SEMICLASSICAL SHELL-STRUCTURE MOMENTS OF INERTIA IN HEATED FERMI SYSTEMS

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The moment of inertia for collective rotation is derived analytically for the harmonic-oscillator Hamiltonian within the cranking model for any rotation frequency and at finite temperature. Semiclassical shell-structure moments of the inertia are obtained in terms of the free-energy shell corrections through the rigid-body inertia of the statistically equilibrium rotation of a heated Fermi system by using the periodic-orbit theory. Their analytical structure in terms of the equatorial and 3-dimensional periodic orbits for the axially-symmetric harmonic-oscillator potential is in perfect agreement with quantum results for critical deformations and temperatures.

Keywords: cranking model, nuclear rotations, moment of inertia, periodic orbit theory, shell-correction energy, harmonic oscillator potential.