Contribution ID: **10** Type: **Oral presentation**

Constraining the 69Zn Neutron Capture Cross-section via the Beta-Oslo Method

Monday 27 May 2024 14:50 (20 minutes)

The existence of the intermediate neutron-capture process (i-process) explains the observed astrophysical abundances of elements around the Z<50 region [1]. Neutron capture reactions in the A=70 mass region for Ni, Cu, and Zn isotopes are known to produce large variations in predicted i-process abundances [1]. Predicted stellar abundances of Ga are particularly affected by the ^{69}Zn(n,γ) reaction. The β-decay of ^{70}Cu offers an opportunity utilize the β-Oslo method to experimentally determine the γ-strength function (γSF) and nuclear level density (NLD) of ^{70}Zn to constrain the ^{69}Zn(n,γ) reaction rate for i-process nucleosynthesis. ^{70}Cu has three different β-decaying spin-parity states that populate different spin ranges at similar excitation energies in the daughter nucleus: the 6^- ground state, the 101 keV 3^- isomeric state, and the 242 keV 1^+ isomeric state [2]. In an experiment performed at the National Superconducting Cyclotron Laboratory the three states of ^{70}Cu was produced and delivered to the Summing NaI (SuN) Total Absorption Spectrometer [3]. Spectra from the β-decays of each state were isolated using different beam on/off periods. Preliminary results from β-Oslo analysis to obtain γSF and nuclear level densities will be presented. The preliminary constrained ^{69}Zn(n,γ)^{70}Zn reaction rate will also be presented.

[1] J. E. McKay et al. MNRAS 491, (2020) 5179-5187.
[2] P. Vingerhoets et al. Phys. Rev. C 82, 064311 (2010).
[3] A. Simon et al. Nucl. Inst. and Meth. Phys. Res. A 703, (2013) 16.

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