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Probing collective behavior in beryllium isotopes

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Ab initio nuclear theory provides not only a microscopic framework for quantitative description of the nuclear many-body system, but also a foundation for deeper understanding of emergent collective correlations. The beryllium isotopes embody the struggle between collectivity and shell effects resulting in, e.g., shape coexistence, parity inversion and intruder ground states. Here we probe the underlying correlations through the lens of approximate symmetries, specifically, Elliot's SU(3), a symmetry group associated with both nuclear deformation and rotation and with the harmonic oscillator. To this end, we decompose wave functions obtained with the no-core shell model by SU(3) symmetry and demonstrate that the collective behavior across the beryllium isotopic chain can be approximately understood in a simple SU(3) framework.

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