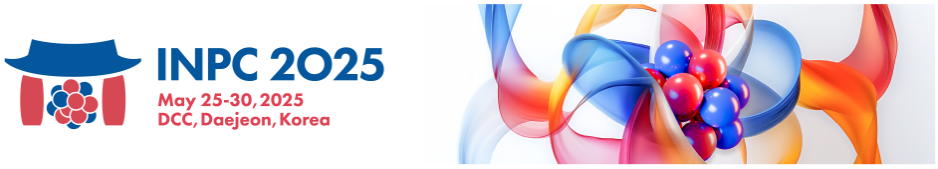

Contribution ID: **180** Type: **Contributed Oral Presentation**

In-gas-jet laser spectroscopy of the heaviest elements

Thursday, 29 May 2025 17:20 (15 minutes)

The in-gas-jet laser spectroscopy technique is a powerful tool to study atomic and nuclear properties of short-lived actinides. Such studies are important to understand the atomic level scheme of these heavy elements, which is influenced by strong electron correlations and relativistic effects. Also, fundamental nuclear properties such as moments, spins and charge radii are unknown for most of these nuclei. Thus, experimental data are crucial to benchmark state-of-the-art atomic and nuclear models.

The Radiation Detection Resonance Ionization Spectroscopy (RADRIS) technique, at GSI, Darmstadt, has provided pioneering experimental data for nobelium and fermium isotopes [1, 2, 3]. The RADRIS technique, however, is limited in the attainable spectral resolution mainly owing to collision- and Doppler-broadening. To overcome these limitations the JetRIS setup [4] has been designed to perform laser spectroscopy in a low-density and low-temperature supersonic gas jet [5] produced by a de-laval nozzle [6, 7]. The performance of JetRIS has been tested online with the spectroscopy of 254No, showing a six-fold increase in spectral resolution with respect to the RADRIS technique [8].

In this contribution we will present the research and development work carried out to commission the JetRIS setup as well as its performance in the upcoming online campaign and the prospects.

References:
[1] M. Laatiaoui et al., Nature 538, (2016) 495–498
[2] S. Raeder et al., Phys. Rev. Lett., 120 (2018) 232503
[3] J. Warbinek et al., Nature 634, (2024) 1075
[4] S. Raeder et al., NIMB 463, (2020) 272–276
[5] Yu. Kudryavtsev et al., Nucl. Instrum. Methods Phys. Res. B, 297 (2013) 7-22
[6] R. Ferrer et al., Phys. Rev. Res., 3 (2021) 043041
[7] D. Muenzberg et al., Atoms 2022, 10(2), 57
[8] J. Lantis et al., Phys. Rev. Res., 6 (2024) 023318

Primary author: CHHETRI, Premaditya (Johannes Gutenberg Universität)

Presenter: CHHETRI, Premaditya (Johannes Gutenberg Universität)

Session Classification: Parallel Session

Track Classification: Nuclear Structure