HK 54: Hauptvorträge III

Zeit: Freitag 11:00–12:30 Raum: Audimax

Hauptvortrag HK 54.1 Fr 11:00 Audimax

The Origin of the Elements: Studying Stellar Reactions in the Laboratory — •Claudia Lederer-Woods — School of Physics and Astronomy, University of Edinburgh, Edinburgh, UK

The evolution of the universe has left an imprint in the form of the chemical elements. The abundances of elements we see in our solar system, distant stars, meteorites, and in stellar explosions provide us with clues about how the elements came to be produced in a variety of different processes and stellar environments. Dramatic progress has been made in Astronomy from detailed observations of chemical abundances in individual stars, to the first observation of neutron star mergers, which are a prime candidate for heavy element production. This has provided a challenge to nuclear physicists to provide similarly detailed information on the reactions and properties of key nuclei responsible for the formation of these elements. I will talk about stellar nucleosynthesis, recent nuclear reaction studies and their relevance to our understanding of the origin of the elements.

Hauptvortrag HK 54.2 Fr 11:30 Audimax

Accelerator mass spectrometry for a wide range of applications: from climate studies to geology and nuclear astrophysics — •Markus Schiffer — Institute for Nuclear Physics, University of Cologne, Germany

CologneAMS is a new centre for accelerator mass spectrometry (AMS) at the University of Cologne dedicated for measurements of cosmogenic nuclides. It was funded by the German Research Foundation (DFG) to improve the experimental measurement capabilities, especially for those German scientists which apply the high sensitivity of the AMS technique for their scientific research in the fields of geoscience, environmental physics and nuclear astrophysics.

The status of the facility will be presented as well as examples of projects by the University of Cologne, from climate studies, erosion, exposure and burial dating to nuclear waste management. The development of a new AMS setup at the 10 MV FN accelerator opens the field of research to nuclear astrophysics, as for instance the search for ^{60}Fe and ^{244}Pu in lake sediment drilling cores with respect to astrophysical models.

Hauptvortrag HK 54.3 Fr 12:00 Audimax

New Phenomena in Gamma-Ray Strength Functions — •Ronald Schwengner — Helmholtz-Zentrum Dresden-Rossendorf

The excitation and deexcitation of atomic nuclei by electromagnetic radiation are fundamental processes in reactions of this many-body quantum system. At high excitation energy and high level density, statistical models are applied to describe reaction rates, which use γ-ray strength functions (γSF) to describe the average transition probabilities in a certain range of excitation energy. The experimental determination and the theoretical understanding of the properties of γSF are important for the accurate description of photonuclear reactions and radiative-capture reactions, which play a central role in the synthesis of the elements in various stellar environments.

We report photon-scattering experiments using bremsstrahlung at the γELBE facility (HZDR) and quasi-monoenergetic, polarized γ beams at the HIγS facility (TUNL, Duke Univ., Durham, USA). Systematic studies of the dipole strength revealed new phenomena that are not described by the analytical approximations currently used in reaction codes. The (γ,γ') experiments at high energy show considerable contributions to the γSF from the quasicontinuum of states. Combined with (γ,n) cross sections, the (γ,γ') data provide experimental input γSF for statistical reaction codes.

The experimental studies are complemented by theoretical investigations. Enhancements of γSF at low energy are described on the basis of statistics of transitions from large-scale shell-model calculations.