

Abstract for an Invited Paper  
for the DAMOP09 Meeting of  
The American Physical Society

### Ultracold Heteronuclear Fermi-Fermi Molecules

KAI DIECKMANN, Ludwig-Maximilians-University of Munich and Max-Planck-Institute for Quantum Optics, Garching, Germany

Spin mixtures of quantum-degenerate fermionic gases exhibit long lifetimes in the strongly-interacting regime near a Feshbach resonance. This has opened the door for numerous key experiments like the creation of Fermi-Fermi molecules, the realization of molecular BEC, the observation of a pairing gap and of superfluidity in a fermionic gas in the BEC-BCS cross-over region near a Feshbach resonance. We present the production of  ${}^6\text{Li}-{}^{40}\text{K}$  heteronuclear molecules based on our experimental platform for the production of a two-species mixture of quantum-degenerate Fermi gases [1]. We studied two s-wave Feshbach resonances between lithium and potassium at 155 G and 168 G. By magnetic field sweeps we created about  $4 \times 10^4$   ${}^6\text{Li}-{}^{40}\text{K}$  molecules at conversion efficiencies of up to 50 % [2]. With a Stern-Gerlach purification technique we are able to image molecules and atoms spatially separated from each other. We show an increased molecule lifetime close to resonance of more than 100 ms in the molecule-atom mixture.

[1] M. Taglieber *et al.*, Phys. Rev. Lett. **100**, 010401 (2008).

[2] A.-C. Voigt *et al.*, Phys. Rev. Lett. **102**, 020405 (2009).