Contribution ID: **435** Type: **Contributed Oral Presentation**

Accessing the immediate vicinity of tin-100 with a hot cavity laser ion source

Friday, 30 May 2025 12:10 (15 minutes)

The different configurations of the atomic nucleus, a self-bound quantum mechanical mesoscopic system, form a landscape of over 3000 known isotopes. However, even more than 100 years since its discovery by Ernest Rutherford, the complexity of the nucleus continues to elude a global theoretical description. To drive theory development, new experimental data are required from unexplored reaches of the chart of nuclei. A key area for new data is the immediate region below the heaviest bound self-conjugate nucleus, tin-100. This proton-rich region past the $N = Z = 50$ shell closure has been and continues to be the subject of intense experimental and theoretical research [1]. However, only limited information is available for the ground-state properties in the region, mainly due to challenges in producing these isotopes with sufficiently high yields. Recently, new ultra-sensitive measurement techniques developed at the University of Jyväskylä Accelerator Laboratory opened the immediate vicinity of tin-100 to optical spectroscopy and mass spectrometry studies [2,3].

Here I will present our most recent result on mass and optical studies on silver [4] and palladium isotope chains, culminating on the masses of $N = Z$ isotopes 94-Ag and 92-Pd which we recently accessed at the IGISOL facility at the University of Jyväskylä Accelerator Laboratory.

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[2] M. Reponen et al. "An inductively heated hot cavity catcher laser ion source". In: Review of Scientific Instruments 86.12 (Dec. 2015), p. 123501.
[3] M. Reponen et al. "Evidence of a sudden increase in the nuclear size of proton-rich silver-96". en. In: Nature Communications 12.1 (July 2021), p. 4596.
[4] Z. Ge et al. High-precision mass measurements of neutron deficient silver isotopes probe the robustness of the N = 50 shell closure. Phys. Rev. Lett. 133, 132503, (2024).

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Session Classification: Parallel Session

Track Classification: Nuclear Structure