A 6: Scattering Processes

Zeit: Montag 16:30–18:00 Raum: VMP 6 HS-E

Hauptvortrag A 6.1 Mo 16:30 VMP 6 HS-E

Atomic parity violation in one single radium ion — •Rob Timmermans — KVI, University of Groningen

The photon-Z0 mixing angle is a fundamental parameter of the unified electroweak theory. Its renormalization group "running" from high to low energy is a poorly tested prediction of the Standard Model. A high-precision measurement of the electroweak mixing angle at low momentum scales is possible by monitoring quantum jumps in one single trapped radium ion with precision laser techniques, and observing the coherent weak charge of the quarks via the effects of parity-forbidden transitions. We discuss the particle-physics and atomic theory, and the feasibility of a definitive parity-violation experiment at the TRImP facility at KVI.

Hauptvortrag A 6.2 Mo 17:00 VMP 6 HS-E

Ultracold few-boson systems — •Sascha Zoellner[1], Hans-Dieter Meyer[1], and Peter Schmelcher[1,2] — [1]Theoretische Chemie, Universität Heidelberg, Im Neuenheimer Feld 229, 69120 Heidelberg — [2]Physikalisches Institut, Universität Heidelberg, Philosophenweg 12, 69120 Heidelberg

Ultracold atoms have openened up the way toward the study of seemingly exotic quantum systems, such as the one-dimensional (1D) Bose gas. This system has the intriguing feature that the bosons behave much like an ideal Fermi gas in the limit of hard-core repulsion (fermionization). This talk deals with the mechanism of the interaction crossover from an ideal Bose gas to the fermionization limit from a few-body perspective.

In the first part, the basic mechanism of this crossover is discussed for the ground state, with a special emphasis on the interplay between two-body interactions and the trapping potential. An extension to the case of attractive bosons and binary mixtures will be discussed.

The second part is devoted to the impact of this crossover on the quantum dynamics, specifically the tunneling dynamics in a double-well trap. The dynamics changes over from Rabi oscillations to multiband tunneling for increasing repulsion. The tunneling can be controlled by making the wells asymmetric. An outlook to the dynamics in larger multi-well traps is given.

A 6.3 Mo 17:30 VMP 6 HS-E

High resolution spectroscopy of Rydberg resonances in 2s2-2s2p dielectronic recombination of berylliumlike Ge — •Dmitry A. Orlov[1], Claude Krantz[1], Eva Lindroth[2], Fabrizio Ferro[2], Anton N. Artemyev[3], Dietrich Bernhardt[4], Carsten Brandau[5], Jens Hoffmann[1], Alfred Müller[4], Ticia Ricsóka[4], Stefan Schippers[4], Andrey Shornikov[1], and Andreas Wolf[1] — [1]Max-Planck-Institut für Kernphysik, D-69117 Heidelberg, Germany — [2]Stockholm University, AlbaNova University Center, SE-106 91 Stockholm, Sweden — [3]Institute of Physics, Heidelberg University, D-69120 Heidelberg, Germany — [4]Institut für Atom- und Molekülphysik, Universität Giessen, D-35392 Giessen, Germany — [5]Gesellschaft für Schwerionenforschung, D-64291 Darmstadt, Germany

Low-energy dielectronic recombination resonances of beryllium-like Ge^{28+} are studied by electron collision spectroscopy in the TSR ion storage ring using its ultracold photoelectron target [1]. The rich resonance structure below 1.7 eV is observed with resolved peaks appearing also below 100 meV [2], which is mainly due to $(2s2p\ ^1P_1)9l$ and $(2s2p\ ^3P_0)14l$ dielectronic resonances. The calculation of Rydberg binding energies for the two-valence-electron core is challenged by these results (work in progress). Since radiative corrections are negligible in these high Rydberg orbits, the QED contributions are those of the $^1S_0{-}^1P_1$ and $^1S_0{-}^3P_0$ core transitions, which are thus probed by the experiment.

[1] D.A. Orlov, et. al., J.Phys.: Conf. Series 4, 290 (2005)
[2] D.A. Orlov, et. al., J.Phys.: Conf. Series (2008), to be published

A 6.4 Mo 17:45 VMP 6 HS-E

Coherent electron emission from H2 and Young type interference in swift ion and electron collisions — D. Misra, S. Chatterjee, and •Lokesh C. Tribedi — Tata Institute of Fundamental Research, Colaba, Mumbai 400005, India

The coherent electron emission from the inversion-symmetric homonuclear diatomic molecule H_2, carry the signature of the Young type electron interference [1,2]. In a new approach we have shown that instead of taking H_2-to-2H DDCS ratios one can use the forward backward asymmetry in electron emission to obtain the oscillation due to interference. Bare fast C and F available from Pelletron accelerator at TIFR and 8 keV electron beam was used for these experiments. The frequency in 160° was found to be a factor of two higher w.r.t. 20°. The difference in the oscillation frequency for the forward and backward angles causes the oscillation in the asymmetry parameter. A model calculation based on Cohen-Fano model joined together with the frequency difference in forward-backward angles, fits the spectrum well. Since this study does not need any atomic target, can be applied for other diatomic molecular targets: a step forward towards the study of Young type interference in ionizations of molecule. Besides first order interference our data provides a strong support for the evidence of a double frequency component in interference oscillations as predicted earlier by Stolterfoht [2].

[1] H. D. Cohen and U. Fano, Phys. Rev. **150**, 30 (1966).
[2] N. Stolterfoht *et al.*, Phys. Rev. Lett. **87**, 023201 (2001).
[3] D. Misra, Phys. Rev. Lett. **92**, 153201 (2004).
[4] D. Misra, Phys. Rev. A-Rapd comm. **74**, 060701(R) (2006).