



“Exploring the limits of nuclear stability with solenoidal spectrometers”

by Yassid Ayyad (IGFAE - Universidad de Santiago de Compostela)

Time and Date: 15:00-17:00, October 10, 2025

Place: Room 745, Science Complex B (H-03) (hybrid)

Registration: "<https://us02web.zoom.us/meeting/register/yIkqmJQdTvCQxxSJ80n-Yw>"

Abstract:

The advent of next-generation radioactive beam facilities will bring a plethora of opportunities to expand and consolidate our knowledge of nuclear structure and dynamics. These facilities will be capable of delivering exotic nuclei with unprecedented intensities ranging from $1\text{E}2$ to $1\text{E}10$ pps. The benefits in this context are twofold: the most exotic species, even those beyond the drip lines, and rare phenomena with very low probabilities will be accessible. This will enable scientists worldwide to tackle some of the most challenging puzzles in low-energy nuclear physics, such as the migration of states, the appearance/disappearance of magic numbers, collective phenomena, fundamental symmetries, astrophysical processes, and other topics of high scientific importance. However, the transition from our present facilities to future state-of-the-art accelerators presents a complex challenge not only from the technological stand-point but, also concerning how adequate the agreement between theory and experiment is going to be. In other words, how many observables will be required to reach a satisfactory description of the intricate phenomena that will be unveiled in the unexplored regions of the nuclear chart? Detectors with significantly enhanced capabilities will be needed to withstand high rates of almost every isotope below ^{238}U while providing excellent resolution. Moreover, inclusive measurements will be crucial to provide as much information as possible within the minimum possible machine time. This talk revolves around the ideas mentioned above, focusing on one of the most promising devices for future experiments: Solenoidal spectrometers, advanced detection systems for direct reactions in inverse kinematics. In particular I will discuss the capabilities, performance and limitations of SOLARIS, a dual-mode solenoidal spectrometer of the Facility for Rare Isotope Beams (FRIB) of Michigan State University (MSU). SOLARIS, an apparatus tailored for nuclear spectroscopy, is a 4 T solenoid that can be coupled with an array of silicon detectors or an active target time projection chamber. The most significant physics results obtained with this device will be presented to highlight the breakthrough that this technology represents. I will discuss the broad experimental program that SOLARIS, and other solenoidal spectrometers such as Isolde Solenoidal Spectrometer (ISS), cover in different energy domains as well as future developments.