

From the MK to the mK: highly charged ions across temperature scales

Priv.-Doz. Dr. José R. Crespo López-Urrutia

Max-Planck-Institut für Kernphysik, Heidelberg

While atoms only survive in a limited temperature range, their positive ions are found at MK temperatures in the cores of stars and their coronae, in extremely hot accretion disks surrounding active galactic nuclei and in the intergalactic medium. In all these places, the electronic properties of the ions determine both radiative energy transfer and plasma dynamics, while their line emission serves as an essential tool for astrophysical diagnostics. In the laboratory, trapped highly charged ions are also used to investigate fundamental quantum electrodynamics and nuclear properties. And new theoretical developments as well as progress in cooling such ions by means of lasers down to temperatures of few mK promise novel access to the study of the time evolution of fundamental constants using optical clocks based on them. The talk will cover basic aspects of the physics of highly charged ions and present recent experimental results on some of these topics.