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Seniority symmetry breaking in semimagic ^{94}Ru

Direct fast-timing lifetime measurements were carried out on low-lying states in the semimagic ($N = 50$) nucleus ^{94}Ru . The experiment was carried out as the first in a series of “FAIR-0” experiments with the DESPEC experimental setup at the Facility for Antiproton and Ion Research (FAIR). Excited states in ^{94}Ru were populated primarily via the β -delayed proton emission of ^{95}Pd nuclei, produced in the projectile fragmentation of a 850 MeV/nucleon ^{124}Xe beam, impinging on a 4 g/cm² ^9Be target. While the $B(E2:2^+ \rightarrow 0^+)$ follows the expected behavior for conserved seniority symmetry, the intermediate $4^+ \rightarrow 2^+$ transition in the seniority multiplet exhibits drastic enhancement of transition strength in comparison with pure seniority model predictions as well as standard shell model predictions in the fp_g proton hole space. The anomalous behavior is ascribed to a subtle interference between the lowest seniority $\nu = 2$ and $\nu = 4$, $I\pi = 4^+$ states due the effect of in-shell cross-diagonal interactions. In addition, the observed strong hindrance of the $6^+ \rightarrow 4^+$ transition is attributed to the same mechanism but with a destructive interference.

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