34th Joliot Curie School
Experimental techniques in Modern Nuclear Physics

The use of Traps in Modern Nuclear Physics

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The last decades have seen an extremely rapid development of Radioactive Ion Beam (RIB) facilities allowing important progress concerning the knowledge of the atomic nucleus. Exploring new territory of nuclei with extreme N=Z ratios allowed the discovery of new structures and behaviors of the nucleus, thus refining the theoretical nuclear models originally developed from observations on long-lived nuclei [1]. At the same time, a new kind of instrumentation was introduced in nuclear physics through the development of ion traps. Their range of applications has steadily increased in the last 15 years with the experimental set-ups for decay spectroscopy, laser spectroscopy and trap-based experiments, in order to study nuclear ground and excited state properties. Thanks to these three complementary techniques, key observables of nuclei far from stability will be accessible, allowing to answer many of the open questions concerning the nuclear forces, the processes of nucleosynthesis as well as testing the Standard Model.

During this course, we are going to describe in a first part the charged particles trapping techniques starting from the fundamental principles to their application to develop the Paul and Penning traps. In the second part, we will present recent developments with different kind of applications as, for example, the isobaric selection, the precise mass measurements or the application to the study of the nuclear structure through trap assisted decay spectroscopy.