Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Repulsive Fermi polarons in the universal mass-balanced broad-resonance case FRANCESCO SCAZZA, GIACOMO VALTOLINA, MATTEO ZACCANTI, GIACOMO ROATI, ANDREA AMICO, ALESSIA BURCHIANTI, CHIARA FORT, MASSIMO INGUSCIO, INO-CNR and LENS, University of Florence, PIETRO MASSIGNAN, ICFO-Institut de Ciencies Photoniques, Barcelona, ALESSIO RECATI, INO-CNR BEC Center and Dipartimento di Fisica, University of Trento — The Fermi polaron represents a fundamental problem in many-body physics. In particular, repulsive Fermi polarons are centrally important for understanding the whole phase diagram of the repulsive Fermi gas and for realizing repulsive many-body states. We employ radio-frequency spectroscopy to investigate spin-mixtures of ultracold Li-6 atoms with tunable polarization in the vicinity of a broad Feshbach resonance. We report on the observation of well-defined coherent quasiparticles up to unitarity-limited interactions. We characterize the many-body system by extracting the key properties of repulsive Fermi polarons: the energy E_+, the effective mass m^*, the residue Z and the decay rate Γ. Above a critical interaction, we find E_+ to exceed the Fermi energy of the bath while m^* diverges and even turns negative, revealing an instability of the repulsive Fermi liquid.

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Date submitted: 24 Jan 2017 Electronic form version 1.4