

The few-body problem in simple atomic systems

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In controlled fusion research reliable transition rates for various processes occurring in ion-atom collisions, like ionization and capture, are needed. To obtain such data is tedious and costly and the results are often afflicted with large experimental uncertainties. Furthermore, it is not always straight forward to account for e.g. the thermal energy distribution of the ions, plasma density effects etc. in a collision experiment. Therefore, the development of accurate theoretical models is essential. The major challenge such efforts are facing is presented by the few-body problem (FBP). The essence of the FBP is that the Schrödinger equation is not analytically solvable for more than two mutually interacting particles even if the underlying forces are precisely known. Thus, theory has to rely on heavy numeric modelling. The assumptions entering in these models have to be tested by detailed experimental data. In this talk, kinematically complete experiments on ionization and capture processes, which offer the most sensitive tests of theory, will be discussed.