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Pushing the limits of Collinear Laser Spectroscopy: Advancements in sensitivity and breakthroughs in the study of exotic nuclei at COLLAPS

Thursday 28 November 2024 16:00 (25 minutes)

Collinear Laser Spectroscopy (CLS) is a powerful tool for investigating nuclear ground state properties such as spin, electromagnetic moments, and the mean-square nuclear charge radius of exotic nuclei [1-3]. Phenomena, like the emergence of new magic numbers and the discovery of proton-emitting nuclei, occur far from stability, requiring researchers to push the limits of their techniques. In 2024, two key areas of investigation at COLLAPS have been the appearance or disappearance of a new magic number at N=32 in calcium and the unknown properties of the proton-emitting nucleus ^{147}Tm. These very exotic nuclei are produced at rates that challenge the capabilities of conventional CLS.

This contribution will present the technical advancements at COLLAPS that have significantly increased sensitivity, achieving detection rates as low as 0.6 ions/s with the recently developed ROC technique. I will also discuss the progress made towards studying the proton-emitting nucleus ^{147}Tm, highlighting efforts to perform spectroscopy on ion configurations with rates lower than 100 ions/s. Overall, this talk will showcase the breakthroughs achieved during a successful year of experiments in 2024.

References

[1] K. Blaum, J. Dilling, W. Noertershaeuser, Physica Scripta 2013, T152.
[2] P. Campbell, I. Moore, M. Pearson, Progress in Particle and Nuclear Physics 2016, 86, 127–180.
[3] R. Neugart et al., Journal of Physics G: Nuclear and Particle Physics 2017, 44.

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