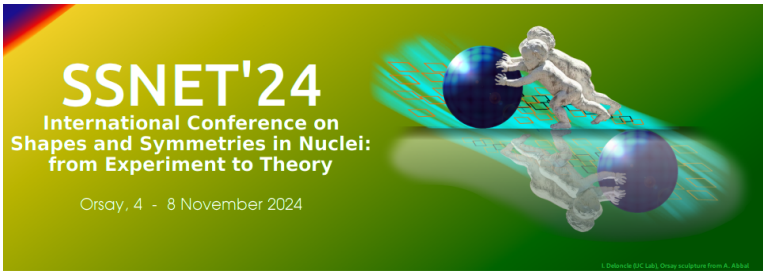

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New insights on origin and evolution of nuclear magicity far from stability

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The stability of nuclei has traditionally found explanation through the concept of magic numbers, comprehensively elucidated by the interplay of central and spin-orbit interactions. However, as we venture into the domain of unstable nuclei, these foundational ingredients begin to exhibit limitations. Roughly two decades ago, the tensor interaction was introduced as an attempt to address these limitations, yet it might not fully capture the dynamic evolution of nuclear magicity within specific mass regions, prompting the search for missing universal mechanisms.
We introduce a novel perspective where the Dirac mass kinetic term, which stems from the distinctive participation of a spin-0 boson in the nuclear strong force, plays a pivotal role in generating the nuclear shell structure. Namely, the combination of the Dirac mass kinetic term with the spin-orbit term redefines magic numbers both in stable and exotic nuclei. The identification of this mechanism allows to provide a broad understanding of the origin and evolution of nuclear magic numbers.

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