Contribution ID: **47** Type: **not specified**

First β-delayed neutron spectroscopy of 24O

Thursday, July 25, 2024 11:20 AM (20 minutes)

Located at the neutron drip-line, 24O is the heaviest doubly-magic isotope of the oxygen isotopic chain. As the Qβ value increases and the neutron separation energy in the daughter nucleus decreases for the neutron-rich nucleus, beta-delayed neutron emission becomes a dominant decay mode, and neutron energy measurement is vital in studying the beta decay to the neutron unbound states. Also, spectroscopy of such drip-line nuclei may provide important information regarding the effects of nuclear interactions and many-body correlations in determining the limits of nuclear stability [1-3]. The neutron energy spectrum measurement of the beta-delayed neutron precursor 24O was performed for the first time at the National Superconducting Cyclotron Laboratory (NSCL) using a neutron time-of-flight array (VANDLE[2]) accompanied by gamma spectroscopy setup. New half-life and beta decay branching ratios are extracted. Following the decay of 24O, the beta-gamma and beta-delayed neutron measurements provided the excitation energies and the beta decay strength distribution to neutron-bound and unbound states in 24F . The decay of "doubly-magic"24O is an excellent case to test the quality of the state-of-the-art calculations of the beta-decay strength distribution near the neutron drip line. The present experimental results were compared with shell-model calculations using the standard, empirical USDB interaction, predictions by the shell model embedded in the continuum, and novel ab initio calculations using the valence-space in-medium similarity renormalization group and the coupled-cluster method.

This work was supported by the U.S. Department of Energy, National Nuclear Security Administration under the Stewardship Science Academic Alliances program through DOE Award No. DENA0002934 and DENA0003899, and NSF Major Research Instrumentation Program Award Number 1919735.

[1] T. L. Tang et al. Phys. Rev. Lett. 124, 212502 (2020).
[2] T. Otsuka et al. Phys. Rev. Lett. 105, 032501 (2010).
[3] G. Hagen et al. Phys. Rev. Lett. 108, 242501 (2012).
[4] W. A. Peters et al., Nucl. Instrum. Methods Phys. Res. A 836, 122 (2016).

Presenter: NEUPANE, Shree (University of Tennessee, Knoxville, Tennessee)

Session Classification: Structure of Light Nuclei - Part 2