Contribution ID: **108** Type: **Oral presentation**

A study of the (d,pg) reaction on radioisotope 85gKr to constrain a key s-process branching point

Tuesday, 25 June 2024 14:20 (20 minutes)

The ^{85}Kr(d,pγ)^{86}Kr reaction has been carried out at 10 MeV/u in inverse kinematics at Argonne's ATLAS facility using the HELIOS spectrometer and the Apollo array. The neutron capture cross section on the radioisotope ^{85}Kr ($T_{1/2}$ = 10.7 yr), an s-process branching point nucleus, carries a significant uncertainty due to the challenges of direct measurements. However, ^{85}Kr can be accelerated as a pure beam, and the (d,pγ) reaction has been demonstrated to be a reliable indirect probe of the (n,γ)-reaction cross section. Neutron excitations from around 2-14 MeV in ^{86}Kr were populated, where S_n=9.86 MeV, with a Q-value resolution of about 150 keV. The γ-ray emission probabilities as a function of excitation energy [$P_{p\gamma}(E_{ex})$] were determined. The $2^+ \rightarrow 0^+$ and $4^+ \rightarrow 2^+$ γ-rays are clearly observed, showing the characteristic constant value of $P_{p\gamma}$ below S_n and a decrease above S_n. These data are used to extract the cross sections for ^{85}Kr(n,γ) reaction, complementing recent direct, high-precision measurements on the stable Kr isotopes. The technique has significant potential for future indirect (n,γ)-reaction studies.

This material is based upon work supported by the U.S. Department of Energy, Office of Science, Office of Nuclear Physics, under Contract No. DE-AC02- 06CH11357. This research used resources of ANL's ATLAS facility, which is a DOE Office of Science User Facility.

Collaboration

Primary authors: CAROLLO, Sara (University of Padova, INFN Padova); WATWOOD, Nate (Argonne National Lab); Dr KAY, Ben (Argonne National Laboratory); RECCHIA, Francesco (Padova); Dr DE ANGELIS, Giacomo (INFN LNL)

Co-authors: Dr AGUILERA, Pablo (University and INFN Padova); AVILA, Melina (Argonne National Laboratory); Dr BENITO GARCIA, Jaime (INFN Padova); BHATT, Khushi (Argonne National Laboratory); BRUGNARA, Daniele (Instituto Nazionale di Fisica Nucleare (INFN)(INFN-Legnaro)); CHIPPS, Kelly (Oak Ridge National Laboratory); Dr COUTURE, Aaron (Los Alamos National Laboratory); DUTTA, Saumi (Shanghai Jiao Tong University, Shanghai); Dr ERTOPRAK, Aysegul (LNL-INFN); ESCUDEIRO, Rafael (University of Sao Paulo - University of Padova); FREEMAN, Sean (The University of Manchester); GALTAROSSA, Franco (INFN Sezione di Padova); GONGORA SERVIN, Benito (University of Ferrara, LNL); GOTTARDO, Andrea (Laboratori Nazionali di Legnaro, Istituto Nazionale di Fisica Nucleare); HALL-SMITH, Alex (Argonne National Laboratory); HENDERSON, Jack; HOFFMAN, C. R.; Dr HUGHES, Richard (Lawrence Livermore National Laboratory); JAYATISSA, Heshani (Los Alamos National Laboratory); LENZI, Silvia M. (University of Padova and INFN, Padova, Italy); MENGONI, Daniele (Instituto Nazionale di Fisica Nucleare (INFN)(INFN-Padova)); Dr MUMPOWER, Matthew (Los Alamos National Laboratory); Dr ONG, Wei Jia (Lawrence Livermore National Laboratory); Dr PAUL, Michael (Racah Institute); PELLUMAJ, Julgen (INFN-LNL); PÉREZ VIDAL, Rosa María (IFIC-CSIC); PIGLIAPOCO, Sara (University and INFN Padova); Dr RATKIEWICZ, Andrew (Lawrence Livermore National Laboratory); Dr REZYNKINA, Kseniia (INFN Padova); SHARP, David (University of Manchester); SUN, Yang (Shanghai Jiao Tong University); Dr TANG, Tsz Leung (Florida State University); Dr TOLSTUKHIN, Ivan (Argonne National Laboratory); Dr WILLIAMS, Matthew (Lawrence Livermore National Laboratory)

Presenter: CAROLLO, Sara (University of Padova, INFN Padova)

Session Classification: Tuesday afternoon 1