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The structure of low-energy excited states in even-even spherical nuclei within a multiphonon approach

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The low-lying spectra of heavy spherical nuclei are investigated within the microscopic Quasiparticle–Phonon model. The approach goes beyond the quasiparticle random-phase approximation by treating a Hamiltonian of separable form in a multiphonon basis. It is therefore able to describe the anharmonic effects of collective modes as well as the multiphonon states. By associating the microscopic isoscalar and isovector quadrupole and octupole phonons with proton–neutron symmetric and mixed-symmetry bosons, respectively. The microscopic states can be classified to their phonon content and their symmetry. Due to its flexibility, the method can be implemented numerically for systematic studies of spectroscopic properties throughout entire regions of vibrational nuclei. The spectra and multipole transition strengths are in overall reasonable agreement with the experimental data.

Primary author: Prof. STOYANOV, Chavdar (Institute for Nuclear Research and Nuclear Energy, Bulgarian Academy of Sciences)

Presenter: Prof. STOYANOV, Chavdar (Institute for Nuclear Research and Nuclear Energy, Bulgarian Academy of Sciences)

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