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Detailed spectroscopic studies around 132Sn at Legnaro

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The strong nuclear force binds the nucleons inside the nucleus and drives the emergence of nuclear structure properties. A rare fraction of nuclei, coined as "magic", exhibit enhanced stability and play a crucial role in nuclear sciences and related fields. This enhanced stability can be related, within an approximate mean-field description, to the existence of a large energy gap between fully occupied and fully empty single-particle orbitals. Recent experimental achievements in nuclei with a large neutron to proton imbalance have revealed significant changes in energy gaps associated with several traditional magic numbers. The precise mechanism behind this evolution remains elusive, because of the complex interference between the various components (e.g. central, spin-orbit, and tensor) entering two- and three-nucleon interactions. Still, the spin-orbit component is known to play a crucial role in the creation of most of the magic gaps via the energy splitting it induces between so-called spin-orbit partner states carrying the same orbital angular momentum but opposite intrinsic spins. The global evolution of spin-orbit splittings as a function of the nuclear mass usually follows a simple trend easily explained via the action of the spin-orbit interaction. However, this trend contains thus far few data points and deviations to it are important to single-out specific effects of the nuclear force, such as the density-dependence of the SO force between 36S and the bubble nucleus 34Si.

One of the organizers asked me to focus on future opportunities at Legnaro. Thus, in this short presentation, I propose to remind the known experimental situation about the determination of the N=82 shell gap in 132Sn and its possible evolution by adding neutrons, as well as what is known on the neutron SO splittings and their influence by the proximity of the continuum there. I assume that someone else will cover opportunities at N=50.

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