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In-gas-jet laser spectroscopy of heavy actinides with JetRIS at GSI

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In-gas-jet laser spectroscopy of heavy actinides with JetRIS at GSI
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The In-Gas Laser Ionization and Spectroscopy (IGLIS) 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 test and improve the predictions of state-of-the-art atomic and nuclear theoretical models.
The Radiation Detection Resonance Ionization Spectroscopy (RADRIS) setup, at the GSI Helmholtzzentrum für Schwerionenforschung in Darmstadt, has recently provided such experimental data for nobelium and fermium isotopes [1, 2]. The RADRIS data, however, are limited in the attainable spectral resolution mainly owing to collision- and Doppler-broadening effects. To overcome these limitations the JetRIS setup [3] has been designed to perform laser spectroscopy in a low- density and low-temperature supersonic gas jet [4] produced by a convergent-divergent contoured nozzle installed at the gas cell exit [5,6]. 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 data.
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 last online campaign and the prospects.

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