

Irreducible representations of $SU(3)$ for nucleons in a oscillator shell η with $\eta \leq 8$: Application to nuclei with proxy- $SU(4)$ symmetry

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Abstract

Applying some simple rules, established in group theory literature, generated are codes (easy to modify as required) for obtaining $SU(3)$ irreducible representations (irreps) for a given number of nucleons in a given oscillator shell η with $\eta \leq 8$. In this approach, first the $SU(3)$ irreps are obtained for spinless fermions in a η shell. Using the codes developed, tables of $SU(3)$ irreps are generated for identical nucleons (protons or neutrons) with a given total spin S . Similarly, the $SU(3)$ irreps are generated for nucleons with a given spin-isospin $SU(4)$ irrep. Some applications of these tables for $\eta = 3$ and 4 shells for nuclei with proxy- $SU(4)$ symmetry will be presented. Also, the procedure used for shell model $SU(3)$ limits is easy to be extended for the $SU(3)$ limit of various interacting boson models and examples for these also will be presented.