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Two-major shell-model effective Hamiltonian from in-medium similarity renormalization group approach

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In the past decade, many efforts have been made in the ab initio nuclear calculations. Nowadays, the capability of ab initio many-body calculations has reached to the mass number 100 region. The calculation methods which are available for the medium-mass region such as coupled-cluster method, self-consistent Green's function method, and in-medium similarity renormalization (IM-SRG) are usually limited the applications to closed-shell nuclei. The combination of the IM-SRG and conventional shell-model calculation is one of the powerful tools to access the open-shell systems. In this framework, the effective Hamiltonian for the shell-model calculations is obtained through the IM-SRG so that the valence-space Hamiltonian is decoupled with the core and outside of the valence space. So far this framework was mainly applied for the single major-shell valence space problem. However, we obviously need the two (or multi) major-shell effective Hamiltonian to investigate the unnatural parity states, excitation spectra for doubly magic nuclei (¹⁶O, ⁴⁰Ca, ...), and exotic region such as the island of inversion. In this talk, we will present how to calculate the two-major shell-model effective Hamiltonian in the IM-SRG framework and show the numerical results with them.

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