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The Exploration of the Indirect Neutron-Capture Constraints of 87,89Kr(n,)88,90Kr reactions in the Astrophysical i-process using the -Oslo method.

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The formation of heavy nuclei along the neutron-rich region of the chart of nuclides is usually explained using two main processes, namely the s- and r-processes. Recent astronomical observations have shown “strange” abundance distributions in Carbon-Enhanced Metallic Poor (CEMP) stars, which cannot be explained by these two neutron-capture processes alone, hence giving rise to additional nucleosynthesis processes. One such process is the astrophysical intermediate (i-)process.
The site at which the i-process occurs is not yet identified as one of the reasons is the associated nuclear uncertainties. The i-process occurs from 2-8 mass units away from the valley of stability, and while the structure of these nuclei along this pathway is mostly known experimentally, the neutron-capture reaction rates are almost entirely provided by theory. In particular, recent sensitivity studies of neutron-capture reactions on Kr isotopes have been identified to strongly affect Rb/Sr abundances.
To better understand the i-process, CARIBU, located at ATLAS facility at Argonne National Laboratory, was utilised to constrain the neutron-capture of the ^{87,89}Kr(n,γ)^{88,90}Kr reactions. The indirect method of β-decays from the ^{88,90}Br nuclei into ^{88,90}Kr was used to identify the resulting γ-rays using the SUmming NaI detector, SuN, and the SuNTAN moving tape system.
Nuclear level densities and γ-ray strength functions of ^{88,90}Kr were extracted using the β-Oslo method, of which the preliminary results will be discussed in this presentation. By exploiting the statistical properties of both ^{88,90}Kr, the ^{87,89}Kr(n,γ)^{88,90}Kr reaction rates and cross sections will be constrained to help understand their impact on the astrophysical i-process and on the Rb/Sr production.

Author: UTHAYAKUMAAR, Sivahami (Facility for Rare Isotope Beams (FRIB) / Michigan State University)

Co-authors: Prof. SPYROU, A. (Facility for Rare Isotope Beams (FRIB) / Michigan State University); Ms HARRIS, C. (Facility for Rare Isotope Beams (FRIB) / Michigan State University); Ms BERG, H. C. (Facility for Rare Isotope Beams (FRIB) / Michigan State University); Dr BLEUEL, D. L. (Lawrence Livermore National Laboratory); Dr COUTURE, A. (Los Alamos National Laboratory); Dr DILLMAN, I. (TRIUMF); Dr DOMBOS, A. C. (University of Notre Dame); Mr GREAVES, B. (Department of Physics, University of Guelph); Prof. GUTTORMSEN, M. (University of Oslo); Prof. LARSEN, A. C. (University of Oslo); Mr LEWIS, R. (Facility for Rare Isotope Beams (FRIB) / Michigan State University); Prof. LIDDICK, S. N. (Facility for Rare Isotope Beams (FRIB) / Michigan State University); Dr LYONS, S. (Pacific Northwest National Laboratory); Dr MOSBY, S. (Los Alamos National Laboratory); Prof. MUECHER, D. (University of Cologne, Germany); Dr NAQVI, F. (Facility for Rare Isotope Beams (FRIB) / Michigan State University); Mr OWENS-FRYAR, G. (Facility for Rare Isotope Beams (FRIB) / Michigan State University); Dr RICHARD, A. L. (Unviersity of Ohio); Prof. SIEM, S. (University of Oslo); Dr SIMON, A. (Department of Physics, University of Notre Dame); Dr SMITH, M. K. (Facility for Rare Isotope Beams (FRIB) / Michigan State University); Prof. WIEDEKING, M. (iThemba LABS and Department of Physics, Stellenbosch University, South Africa); Mr ZEISER, F. (University of Oslo)

Presenter: UTHAYAKUMAAR, Sivahami (Facility for Rare Isotope Beams (FRIB) / Michigan State University)