Contribution ID: **58** Type: **Poster**

Stopping and Trapping of Radioactive Isotopes for Precision Experiments (STRIPE)

Tuesday 9 July 2024 17:38 (2 minutes)

The investigation of nuclear ground-state properties of short-lived radioactive isotopes through laser spectroscopy is an important probe of state-of-the-art nuclear-structure theories. This field has mainly been driven by Collinear Laser Spectroscopy (CLS) and Resonant Ionization Spectroscopy (RIS) in the last decades. In both techniques, the laser spectroscopy is performed in-flight which limits the interaction time between the laser and atoms to few µs. This inherently results in linewidths larger than few MHz. To increase the interaction time and with it the possible observable linewidth by orders of magnitude, a new quest has started with the goal to stop and trap radioactive isotopes for precision experiments (STRIPE). In contrast to commonly used buffer-gas filled linear Paul traps, this approach will try to circumvent the buffer gas and laser-cool the decelerated ions inside the Paul trap instead. This will enable high-precision measurements of the nuclear hyperfine structure through laser spectroscopic double-resonance experiments to investigate nuclear octupole moments. Furthermore, weak optical transitions with narrow linewidths will be explored which might open the route for investigations of King plot nonlinearities over long isotope chains. To characterize and optimize this process, a new offline beamline is currently under construction at the Institute for Nuclear and Radiation Physics of KU Leuven. This contribution will give an overview of the project and present the current status.

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Session Classification: Poster session

Track Classification: Nuclear Physics