

## **Structure and dynamics of highly-charged heavy ions**

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Highly-charged ions provide today an ideal “playground” to explore few-electron systems exposed to extremely strong electromagnetic fields as they are produced by heavy nuclei. In such a strong-field regime, the relativistic, many-body and quantum electrodynamic (QED) effects become of paramount importance and may significantly affect not only the shell structure but also the collision dynamics of the few-electron heavy species. A wide range of studies has been initiated over the last years to probe the ionic structure and dynamics and, hence, to test our basic understanding of atomic systems in the critical regime. In this contribution, I will review recent theoretical works in the field of high- $Z$  atomic physics. Special emphasis will be placed on the analysis of x-ray emission from highly-charged heavy ions. The investigations along this line help improve our knowledge on the electron – electron and electron–photon interactions in the presence of strong fields. The theoretical analysis of the basic non-radiative processes, such as, for example, the dielectronic recombination and the Coulomb excitation, will also be reported. Finally, I aim to discuss the recent studies on the lepton pair production as may be observed both in energetic and soft heavy-ion collisions.