

Laser spectroscopy on the borders of the region of reflection asymmetry

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Two successful experimental campaigns have been carried out in 2012 on the new Collinear Resonant Ionization Spectroscopy (CRIS) experimental beam line. During these campaigns a sensitivity to 1 atom in 60 was demonstrated using the measured yield of ^{202}Fr as a reference. This work has also demonstrated a suppression of isobaric contamination by a factor of 105.

These experiments have measured the hyperfine structures of ^{218}Fr and ^{219}Fr bordering the region of the shape transition of the nucleus from spherical to octupole-quadrupole deformed. This region of reflection symmetry breaking is centred at the $N=137$ isotone chain. This region is characterized by almost degenerate doublets of the same spin but different parities in the odd-even nuclei and an alternating spin and parity band sequence ($0^+ 1^- 2^+ 3^- \dots$) that are connected by enhanced $E1$ matrix elements in the even-even nuclei. This has been attributed to either the presence of an octupole deformation or alpha clustering. The presence of octupole deformation is alluded to by the dramatic reversal in the odd-even staggering of the isotope shifts and a vanishing magnetic moment in the laboratory frame. This talk will present the latest measurements on ^{218}Fr and ^{219}Fr as well as the neutron rich isotope ^{229}Fr and ^{231}Fr and discuss the future prospects of measuring out to ^{233}Fr at ISOLDE.

Primary authors: Mr BUDINCEVIC, Ivan (IKS, KU Leuven); FLANAGAN, Kieran (University of Manchester (GB))

Presenter: Mr BUDINCEVIC, Ivan (IKS, KU Leuven)

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