ID de Contribution: **31** Type: **Non spécifié**

Collinear resonance ionization laser spectroscopy for nuclear structure studies at ISOLDE and DESIR

lundi 12 mai 2025 17:20 (20 minutes)

Understanding how nuclear structure emerges from the nucleon-nucleon interaction and how it evolves going far from the valley of stability has become one of the main quests of contemporary nuclear physic. High-resolution colinear laser spectroscopy has long been established as a very powerful tool to study ground-state nuclear properties, providing a nuclear model-independent access to the nuclear ground-state spin, changes in mean square charge radii, magnetic dipole, and electric quadrupole moments. It is used at several radioactive beam facilities all over the world and gives insight into many aspects of nuclear structure and provide crucial input for the development of nuclear theories.

At the ISOLDE facility of CERN, the Collinear Resonance Ionization Spectroscopy (CRIS) laser spectroscopy experiment has undertaken several experimental campaigns aiming at the study of nuclear structure evolution around 100Sn, 78Ni and the N=20 and 40 island of inversions. The neutron rich Cr isotopes, located between the magical Ca and Ni, display the highest level of deformation and collectivity of the region. 64Cr is understood to be at the center of the N=40 island of inversion and the study of Cr ground state property from the stability to the N=40 IoI allows to get a comprehensive picture of the evolution from spherical and single particle behavior to deformed and collective structures.

In the past decade, the GANIL facility has undergone a major upgrade with the development of a new radioactive ion beam facility SPIRAL2-S3 and a new low-energy experimental hall DESIR. The SPIRAL2 facility, coupled to the S3 recoil separator, will enhance the study of exotic nuclei by producing intense beams of rare radioactive isotopes. The DESIR facility, now under construction, will host several experimental setups, among which a new versatile high-resolution laser spectroscopy setup: LAser Spectroscopy At GaNil (LASAGN). Such setup combined to the many beam preparation and purification devices of DESIR will offer unique opportunities for nuclear structure studies.

In this talk, laser spectroscopy as a tool for nuclear structure studies will be introduced. Recent results on chromium moments from the CRIS experiment at ISOLDE/CERN will be shown. Finally ongoing laser spectroscopy projects and future plans at the DESIR facility will be presented.

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Classification de Session: Session 2