**LENS-QSTAR Seminar**
**March 14, 2014 at 10:00**
**Dipartimento di Fisica e Astronomia, sede di Arcetri (L.go E. Fermi 2, Firenze)**
**Aula A**

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## New Quantum Simulation with Multi-component Fermi Gases

In this talk I will report on the latest results in the Ytterbium lab at LENS where we achieved quantum degeneracy of fermionic 173Yb. This Ytterbium isotope is an alkaline-earth-like two electrons atom with N = 6 nuclear spin components (I = 5=2) interacting within the SU(N) symmetry class. The specific features of this atomic element provide a powerful test bench for large-spin models ranging from quantum simulation of spinful one-dimensional (1D) systems to the realization of spin-orbit coupling in multicomponent ultracold fermions. In the first part of the talk, I will report on the realization of 1D, strongly-correlated liquids of ultracold fermions interacting repulsively [1] with a tunable number N of spin components. We observe that static and dynamic properties of the system deviate from those of ideal fermions and, for N > 2, from those of a spin-1=2 Luttinger liquid. In the large-N limit, the system exhibits properties of a bosonic spinless liquid.
In the second part of the talk, I will briefly report on the work in progress regarding the physics of a spin-orbit coupled multicomponent Fermi gas. By engineering opportunely Raman couplings between the nuclear spin components of 173Yb we are able to create spin-orbit coupling with three or six spin components. I will show preliminary results on spin dynamics and the perspectives about this physical system.

References

[1] G. Pagano, M. Mancini, G. Cappellini, P. Lombardi, F. Sch□afer, H. Hu, X.J. Liu, J. Catani, C. Sias, M. Inguscio, L. Fallani, A one-dimensional liquid of fermions with tunable spin, Nature Physics 10, 198-201 (2014).

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