DEFORMED STRUCTURES AND SHAPE COEXISTENCE IN ^{98}Zr

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The rapid onset of deformation across the $_{40}$Zr isotopes is unprecedented in the nuclear chart, and the issue of how collectivity appears and disappears in these isotopes is of special interest. This has been theoretically explained within the framework of shape coexistence, where two bands with very different deformation coexists at similar energies and swap their relative order as ground and excited states near N=60. In this scenario, $^{98}_{40}$Zr$_{58}$ is a key nucleus in understanding the evolution of the different band structures coexisting in the region. But despite its importance, the structure of this nucleus is far from clear, with recent experimental results challenging the shape coexistence interpretation.

To provide evidence of shape coexistence in ^{98}Zr a high-statistics $\gamma\gamma$, γ-e$^-$ experiment was performed. This experiment was aimed at precisely measuring very weak low-energy branching ratios in the β-decay of ^{98}Y, which, due to the energy dependence of the quadrupole transitions (E_γ^5 for E2 transitions), is dominated by high-energy γ-transitions. This effect may obscure low-energy lines, even those with a large reduced transition rate, resulting in a failure to identify band structures.

The experiment was carried using the 8π spectrometer at TRIUMF-ISAC, which consists of an array of 20 Compton-suppressed hyper-pure germanium detectors in conjunction with 5 high energy resolution Si(Li) conversion electron detectors. Excited states up to $\sim$ 5 MeV in ^{98}Zr were populated in the β^- decay of ^{98}Y $J^\pi = (0^-)$, greatly expanding the known level scheme. A new interpretation of the ^{98}Zr nuclear structure based on triple shape coexistence will be presented.