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New microscopic theory of low-energy collective motion in soft spherical nuclei[1] LIYUAN JIA, VLADIMIR ZELEVINSKY, Michigan State University and NSCL — Many medium and heavy spherical nuclei clearly manifest strong collective motion of low frequency, mainly of quadrupole symmetry. In the absence of static deformation, this motion has a character of large amplitude collective vibrations. While the shell-model diagonalization is usually impossible in such cases, and anharmonic effects are crucial, we develop a method to go beyond standard Hartree-Fock-Bogoliubov mean field and random phase approximation. Considering typical frequencies of collective motion smaller than the pair breaking energy, we map the exact operator equations of motion onto the dynamics governed by the collective Hamiltonian. The parameters of this Hamiltonian (cubic and quartic anharmonicity) are determined self-consistently. After checking the approach by simple cases (Lipkin model and the model with factorizable forces), we discuss the realistic applications.

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