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Can we perturbatively expand the $\hat{Q}$-box in the Bloch-Horowitz Hamiltonian? GENKI SHIMIZU, Department of physics, the University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo, Japan, KAZUO TAKAYANAGI, Department of Physics, Sophia University, 7-1 Kioi-cho, Chiyoda-ku, Tokyo 102, Japan, TAKAHARU OTSUKA, Department of physics, the University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo, Japan — In nuclear many-body problems, it is impossible to diagonalize the Hamiltonian directly because of the huge Hilbert space. We introduce, therefore, the concept of the effective interaction. We first partition the whole Hilbert space into the model space of tractable size and its complement, and then look for the effective Hamiltonian defined in the model space that reproduces exact eigenenergies and model space projections of the corresponding eigenstates. Effective Hamiltonians are categorized into energy-independent and energy-dependent groups. The energy-independent effective Hamiltonian has been calculated by iterative methods, and has been used widely for a long time. The energy-dependent effective Hamiltonian is known as the Bloch-Horowitz (BH) Hamiltonian. Though it requires a self-consistent solution, it can, in principle, give all the eigenenergies of the Hamiltonian, if provided with the exact BH Hamiltonian. In actual calculations, however, we can calculate the $\hat{Q}$-box only up to a finite order of perturbation expansion. In this work, we clarify its convergence condition and examine what we can obtain with the approximate BH Hamiltonian, and what we cannot.

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