# Odd nuclei in nuclear DFT*

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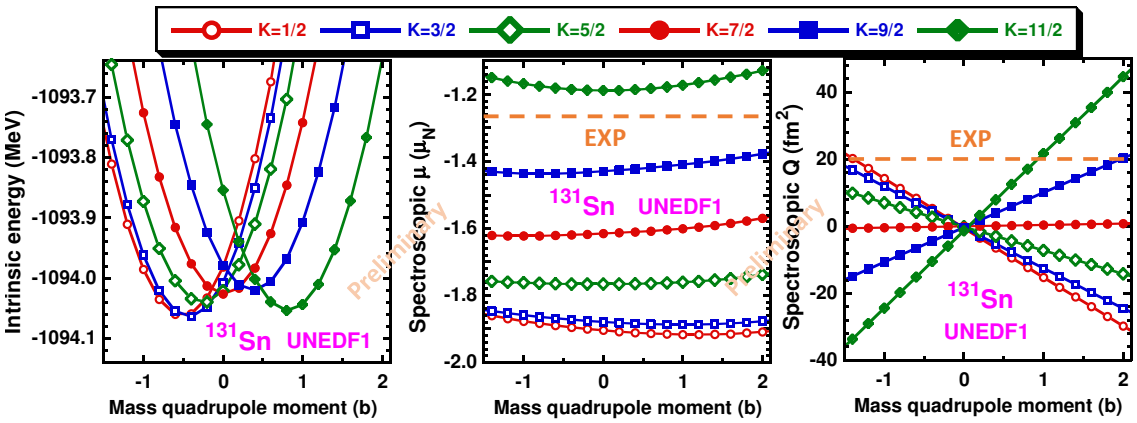
About half of the nuclei in nature have odd particle numbers; however, in the past nuclear-DFT applications, odd nuclei were considered much less frequently than even-even ones. As a result, in building the nuclear-DFT functionals, the existing wealth of experimental information on odd systems was virtually unused. In this talk, I will review the challenges in describing odd nuclei in nuclear DFT and show results obtained in the unpaired odd near doubly magic nuclei [1], heavy paired odd open-shell nuclei [2,3], and in indium [4,5], silver [6], tin [7], and dysprosium [8] isotopes. In particular, as shown in the Figure for the $1h_{11/2}$ hole state in $^{131}$Sn, I will discuss different aspects of occupying and mixing the deformed sub-orbitals (Nilsson states) characterised by the projections $K$ of the angular momentum on the intrinsic axial-symmetry axis.




[1] P.L. Sassarini *et al*, J. Phys G **49** (2022) 11LT01
[2] J. Bonnard *et al*, Phys. Lett. **B843** (2023) 138014
[3] H. Wibowo *et al*, to be published
[4] A.R. Vernon *et al*, Nature **607** (2022) 260; A.R. Vernon *et al*, to be published
[5] L. Nies *et al*, Phys. Rev. Lett. **131** (2023) 022502
[6] R.P. de Groote *et al*, to be published
[7] T.J. Gray *et al*, to be published; J. Dobaczewski *et al*, to be published
[8] J. Dobaczewski *et al*, to be published

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