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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 fpg 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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