Physikalisches Institut
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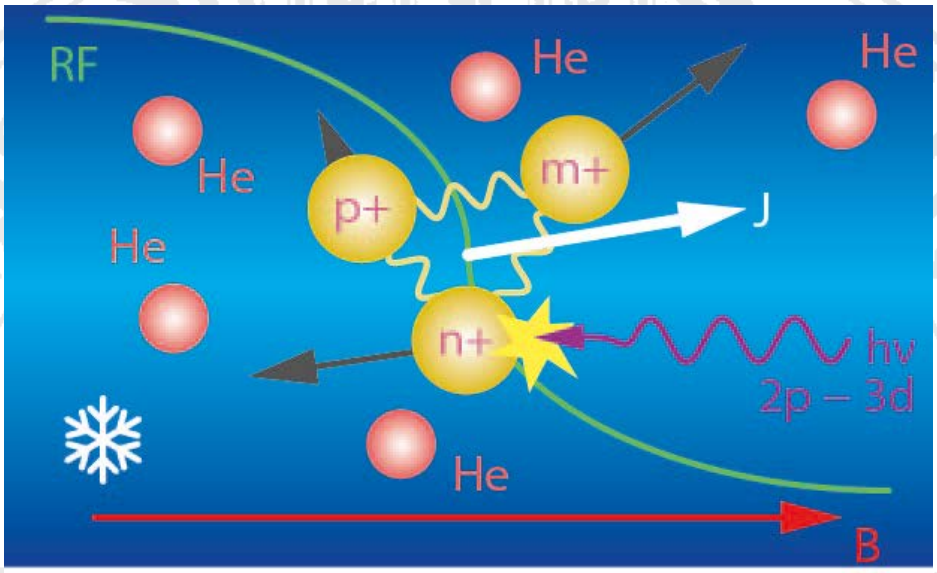
PHYSIKALISCHES KOLLOQUIUM

AM 12. OKTOBER 2015 UM 16:15 UHR

IM GROßEN HÖRSAAL



Ion Traps for X-ray Spectroscopy: A Tool to Study Magnetic Properties and Interactions

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The combination of cryogenic radio frequency ion traps with synchrotron radiation [1] and magnetic fields [2] has created new opportunities to investigate magnetism at the level of individual atoms in molecules, clusters, and complexes. This technique can be applied across the whole size-range. Examples include the determination of electronic ground states of "simple" 3d-transition-metal diatomic molecular ions, which still present a remarkable challenge even for state-of-the art theoretical approaches [3]. In the regime of size-selected free clusters, the quenching of the orbital magnetic moment along the way from atom to bulk can be followed experimentally atom by atom for the first time, and a surprising spin coupling in clusters of the archetypal ferromagnet [2] can be linked to the phase diagram. A close relation of magnetic and structural properties can also be found in transition-element doped semiconductor and coinage metal clusters [4], with implications for dilute magnetic semiconductors and the Anderson impurity model. This talk will aim at an introduction into x-ray magnetic circular dichroism spectroscopy (XMCD) of trapped ions, and present an overview of recent results.

[1] J. T. Lau *et al.*, *Phys. Rev. Lett.* **101**, 153401 (2008)
[2] M. Niemeyer *et al.*, *Phys. Rev. Lett.* **108**, 057201 (2012); A. Langenberg *et al.*, *Phys. Rev. B* **90** 184420 (2014)
[3] V. Zamudio-Bayer *et al.*, *Angew. Chem. Int. Ed.* **54**, 4498 (2015)
[4] K. Hirsch *et al.*, *Phys. Rev. Lett.* **114**, 087202 (2015); V. Zamudio-Bayer *et al.*, *Phys. Rev. B* **88**, 115425 (2013)