Contribution ID: **92** Type: **Invited talk**

EXOTIC NUCLEI: THE ^{78}Ni REGION (ZOOM)

Tuesday, 1 August 2023 09:00 (30 minutes)

In this contribution,
I will expose microscopic nuclear structure calculations for exotic nuclei far from stabilitity in the vicinity of ^{78}Ni, in a key region needed for understanding nucleosynthesis paths of gold and some of the most heavy elements.
Our recent algebraic Nilsson SU3 self-consistent model[1] will be used to describe the intruder relative evolution in the vicinity of ^{78}Ni. The spectroscopy of the exotic nucleus ^{78} performed at the RIKEN-RIF laboratory in Japan has been published in Nature [2]. The results support the doubly magic character N=50, Z=28, of the heaviest nickel isotope, that is spherical in its ground state. In addition they have detected the presence at very low energy (2.5 MeV) of another facet of the same nucleus which is radically different, characterized by its spheroidal shape. This atypical phenomenon of coexistence, more germane to molecular systems, was predicted by the Configuration-Interaction (LSSM) calculations of the Strasbourg-Madrid collaboration in 2016 [3].
The model predicts as well the vanishing of the magic closure at N=50 for the
more exotic isotones of Chromium and Iron which should be deformed in their ground states, leading to the idea of merging islands of collectivity from N=40 to N=50, as already observed from N=20 to N=28[4]. New cases of shape coexistence cases in the region will be discussed and interpreted with our newly developed DNO Shell Model approach employing beyond mean field techniques[5].
Finally we will briefly expose some of the latest developments for exotic nuclei far from stabilitity at the N=Z line[6] and new theoretical calculations for the very region of ^{80}Zr.

[1] A. P. Zuker et al., Phys. Rev. C 92, 024320 (2015)
[2] R. Tanushui et al., Nature 569, 53-58 (2019)
[3] F. Nowacki, A. Poves, E. Caurier, B. Bounthong, Phys. Rev. Lett. 117, 272501 (2016)
[4] F. Nowacki, A. Obertelli, A. Poves, Prog. Part. Nuc. Phys. 120, 103866 (2021)
[5] D. D. Dao and F. Nowacki, Phys. Rev. C \textbf{105}, 054314 (2022).
[6] D. D. Dao, F. Nowacki, A. Poves in preparation

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Session Classification: Shell structure around 78Ni isotope