Contribution ID: **163** Type: **Oral talk (15 min + 5 min questions)**

POSSIBILITIES TO IMPROVE VARIATIONAL CALCULATIONS USING OSCILLATOR BASIS

Friday, 15 July 2022 10:00 (20 minutes)

Oscillator basis is widely used in nuclear structure studies, e. g., within *ab initio* No-Core Shell Model (NCSM) [1]. A problem faced by the NCSM calculations is an exponential grows of the many-body basis dimension and of the number of non-zero Hamiltonian matrix elements which restricts the accuracy of the results and the NCSM applicability to heavier nuclei. This difficulty can be overcome by using the complete Hamiltonian matrix up to some excitation quanta *N{max} and extending it to a larger excitation quanta* N'{max} by kinetic energy *T* matrix elements only (*T* extension). The *T* extension can be considered as a simplified version of the Symmetry-Adapted NCSM (SA-NCSM) [2] which utilizes the Sp(3,R) symmetry to extend the Hamiltonian matrix since T is one of the Sp(3,R) generator. The *T*-extended Hamiltonian matrix has an essentially smaller number of non-zero matrix elements and improves predictions for binding energies. The Hamiltonian matrix extended up to infinite *N'*_{max} in a channel that is supposed to dominate in the asymptotics of the wave function of bound state of interest, can be used to calculate the S matrix by means of the HORSE formalism [3] and to locate numerically its pole associated with the bound state that makes it possible to obtain a very accurate prediction for the binding energy and asymptotic normalization coefficient (ANC). The utilization of the complete HORSE formalism within the NCSM is impractical because it requires calculation of extremely large number of the NCSM eigenstates; however, one can use its simplified version SS-HORSE [4] to design an extrapolation technique for binding energies and ANC. An interesting and important convergence acceleration of the above approaches is the smoothing of potential energy matrix elements suggested in Ref. [5]. We illustrate the above possibilities using a model problem.

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The speaker is a student or young scientist

No

Section

1. Nuclear structure: theory and experiment

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