ID de Contribution: **9** Type: **Non spécifié**

Nuclear DFT magnetic dipole moments in odd near doubly-magic nuclei

mercredi 14 mai 2025 09:00 (30 minutes)

The study of nuclear electromagnetic moments plays a crucial role in understanding the structure of atomic nuclei [1]. While the electric quadrupole moments in atomic nuclei indicate nuclear deformation and collectivity, the magnetic dipole moments are sensitive to the single-particle properties of valence nucleons. In our nuclear DFT methodology, the intrinsic electric quadrupole and magnetic dipole moments in odd nuclei are generated by the self-consistent shape and spin core polarization effects induced by the unpaired nucleon. The spectroscopic moments of angular-momentum-projected wave function are determined and compared with available experimental data without introducing effective charges and g-factors. We have applied our methodology to calculate the spectroscopic moments in heavy deformed open-shell odd nuclei in several regions of the nuclear chart [2, 3, 4].

In contrast to the predicted quadrupole moments that generally reproduce the data very well, the calculated magnetic dipole moments may deviate from the data sometimes by a significant amount. To improve the agreement with the data, following Refs. [5, 6], we extended the one-body magnetic dipole moment operator used in the nuclear DFT by two-body terms derived from the meson-exchange currents. We have incorporated these terms into our recent calculations for the odd-nuclei around eight doubly magic nuclei (^{16}O, ^{40}Ca, ^{48}Ca, ^{56}Ni, ^{78}Ni, ^{100}Sn, ^{132}Sn, and ^{208}Pb). This talk will focus on the spectroscopic magnetic dipole moments in the vicinity of doubly-magic ^{78}Ni, ^{100}Sn, and ^{132}Sn nuclei, which are the main interests of the gSPEC collaboration [7].

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Author: WIBOWO, Herlik (Department of Physics, University of York)

Co-auteurs: Dr HAN, Rui (Department of Physics, University of Jyväskylä, Finland); Mlle CAMILLE BACKES, Betania (School of Physics, Engineering and Technology, University of York, UK); Prof. DOBACZEWSKI, Jacek (School of Physics, Engineering and Technology, University of York, UK); Prof. KORTELAINEN, Markus (Department of Physics, University of Jyväskylä, Finland)

Orateur: WIBOWO, Herlik (Department of Physics, University of York)

Classification de Session: Session 7