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In-beam γ-ray spectroscopy of 94Ag

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The concept of isospin has been introduced to explain the apparent exchange symmetry between protons and neutrons. However, if the nuclear force were the same for neutrons and protons properties such as excitation energies and masses would depend only on the mass number A. Naturally, the Coulomb force will break this degeneracy, although the underlying wave functions are expected to retain their isospin symmetry.

Isospin symmetry implies that states with the same isospin number T in mirror nuclei, are remarkably similar. Energy differences between mirror analog states arise from isospin-non-conserving interactions, such as the Coulomb interaction. The study of these energy differences has gathered attention in recent years [1-3 and references therein]. These studies have shown that electromagnetic effects within the shell model alone cannot explain all these energy differences, suggesting other effective isospin-non-conserving (INC) interactions are missing from current models [4].

In addition, pairing correlations have a significant importance in the description of the nuclear structure of N=Z nuclei, where protons and neutrons are arranged occupying the same orbits, allowing T=0 np pairing in addition to the normal T=1. It was recently suggested that spin-aligned T=0 np pairs dominate the wavefunction of the y-rast sequence in 92Pd [5]. Subsequent theoretical studies were devoted to probe the contribution of np pairs in other N=Z A>90 nuclei [6-7], suggesting that a similar pairing scheme strongly influences the structure of these nuclei.

In an effort to answer these questions, a recoil beta tagging experiment has been performed to try and identify the excited T=0 and T=1 states in odd-odd N=Z 94Ag using the 40Ca(58Ni,p3n)94Ag reaction. The experiment was conducted using MARA recoil separator and JUROGAM3 array at the Accelerator Laboratory of the University of Jyväskylä. The identified transitions, experimental CED and nuclear shell model predictions will be shown in this presentation. A preliminary interpretation of the experimental results will also be discussed.

References

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