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Collective Motion in Soft Spherical Nuclei: Microscopic Description[1] LIYUAN JIA, VLADIMIR ZELEVINSKY, NSCL/Michigan State University — The Generalized Density Matrix (GDM) method is used to microscopically calculate the parameters of the collective Hamiltonian for soft spherical nuclei. We map the equation of motion for the GDM onto the collective degrees of freedom. The lowest orders give the Hartree-Fock-Bogoliubov equations and the random phase approximation (RPA) equation naturally. For higher orders, the formalism was checked by the Lipkin model and the factorizable force model. We calculated the quartic anharmonicity that is responsible for restoring the stability of the system as the RPA frequency goes to zero. In both simple cases our approach agrees well with the known results. Applying the formalism to realistic nuclei, we calculate the collective Hamiltonian for quadrupole and octupole degrees of freedom including their interaction. This interplay is observed empirically and might be important in the search for enhancement of parity violation. The results are applied to collective excitations in medium soft nuclei.

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