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(G*) (POS-20) Commissioning of a Paul trap for Collinear Laser Spectroscopy of Exotic Radionuclides performed in a 30 keV MR-ToF device

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The presumption of magic numbers and nuclear shell closures is a fundamental paradigm of our understanding of atomic nuclei. However, far away from the valley of stability, expected properties within these well-established shell closures can significantly differ. A prime example for this so-called shell evolution is the island of inversion around neutron-rich magnesium and sodium isotopes (N=20) [1]. Experimental studies of isotopes in these exotic regions of the nuclide chart are however often challenged by low production yields and short half-lives.
The Multi-Ion Reflection Apparatus for Collinear Laser Spectroscopy (MIRACLS) [2] is a novel experimental technique in which high-resolution collinear laser spectroscopy (CLS) is performed in a multiple-reflection time-of-flight (MR-ToF) device. By trapping and revolving ions multiple thousands of times in an optical detection region (ODR), experimental sensitivity can be significantly improved when compared to conventional, single-passage CLS. This gain in sensitivity allows for the study of radioisotopes in more exotic regions of the nuclear chart.
In order to maximize the gain obtained from this new apparatus, the MIRACLS MR-ToF device requires cooled ion bunches with stringent emittance requirements. To address these needs, a preparation Paul trap was designed, constructed, and commissioned. In this presentation, we will describe the current status of the MIRACLS experiment with an emphasis on its newly commissioned Paul trap. A description of the goals of MIRACLS and its experimental setup will be provided, including the recent commissioning of the Paul trap.

[1] E. K. Warburton, J. A. Becker, and B. A. Brown, Phys. Rev. C 41, 1147 (1990)

[2] S. Sels et al., Nucl. Inst. Meth. Phys. Res. Sec. B, 463, 310–314 (2020)
V. Lagaki et al., Nucl. Inst. Meth. Phys. Res. Sec. A, 165663 (2021)
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Keyword-1

collinear laser spectroscopy

Keyword-2

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Keyword-3

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