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Description of heavy nuclei within the Shell Model

The great challenge in the Shell Model framework is the diagonalization of the effective (generally two-body) Hamiltonian in the model space. Indeed, this is a huge task for open shell nuclei as the model space dimension grows combinatorially with the number of particles. I will present our recent development which allows to expand the applicability of the Shell Model into heavy nuclei by means of a generator coordinate method (GCM) based on constrained Hartree-Fock wave-functions after angular momentum projection. In particular, we have developed an efficient minimization technique that addresses the question of selecting relevant basis states in the GCM. Several applications in $N = Z$ heavy nuclei and in the Nobelium isotopes ($Z = 102$) will be presented.

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