Notre Dame Science
Department of Physics

AB INITIO CONFIGURATION-INTERACTION CALCULATIONS IN SU(3)-SCHEME BASIS

Nuclear Seminar

Dr. Tomas Dytrych
Louisiana State University
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4:00 P.M. NSH 124

The predictive power of ab initio approaches to nuclear structure depends critically on the choice of a realistic nuclear potential, and on the ability of a finite model space to describe multifaceted properties of atomic nuclei emerging from the underlying nuclear forces. We use powerful algorithms of the computational group theory to perform ab initio configuration-interaction (CI) calculations in the model space spanned by SU(3) symmetry-adapted many-body configurations. We demonstrate that the results for the ground states of ^{6}Li, ^{7}Li, ^{12}C, and ^{16}O exhibit a strong dominance of low proton, neutron, and total intrinsic spins, and carry the same spatial deformations as the leading symplectic Sp(3,R) irreducible representations. We also find states dominated by the clustering correlations among the lowest lying 0_{+} eigenstates of ^{12}C and ^{16}O. Our findings imply that only a small fraction of the complete model space is needed to model nuclear collective dynamics, deformations, and clustering even if one uses a modern relistic interactions that do not preserve SU(3) symmetry. This in turn points to the importance of using a symmetry-adapted CI framework, one based on an LS coupling scheme with the associated spatial configurations organized according to deformation.

All interested persons are cordially invited to attend.