FAKULTÄT für PHYSIK
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PHYSIK-DEPARTMENT
TECHNISCHE UNIVERSITÄT MÜNCHEN
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MLL-KOLLOQUIUM

Donnerstag, 10.07.2014, 16^{15} Uhr

Seminarraum 127, TUM, Physik II, Erdgeschoss/Nord
Treffen zum gemeinsamen Kaffee 16 Uhr

Dr. Wolfgang Plass

(Univ. Giessen)

Multiple Reflection Time-of-Flight Mass Spectrometry - a Powerful Tool for the Research with Exotic Nuclei and for Analytical Mass Spectrometry

In the recent decades, mass spectrometry has evolved into a key analytical method in many fields of science and industry, ranging from nuclear physics to climate research and medicine. Mass spectrometry is a universal method, in which atoms or molecules are ionized, dispersed in time or space according to their mass-to-charge ratios using electromagnetic fields and registered in a detector. Mass information, identification, as well as abundance information can be obtained. Extremely high mass accuracy and mass resolving power, sufficient to distinguish between isobars or even isomers, and the ultimate sensitivity of single ions can be achieved. A novel development in mass spectrometry are multiple-reflection time-of-flight mass spectrometers (MR-TOF-MS). Such instruments have been developed for the research with exotic nuclei at present and future accelerator facilities, including GSI Darmstadt, TRIUMF (Vancouver), and FAIR (Darmstadt). They can perform highly accurate mass measurements of exotic nuclei, serve as high-resolution, high-capacity mass separators and be employed as diagnostics devices to monitor the production, separation and manipulation of beams of exotic nuclei. Thus they help to overcome present limitations of rare isotope beam facilities due to strong contamination from isobaric reaction products and the short lifetime of the nuclei to be studied. The performance of these devices has been demonstrated by the recent measurement of ^{213}Rn with a half-life of 19.5 ms only; a mass determination with only 25 detected ions and at ion rates of four ions per hour could be performed. In addition, a mobile MR-TOF-MS has been developed for analytical mass spectrometry. It enables, for the first time, (ultra-)high resolution for in-situ measurements. Envisaged applications include in-situ waste water monitoring and real-time tissue recognition in the operating room.

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