

Shell-model Fermi gas calculations of nuclear level densities

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ABSTRACT: One of the basic theoretical approaches to nuclear level densities is Bethe's Fermi gas prescription. I investigate this in the context of the interacting shell-model. Using large-scale diagonalization I can compute numerically the exact level density; then, starting from a deformed Hartree-Fock state computed in the same model space and with the same interaction, I derive mean-field single-particle energies. When I add in rotational energy, again computed directly from the Hartree-Fock state using the same interaction, I get very good agreement. This suggests the possibility of a simple yet "ab initio" approach to level densities, as long as one uses the correct interaction.