Contribution ID: **83**　　　　Type: **Invited (In person)**

Nuclear DFT electromagnetic moments in heavy deformed open-shell odd nuclei

Thursday 30 November 2023 14:00 (25 minutes)

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.

Nuclear electromagnetic moments provide essential information in our understanding of nuclear structure. Observables such as electric quadrupole moments are highly sensitive to collective nuclear phenomena, whereas magnetic dipole moments offer sensitive probes to test our description of microscopic properties such as those of valence nucleons. Although great progress was achieved in the description of electromagnetic properties of light nuclei and experimental trends in certain isotopic chains, a unified and consistent description across the Segré chart of nuclear electromagnetic properties remains an open challenge for nuclear theory.

In our nuclear-DFT methodology, we align angular momenta along the intrinsic axial-symmetry axis with broken spherical and time-reversal symmetries. We fully account for the self-consistent charge, spin, and current polarizations, in particular through the inclusion of the crucial time-odd mean-field components of the functional. Spectroscopic moments are then determined for symmetry-restored wave functions without using effective charges or effective g-factors and compared with available experimental data.

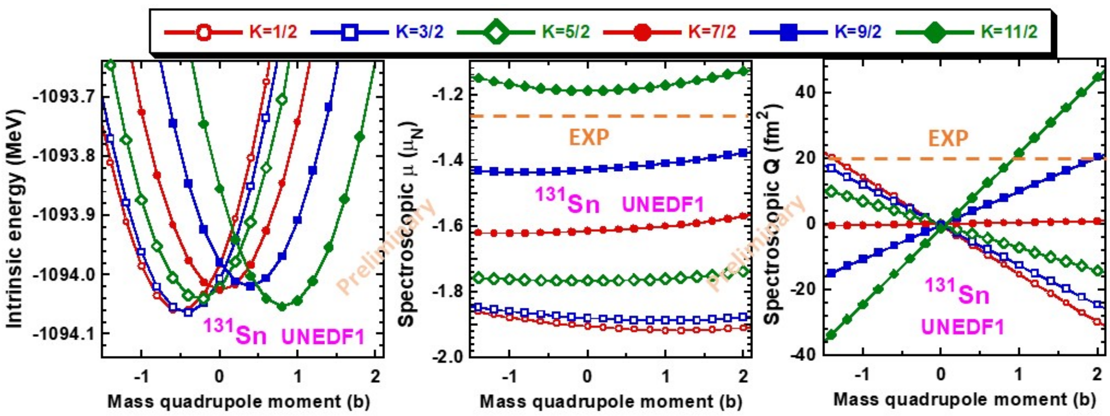

Figure 1: Properties of the the $1h_{11/2}$ hole state in ^{131}Sn

In this talk, I will review the DFT description of nuclear electromagnetic moments and illustrate it with the results obtained in the unpaired odd near doubly magic nuclei [1], heavy paired odd open-shell nuclei [2,3], and in indium [4], silver [5], tin [6], dysprosium [7], and potassium [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. B **843** (2023) 138014

[3] H. Wibowo *et al.*, to be published
[4] A.R. Vernon *et al.*, Nature **607** (2022) 260; L. Nies *et al.*, Phys. Rev. Lett. **131** (2023) 022502; A.R. Vernon *et al.*, to be published; J. Karthein *et al.*, to be published
[5] R.P. de Groote *et al.*, to be published
[6] T.J. Gray *et al.*, arXiv:2310.11980
[7] J. Dobaczewski *et al.*, to be published
[8] A. Nagpal *et al.*, to be published

Authors: DOBACZEWSKI, Jacek; BACKES, Betânia; BENDER, Michael; BONNARD, Jérémy; DANNEAUX, Gauthier; GARCIA RUIZ, Ronald; DE GROOTE, Ruben; KORTELAINEN, Markus; MUIR, David; NAGPAL, Anu; NAZAREWICZ, Witold; SÁNCHEZ-FERNÁNDEZ, Adrian; SASSARINI, Paolo; SATUŁA, Wojciech; SUN, Xuwei; WIBOWO, Herlik; WOOD, John

Presenter: DOBACZEWSKI, Jacek

Session Classification: Ground state properties