Contribution ID: **7**

Type: **Invited**

High-precision laser ionization spectroscopy towards 100Sn

Friday 27 November 2020 10:10 (20 minutes)

Collinear resonance ionization spectroscopy is a powerful technique which can provide a unique insight in nuclear properties such as spins, electromagnetic moments and changes in mean-square charge radii from near doppler-free measurement of the hyperfine structure. This technique was used at the Collinear Resonance Ionization Spectroscopy (CRIS) beamline at ISOLDE-CERN, for studying nuclear structure in the proximity of the heaviest self-conjugate doubly magic nucleus 100Sn. Recently, state-of-the-art many-body methods including ab-initio calculations have been able to reach this important stepping-stone in the nuclear landscape. However, many questions remain unanswered regarding the nuclear structure of the lightest tin isotopes due to the lack of experimental data. The controversial robustness of the shell closure, insufficient understanding of the collective behaviour and the unknown level ordering of the neutron d5/2 and g7/2 shell-model orbits further motivate the curiosity.

In preparation for studying the exotic neutron-deficient cases extensive testing using a recently commissioned ion source enabled spectroscopy of all stable tin isotopes. This work allowed for the development of several previously unexplored laser ionization schemes of tin. The insight of their sensitivity to nuclear observables and overall efficiency laid foundation for the study of the unstable tin nuclei and provide valuable insight for atomic physics calculations. Using two selected ionization schemes the hyperfine structure of ground and long-lived isomeric-states, extending from 124Sn down to 104Sn were investigated. These new measurements allow for the first determination of electromagnetic moments, changes in mean-square charge radii and ground-state spin assignments of 104-107Sn, shedding new light on the level ordering and collectivity approaching N=50.

Authors: PARNEFJORD GUSTAFSSON, Fredrik Olof Andre (KU Leuven (BE)); BAI, Shiwei (Peking University (CN)); BILLOWES, Jonathan (University of Manchester (GB)); BINNERSLEY, Cory (University of Manchester (GB)); BISSELL, Mark (University of Manchester (GB)); Prof. COCOLIOS, Thomas Elias (KU Leuven - IKS); NEYENS, Gerda (CERN); RICKETTS, Christopher Malden (University of Manchester (GB)); FLANAGAN, Kieran (University of Manchester (GB)); DE GROOTE, Ruben Pieter (University of Jyvaskyla (FI)); COOPER, Ben (University of London (GB)); FAROOQ-SMITH, Gregory James (KU Leuven (BE)); FRANCHOO, Serge (Centre National de la Recherche Scientifique (FR)); GARCIA RUIZ, Ronald Fernando (Massachusetts Inst. of Technology (US)); Dr KOSZORUS, Agota (University of Liverpool); ROMERO ROMERO, Elisa (Oak Ridge National Laboratory - (US)); VERNON, Adam Robert (KU Leuven (BE)); WILKINS, Shane (CERN); YANG, Xiaofei (Peking University (CN)); HEYLEN, Hanne (CERN); WENDT, Klaus (Johannes Gutenberg Universitaet Mainz (DE)); Dr KÖNIG, Kristian (Michigan State University); Dr GINS, Wouter (University of Jyvaskyla (FI))

Presenter: PARNEFJORD GUSTAFSSON, Fredrik Olof Andre (KU Leuven (BE))

Session Classification: Ground State Properties Session