

Symmetries of Collective Models in Intrinsic Frame

A. Gózdź, A. Pędrak, A. Szulerecka

Institute of Physics, Department of Mathematical Physics, University of Maria Curie-Skłodowska, pl. Marii Curie-Skłodowskiej 1, PL 20-031, Lublin, Poland

Nuclear collective models can be considered in both: laboratory and intrinsic frames. However, only an intrinsic frame allows to write down rotational terms of a collective nuclear Hamiltonian, explicitly. It allows to interpret various terms of the Hamiltonian as rotational, vibrational or other collective modes. A possibility of distinction between orientation and shape dependent collective modes allows for considering of analyzing of intrinsic geometric symmetries of a nucleus which are not seen in the laboratory frame. The main problem, which should be considered to find physical, shape related symmetries, is to exclude from the set of symmetry transformations the operations belonging to the symmetrization group which is a kind of virtual symmetry of description of the system in its intrinsic frame. We consider some sufficient conditions which allow to find physical intrinsic symmetries and apply them to a quadrupole+octupole nuclear collective model. As a consequence we reestablish the question about existence of higher point group (shape related) symmetries in nuclei.