Contribution ID: **118** Type: **Contributed Oral Presentation**

Isospin breaking in the upper fp-shell nuclei

Wednesday, September 27, 2023 4:30 PM (13 minutes)

The concept of isospin symmetry originates in the attributes of charge symmetry and charge independence of the strong nuclear force. This implies that the strong interaction exhibits equal strength between proton-proton, neutron-neutron, and proton-neutron pairs. As a result, isobaric analog nuclei with the same mass, A = N + Z, but with differing neutron and proton numbers, such as N = Z - 2, N = Z, and N = Z + 2, called isobaric analog states (IAS), should possess degenerate sets of excited states. However, electromagnetic effects introduce energy differences among IAS. The measurement of these differences has proven valuable in probing nuclear structures and examining the conservation of isospin symmetry. However, experimental data for the A = 70-80 region are minimal, and conducting experiments in this region is challenging.

An experiment was performed at the University of Jyvaskyla Accelerator Laboratory to investigate the structures of 78Y using the 40Ca(40Ca, np) reaction. The experiment employed the JUROGAM 3 Ge-array, MARA vacuum-mode recoil separator. The recoil-beta tagging method was employed to investigate the excited states in the nuclei of 78Y. Several new gamma-ray transitions were detected from the decay of the excited states in the 78Y nucleus. This presentation discusses the experimental methods to study exotic nuclei close to the proton dripline and discusses results from the 78Y experiment compared to theoretical predications.

Abstract Category

Nuclear Physics

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Session Classification: Parallel Session 1

Track Classification: Physics Research