Contribution ID: **372** Type: **Invited Presentation**

Atomic and molecular In-gas-jet laser spectroscopy studies: Revealing the configuration of the K^\pi=8^- isomer in ^{254}No with JetRIS

The In-Gas Laser Ionization and Spectroscopy (IGLIS) technique is a powerful tool to study atomic and nuclear properties of short-lived actinides [1]. Such studies are important to understand the atomic level scheme of these heavy elements, strongly influenced by electron correlations and relativistic effects. Laser spectroscopy in a collimated and low-temperature supersonic gas jet produced by a convergent-divergent contoured nozzle [2] can be used for high precision determination of fundamental nuclear properties still unknown for most of these nuclei, such as moments, spins and differences in mean-square charge radii independently of nuclear model assumptions [3]. Thus, IGLIS studies provide experimental data that are crucial for testing and improving the predictions of state-of-the-art atomic and nuclear theoretical models.

The in-gas-Jet Resonance Ionization Spectroscopy (JetRIS) setup [4] has been designed to perform high-precision IGLIS studies of heavy actinides. JetRIS has recently been commissioned at the focal plane of the SHIP spectrometer in GSI to perform laser spectroscopy on the 254No nuclear ground state [5]. Combining an improved overall efficiency with a fast atom extraction, laser spectroscopy studies of the K^{\pi}=8^- isomer in ^{254}No (T_{1/2} = 265 ms) have been performed in a follow up online campaign. The obtained hyperfine structure has been used to extract the magnetic moment (gK-factor) providing a direct determination of the two quasi-particle configuration of the K-isomer.

In this contribution we will present the nuclear moments and isomer shift of the K-isomer as well as recent results on atomic and molecular IGLIS studies of Th species obtained in offline measurements at KU Leuven.

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Session Classification: Parallel session

Track Classification: Nuclear Structure, Spectroscopy and Dynamics