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Rotational bands beyond the Elliott model[1] RYAN ZBIKOWSKI, Computational Science Research Center, San Diego State University, CALVIN W. JOHNSON, Department of Physics, San Diego State University, ANNA E. MCCOY, Institute for Nuclear Theory, University of Washington, MARK A. CAPRIO, PATRICK J. FASANO, Department of Physics, University of Notre Dame — Rotational bands are commonplace in the spectra of atomic nuclei. Inspired by early descriptions of these bands by quadrupole deformations of a liquid drop, Elliott constructed discrete nucleon representations of SU(3) from fermionic creation and annihilation operators. Ever since, Elliott's model has been foundational to descriptions of rotation in nuclei. Later work, however, suggested the symplectic extension $\mathrm{Sp}(3,\mathrm{R})$ provides a more unified picture. We decompose no-core shell-model nuclear wave functions into symmetry-defined subspaces for several beryllium isotopes, as well as ^{20}Ne, using the quadratic Casimirs of both Elliott's SU(3) and $\mathrm{Sp}(3,\mathrm{R})$. The band structure, delineated by strong $B(E2)$ values, has a more consistent description in $\mathrm{Sp}(3,\mathrm{R})$ rather than SU(3). In particular, we confirm previous work finding in some nuclides strongly connected upper and lower bands with the same underlying symplectic structure.

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