Critical Point Symmetry in A Fermion Monopole and Quadrupole Pairing Model

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Recent interest in symmetries at a critical point of phase transitions in nuclei prompts a revisit to the fermion monopole and quadrupole pairing model [1]. This model has an exactly solvable symmetry limit that is transitional between spherical nuclei and gamma unstable deformed nuclei [2, 3]. In Figure 1 the energy surface for this limit as a function of the deformation $\beta$ is plotted for various number of pairs of nucleons, N. As N increases the energy surface becomes more flat until half-shell when the leading term is $\beta^4$. The eigenenergies, eigenfunctions, pairing strength and quadrupole transition rates in this limit are derived as a function of N and the number of pairs for the full shell, $\Omega$. Comparison with empirical quadrupole transition rates suggests that the Xenon isotopes may have this symmetry [4].

![Energy surface as a function of the deformation $\beta$ for different pairs of nucleons, N. The number of pairs at half-filled shell is 8.](image)

**References**