Shell Model Calculation Of Nuclei Around 208pb

[1]Ms Eri Teruya, [2]Prof Naotaka Yoshinaga, [3]Prof Koji Higashiyama

Large-scale shell-model calculations are performed for heavy nuclei with $Z \geq 82$ around ^{208}Pb. One feature for nuclei in this mass region is the existence of a lot of low-lying negative parity states. The low-lying 3^- states which are made by the core excitations are found in several nuclei. In contrast, it is known that the several 3^- states are lowered by the collective octupole correlation among valence nucleons. However, the theoretical investigations in this region are not enough so that the microscopic structures of these nuclei have not been clarified yet.

In this study shell-model calculations are performed for even-even, odd-mass, and doubly-odd nuclei of Pb, Bi, Po, At, Rn, and Fr isotopes assuming ^{208}Pb as a doubly magic core. As for single-particle orbitals, one major shell with the six single-particle orbitals, $0h_{9/2}$, $1f_{7/2}$, $0i_{13/2}$, $2p_{3/2}$, $1f_{5/2}$ and $2p_{1/2}$, are taken between the magic numbers 82 and 126, and the seven single-particle orbitals, $1g_{9/2}$, $0i_{11/2}$, $0j_{15/2}$, $2d_{5/2}$, $3s_{1/2}$, $1g_{7/2}$, and $2d_{3/2}$ are taken over the magic number 126. As for a phenomenological interaction, one set of the interaction strengths, which consists of the multipole-paring interactions including the monopole pairing and quadrupole-quadrupole interactions, is employed for all the nuclei considered. The energy spectra and electromagnetic properties are calculated and compared with the experimental data. In this region, the high-*j* orbitals like the $0i_{13/2}$ and $0j_{15/2}$ orbitals play an important role for nuclear structure. We discuss contributions from these intruder orbitals. In addition, several typical isomers are investigated.