

Physikalisches Kolloquium



Thursday, 23.10.14, 17:00, HS 100
 Reception with coffee & cookies 16:45

Prof. Svetlana Malinovskaya, Stevens Institute of Technology, Hoboken, NJ, USA
 zurzeit Gastprofessorin am Institut für Physik, Universität Kassel

Ultracold quantum control: From molecular cooling to the excitation of two-atomic Rydberg states

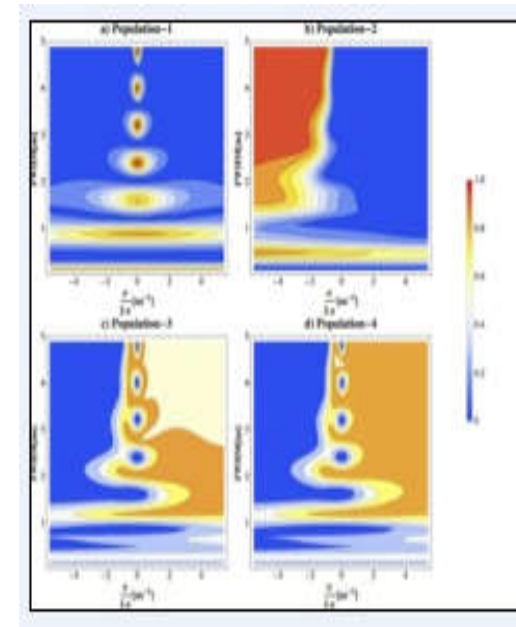
Abstract

At temperatures about a millionth of a degree above absolute zero, matter enters a new regime where all its motions are fully quantum-mechanical. Investigating the properties of atoms and molecules under these conditions provides insight into quantum world, not that readily accessible at room temperatures. Quantum control methods were proven to be particularly useful in studies of light-matter interactions in ultracold regime. In this talk, I will discuss novel techniques implementing ultrafast optical frequency combs and tailored pulses to manipulate ultracold gases. I will address a femtosecond Raman type method to control molecular vibrations with the use of optical frequency combs in the presence of decoherence. The method enables us to create deeply bound ultracold polar molecules from the Feshbach state [1]. We will uncover the advantages of the adiabatic passage in deterministic excitation of a single ultracold Rb atom [2] and a two-atomic Rydberg state in the Rydberg blockade regime. Also, two-photon adiabatic passage to create non-equilibrium states in ultracold Rb atoms using a single, linearly chirped laser pulse will be presented [3].

[1] S.A. Malinovskaya, S.L. Horton, J. Opt. Soc. Am. B **30**, 482 (2013); W. Shi, S. Malinovskaya, Phys. Rev. A **82**, 013407 (2010).

[2] E. Kusnetzova, G. Liu, S.A. Malinovskaya, Phys. Scr. **160**, 014024 (2014).

[3] T. A. Collins, S. A. Malinovskaya, Opt. Lett. **37**, 2298 (2012); G. Liu, V. Zakharov, T. Collins, P. Gould, S.A. Malinovskaya, Phys. Rev. A. **89**, 041803(R) (2014).



All of you interested in physics are cordially invited!