

Abstract Submitted  
for the DAMOP18 Meeting of  
The American Physical Society

**Observation of strongly interacting Fermi gases and orbital Feshbach molecules of Ytterbium atoms** GIACOMO CAPPELLINI, LORENZO LIVI, LORENZO FRANCHI, Univ Degli Studi di Firenze, MASSIMO INGUSCIO, JACOPO CATANI, CNR-INO, LEONARDO FALLANI, Univ Degli Studi di Firenze — The existence of long-lived electronic states is a remarkable property of two-electron atoms such as Ytterbium. These states can be addressed and manipulated with ultranarrow lasers, allowing for the investigation of new phenomena in which multiple degrees of freedom are involved as well as for the realization of new quantum simulation and information schemes. I will report on the experimental realization of a strongly interacting ultracold Fermi gas of  $^{173}\text{Yb}$  atoms in different electronic states obtained by exploiting a novel kind of Feshbach resonance, the recently proposed Orbital Feshbach resonance, based on the orbital spin-exchange mechanism between atoms in different electronic and nuclear spin states. I will also report on the observation and characterization of orbital molecules formed by two Yb atoms in different electronic states on the repulsive side of the resonance, a first step towards the investigation of the BEC-BCS crossover in fermionic systems with multiple degrees of freedom.

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Date submitted: 26 Jan 2018

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