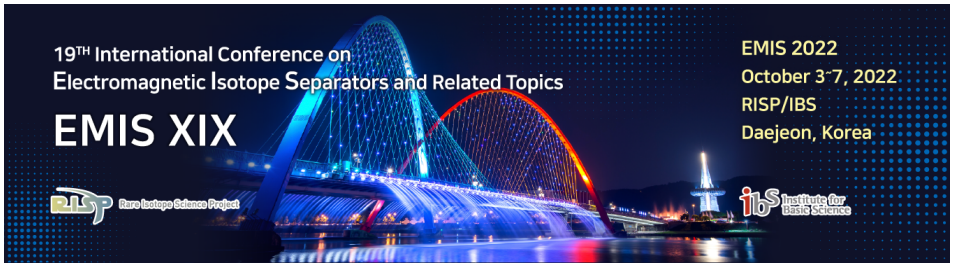

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High-resolution laser ionization spectroscopy of actinides in a Supersonic Gas Jet

Monday, 3 October 2022 22:54 (8 minutes)

Resonant laser ionization and spectroscopy are widely used techniques at radioactive ion beam facilities to produce pure beams of exotic nuclei and measure the mean-square charge radii, spins and electromagnetic moments of these nuclei. In such measurements on the heaviest elements it is, however, difficult to combine a high efficiency with a high spectral resolution. A significant improvement in the spectral resolution by more than one order of magnitude was demonstrated without loss in efficiency [1] by performing laser ionization spectroscopy of actinium isotopes in a supersonic gas jet. This novel spectroscopic method [2] is thus suited for spectroscopic studies of the ground- and isomeric-state properties of the hardly accessible actinide elements with an unprecedented spectral resolution and a high efficiency at radioactive beam facilities such as SHIP (GSI) and S3-LEB (GANIL).
Offline characterization studies at KU Leuven, dealing with the flow dynamics and the formation of supersonic jets produced by different gas-cell exit nozzles [3], and the characterization of a high-power, high-repetition rate laser system comprising multi- and single-mode lasers [4], have been carried out to optimize the performance of the technique. Furthermore, we plan on producing pure ion beams of the low-energy nuclear isomer in ^{229}Th to determine its lifetime and excitation energy in a series of experiments that will complement current and future measurements performed at ISOLDE (CERN).
In my talk, I will summarize the main results of off-line studies carried out at KU Leuven and will report on the implementation and prospects of the in-gas-jet resonance ionization method applied to very-heavy elements.

References:
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