SYPS 2: Precision spectroscopy of highly ionized matter II

Time: Friday 14:00–15:00 Location: A 001

Invited Talk SYPS 2.1 Fr 14:00 A 001

Exciting and ionizing trapped highly charged ions with electrons and photons in an EBIT — •José R. Crespo López-Urrutia — Max-Planck-Institut für Kernphysik, D-69117 Heidelberg, Germany

Hot cosmic matter, which can *e.g.* be found in black hole accretion disks, active galactic nuclei, supernova remnants, and in the warm-hot intergalactic medium, can be prepared and studied in the laboratory with electron beam ion traps (EBITs). A fundamental interest arises from the fact that, for bound electrons, quantum electrodynamic (QED) as well as relativistic contributions grow steeply with the fourth power of the nuclear charge, and thus from small perturbations to major effects. Denuding atoms from most of their electrons in a controlled way exposes these magnified effects even better, and allows for electronic correlation studies along isoelectronic sequences. In EBITs, highly charged ions (HCI) are produced, and their interactions with nearly monoenergetic electrons, with tunable lasers (both in the visible and soft X-ray region), and with keV photon beams from synchrotrons are used to excite and precisely measure electronic resonances. In particular, novel X-ray free-electron lasers (FLASH, LCLS), and synchrotron radiation (BESSY II) allow to go beyond the current accuracy limits. A report on recent results on few-electron QED, photoionization of HCI, dielectronic and trielectronic recombination processes, and laser spectroscopy of forbidden transitions investigated at the Heidelberg EBIT laboratory will be given.

Invited Talk SYPS 2.2 Fr 14:30 A 001

Precision x-ray spectroscopy of intense laser-plasma interaction experiments — •Nigel Woolsey — Department of Physics, University of York, York, YO10 5DD, United Kingdom

Detailed knowledge of electric and magnetic fields and properties of fast electron beams following the interaction of high-intensity, ultra-short laser pulses is a key area for fast ignition and secondary source generation. X-ray spectroscopy is a powerful method for in situ measurement of the physics that occurs in laser-produced plasmas. Combining high spectral and spatial resolution enables measurement of plasma waves, magnetic fields and the properties of electron beams as they propagate through a target. This discussion will include experiments demonstrating the viability of precision spectroscopy at laser intensities of 10^{21} Wcm^{-2}, a significant milestone as this suggests that spectroscopy is as an effective probe of fast electron physics in regimes relevant to a new generation of lasers such as ELI and HiPER.