PHYSIKALISCHES KOLLOQUIUM

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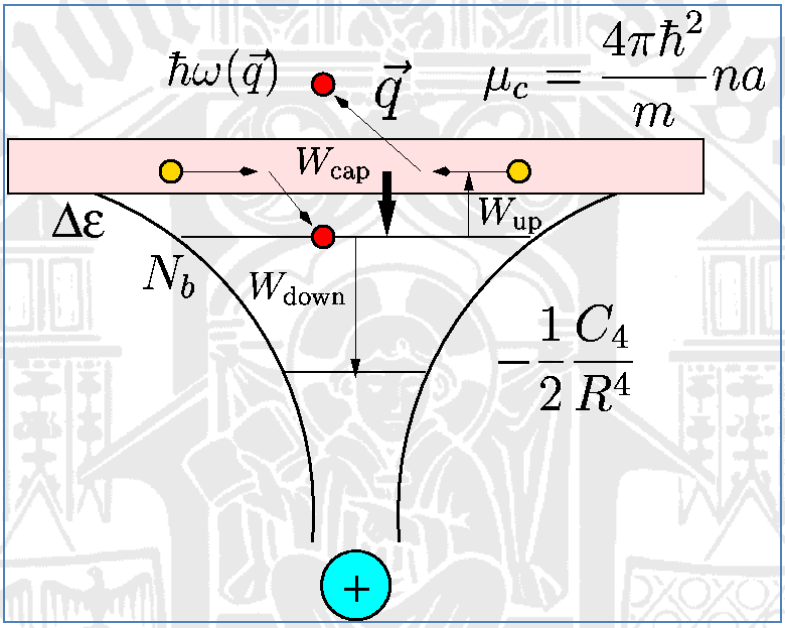
IM GROßEN HÖRSAAL



ULTRACOLD REACTIONS INVOLVING IONS AND ATOMS

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In recent years, there has been an increasing interest in systems that include neutral and ionic species, such as atoms and ions. Several ultracold atomic systems are being investigated in which electric charges play an important role, such as ultracold plasmas or ultracold Rydberg gases. In our early studies of atom-ion collisions, we showed that large elastic cross sections could occur and ions could be sympathetically cooled by neutral atoms, while resonant charge transfer could dominate charge transport at extremely low temperatures. We also explored the interactions between different partners, and between identical alkaline-earth elements. In this presentation, we study charge transfer in collisions of cold Be^+ and Be in an external magnetic field. The atom-ion interaction is modeled by high-level *ab-initio* potential energy curves, including the dipole-dipole terms, as well as Zeeman and hyperfine couplings. The scattering calculations are performed for a range of experimentally accessible magnetic fields and different initial hyperfine states using fully-quantum coupled channel formalism. We report detailed inelastic and charge-exchange cross sections for different isotopes of Be. In addition, we predict a number of magnetic Feshbach resonances and discuss their applications on controlled charge transfer in ultracold samples, where we predicted hopping conductivity and the formation of large metastable mesoscopic molecular ions.