Int. Workshop “Shapes and Dynamics of Atomic Nuclei: Contemporary Aspects”
ed. Nikolay Minkov, Heron Press, Sofia 2026

Progress with understanding K-isomer decay rates

P.M. Walker

Department of Physics, University of Surrey, Guildford GU2 7XH, United Kingdon

Abstract

High-K isomers are one of the principal classes of nuclear isomer [1]. The approximate quantum number, K, represents the projection of the angular momentum on the nuclear symmetry axis, and changes in K play a key role in K-isomer deexcitation probabilities. Despite a good qualitative understanding of the main factors that influence K isomer half-lives, a quantitative understanding remains elusive. Meanwhile, the data show a number of systematic features that shed light on the controlling degrees of freedom.

For K-forbidden transitions, it is usual practice to evaluate the reduced hindrance, $\mathrm{f}_\nu = F_W^{1/\nu}$, where the degree of forbiddenness, $\nu = \Delta K - \lambda$, F_W is the Weisskopf hindrance factor, ΔK is the change in the K value involved in the transition, and λ is the multipole order of the transition. Correlations between f_ν and other variables indicate the importance of, for example, the product of the valence nucleon numbers, $N_p N_n$ [1], and the isomer energy relative to the yrast line [2].

For isomeric $E2$ transitions, it was shown recently [3] that an alternative approach provides further insights. By studying the systematic behaviour of the implied mixing matrix element, V, between the isomer and the rotational band to which it decays, configuration-dependent features are revealed. The present work reports on the implications of new data for ^{173}W [4], which test the f_ν and V correlations.

References

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