Abstract Submitted
for the APR14 Meeting of
The American Physical Society

Study of nuclear clustering using the modern shell model approach[1] ALEXANDER VOLYA, Florida State University, YURY TCHUVIL'SKY, Lomonosov Moscow State University — Nuclear clustering, alpha decays, and multi-particle correlations are important components of nuclear dynamics. In this work we use the modern configuration-interaction approach with most advanced realistic shell-model Hamiltonians to study these questions. We utilize the algebraic many-nucleon structures and the corresponding fractional parentage coefficients to build the translationally invariant wave functions of the alpha-cluster channels. We explore the alpha spectroscopic factors, study the distribution of clustering strength, and discuss the structure of an effective 4-body operator describing the in-medium alpha dynamics in the multi-shell valence configuration space. Sensitivity of alpha clustering to the components of an effective Hamiltonian, which includes its collective and many-body components, as well as isospin symmetry breaking terms, are of interest. We offer effective techniques for evaluation of the cluster spectroscopic factors satisfying the orthogonality conditions of the respective cluster channels. We present a study of clustering phenomena, single-particle dynamics, and electromagnetic transitions for a number of nuclei in p-sd shells and compare our results with the experimentally available data.

[1]This work is supported by the U.S. Department of Energy under contract number DE-SC0009883.

Alexander Volya
Florida State University

Date submitted: 10 Jan 2014 Electronic form version 1.4