A 34: Poster VII

Time: Thursday 17:00–19:00 Location: Tent B

A 34.1 Thu 17:00 Tent B

Narrow-Linewidth Laser System for Optical Trapped Barium Ion Coulomb Crystals — •Wei Wu, Daniel Hoenig, Andreas Weber, and Tobias Schaetz — University of Freiburg, Institut of Physics, Hermann-Herder-Strasse 3, Freiburg 79104, Germany

We designed and implemented a 1762 nm laser system, specifically for driving the electric quadrupole transition from S1/2 to D5/2 states in Ba138 ions. The laser is locked to an 100 mm ULE cavity using PDH circuits and its wavelength is determined using a Michelson interfereometer. The laser system permits to discern the motional energy levels of ions within a optical dipole trap or Paul trap, which subsequently facilitates the implementation of Raman side-band cooling, enabling us to exert precise control over the ion temperature. Such presicion will significantly help us enhancing the understanding of the dynamics of the barium ion influenced by its colissions with ultracold lithium or rubidium atoms. Moreover it can be used to populate ions in a superposition of elecronic states, allowing for in-depth investigation of electronic state dependence of optical potential towards conditional stimulated phase transitions and their related superpositions.

A 34.2 Thu 17:00 Tent B

Towards fermionic weakly-bound open-shell RbSr molecules — •Noah Wach[1,2], Digvijay Digvijay[1], Premjith Thekkeppatt[1], Klaasjan van Druten[1], and Florian Schreck[1] — [1]Van der Waals-Zeeman Institute, Institute of Physics, University of Amsterdam, The Netherlands — [2]Physikalisches Institut der Universität Heidelberg, Im Neuenheimer Feld 226, 69120 Heidelberg, Germany

Our goal is to produce ultracold RbSr polar, open-shell molecules, to extend the range of possibilities offered by ultracold molecular physics. Unlike in alkali atoms, Feshbach resonances in alkali-alkaline earth atoms are extremely narrow due to the non-magnetic ground state of alkaline earth atoms. The creation of weakly bound molecules of alkali-alkaline earth atoms is strongly hindered by the very weak coupling of the Feshbach resonances. Here we present our novel approach, utilizing confinement-induced resonances (CIR) in a strongly interacting Bose-Fermi mixture to create weakly bound RbSr molecules. We plan to take advantage of CIR, which strongly couples an excited trapped state of a very weakly bound molecule to the atomic pair state in a strongly interacting Rb-Sr mixture. We also observe the protection against 3-body collisional losses in a strongly interacting Bose-Fermi mixture in the quasi-2D regime.

A 34.3 Thu 17:00 Tent B

multiply charged ions from highly-charged helium droplets — •shaimaa Habib — 1Universität Innsbruck, Institut für Ionenphysik und Angewandte Physik, Technikerstr. 25, A-6020 Innsbruck, Austria

Helium droplets have been demonstrated to pick up dopants from the gas phase, and evaporative cooling enables experiments at temperatures below 1 K [1]. Massive doping of neutral droplets leads to the formation of nanoparticles and quantum wires which were studied after deposition with high resolution microscopy [2] and in situ via coherent X-ray diffraction [3]. Recently, we discovered that large helium droplets can become highly-charged [4]. The charge centers self-organize as two-dimensional Wigner crystals at the surface of the droplets and act as seeds for the growth of dopant clusters [5]. Cluster ions and charged nanoparticles of a specific size and composition can be formed by this technique with unprecedented efficiency. Dopant cluster ions can be extracted by collision induced evaporation of the host droplet [6,7] or by splashing of the droplet upon surface impact [8]. Both methods are suitable to form high yields of He tagged ions of both polarities which enables messenger type spectroscopy of all kinds of cold ions. The location of charge centers in multiply charged He droplets close to the surface makes them accessible for subsequent interactions with metastable He atoms which leads to Penning ionization and the formation of cold multiply-charged dopant ions. For many dopant clusters, we obtain critical sizes of di- and trications that are well below the values obtained by conventional techniques.

A 34.4 Thu 17:00 Tent B

multiply charged ions from highly-charged helium droplets — •shaimaa Habib[1,2], S Bergmeister[1], L Ganner[1], F Foitzik[1], I Stromberg[1], F Zappa[1], O Echt[1], P Scheier[1], and E Gruber[1] — [1]1Universität Innsbruck, Institut für Ionenphysik und Angewandte Physik, Technikerstr. 25, A-6020 Innsbruck, Austria — [2]Faculty of Science, Damnhour University, Egypt

Helium droplets have been demonstrated to pick up dopants from the gas phase, and evaporative cooling enables experiments at temperatures below 1 K [1]. Massive doping of neutral droplets leads to the formation of nanoparticles and quantum wires which were studied after deposition with high resolution microscopy [2] and in situ via coherent X-ray diffraction [3]. Recently, we discovered that large helium droplets can become highly-charged [4]. The charge centers self-organize as two-dimensional Wigner crystals at the surface of the droplets and act as seeds for the growth of dopant clusters [5]. Cluster ions and charged nanoparticles of a specific size and composition can be formed by this technique with unprecedented efficiency. Dopant cluster ions can be extracted by collision induced evaporation of the host droplet [6,7] or by splashing of the droplet upon surface impact [8]. Both methods are suitable to form high yields of He tagged ions of both polarities which enables messenger type spectroscopy of all kinds of cold ions.