

## **Alignment and polarization phenomena in energetic atomic collisions and techniques for their investigation**

Dr. Stanislav Tashenov

*Physikalisches Institut, Universität Heidelberg*

Collisions of energetic electrons with highly charged ions (HCI) and heavy atoms provide unique opportunities to investigate fundamental atomic processes in the extreme regime of strong Coulomb fields and hard x rays. The fields of HCIs approach the Schwinger limit of  $1e16$  V/cm where the atomic interactions are affected by a host of previously unexplored relativistic and spin phenomena. Development of novel techniques of hard x-ray polarimetry opened broad possibilities to explore these phenomena in processes such as photoelectric effect, radiative and dielectronic recombination and bremsstrahlung. These phenomena may also find applications for diagnostics of fusion plasmas and extreme astrophysical environments. I will review the instrumental developments and experiments performed in my research group and outline the prospects for the future investigations.