Contribution ID: **504** Type: **Oral Presentation**

Theoretical studies of chiral systems described within particle-rotor model

Friday 11 July 2025 09:40 (20 minutes)

Chirality in nuclear systems requires an aplanar orientation of the total angular momentum and stable triaxial nuclear shape is needed [1-2]. It is expected that the angular momenta of an odd particle and an odd hole (both occupying high-j orbitals) are aligned predominantly along the short and the long axes of the nucleus respectively, whereas the collective rotation occurs predominantly around the intermediate axis of a triaxially deformed nucleus to minimize the total energy of the system. Experimentally one observes $\Delta I = 1$ rotational partner bands built on two- or multi-quasiparticle configuration. Multiple chiral bands (MχD) with different or same nucleon configuration can indeed form in a single nucleus, as theoretical calculations show (e.g., 3-5]), and experimental data suggest (e.g., [6-8]).
Investigations using the particle-rotor model have shown that the fingerprints of chirality in the two-quasiparticle system can occur in an idealised model description, where an odd proton and an odd neutron are restricted to one orbital each located at the lowest- and highest-energy orbitals or vice versa of a high-j shells [9-10]. For systems with many-quasiparticles, the calculations showed that nuclear chirality can also persist [11-13].
The present work reports on the review of theoretical studies of chiral systems performed using two-quasiparticle-rotor [14] and many-particle-rotor [15] models in different mass regions.

[1] S. Frauendorf, J. Meng, Nucl. Phys. A617, 131 (1997)
[2] S. Frauendorf, Rev. Mod. Phys. 73, 463 (2001).
[3] T. Koike et al., Phys. Rev. C 67, 044319 (2003).
[4] S. Wang, et al., Phys. Rev. C 74, 017302 (2006).
[5] B. Qi et al., Phys. Rev. C 98, 014305 (2018).
[6] T. Roy et al., Phys. Lett. B 782, 768 (2018).
[7] C. M. Petrache, et al., Phys. Rev. C 97, 041304(R) (2018).
[8] C. Liu, et al., Phys. Rev. Lett. 116, 112501 (2016).
[9] E. A. Lawrie and O. Shirinda, Phys. Lett. B 689(2-3), 66 (2010).
[10] O. Shirinda and E. A. Lawrie, Eur. Phys. J. A 48(9), 118 (2012).
[11] O. Shirinda, E. A. Lawrie, and B. G. Carlsson, Acta Phys. Pol. B 44(3), 341 (2013).
[12] O. Shirinda and E. A. Lawrie, Eur. Phys. J. A 52(11), 344 (2016).
[13] O. Shirinda and E. A. Lawrie, Acta Phys. Pol. B Proc. Suppl. 11(1), 149 (2018)
[14] P.B. Semmes and I. Ragnarsson, AIP Conf. Proc. No. 259, p.566 (1992)
[15] B.G. Carlsson and I. Ragnarsson, Phys. Rev. C74, 044310 (2006).

Apply for student award at which level:

None

Consent on use of personal information: Abstract Submission

Yes, I ACCEPT

Primary author: Dr SHIRINDA, Obed (Sol Plaatje University)

Co-author: Dr LAWRIE, Elena Atanassova (iThemba LABS)

Presenter: Dr SHIRINDA, Obed (Sol Plaatje University)

Session Classification: Nuclear, Particle and Radiation Physics-1

Track Classification: Track B - Nuclear, Particle and Radiation Physics