so-called repulsive polaron quasiparticle [1]. In the regime of strong interactions, above a critical value of repulsion, the polaron energy is found to exceed the Fermi energy of the surrounding Fermi sea, while the polaron effective mass diverges and even turns negative. Our findings indicate that the repulsive Fermi liquid of polarons becomes energetically and thermodynamically unstable.
In a second recent set of experiments, we focus on balanced spin mixtures. We use rapid radio-frequency transfers to quench repulsive interactions on a time scale much faster than the pairing one. We probe the spectral and spin response of the many-body system, investigating both the growth of spin correlations and the decay processes into a paired state.

[1] F. Scazza *et al.*, *Phys. Rev. Lett.* **118**, 083602 (2017).