

Characteristics of **two-quasiparticle chiral bands**

O. Shirinda^{1,2}, E.A. Lawrie¹

¹Department of Nuclear Physics, iThemba LABS, P.O. Box 722, Somerset West 7129, South Africa

²Department of Physics, University of the Western Cape, Private Bag X17, Bellville 7535, South Africa

Nuclear chiral symmetry is suggested to occur in the angular momentum space. The necessary condition for such a system to form is an aplanar orientation of the total angular momentum, i.e. the total angular momentum should point out of the planes defined by any two of the major nuclear axes [1, 2]. For a two quasiparticle configuration an aplanar orientation of the total angular momentum could be achieved if the nuclear shape is triaxial and if one of the quasiparticles has a predominant particle nature, while the second one – a predominant hole nature. In that case the angular momentum of the particle will be oriented along the short nuclear axis, that of the hole – along the long nuclear axis, and the angular momentum of the rotating core – along the intermediate axis. We have examined the properties of such systems using the two-quasiparticle-plus-triaxial-rotor model codes of P.B. Semmes and I. Ragnarsson [3].

We found that degeneracy in all properties of the chiral bands can be reached. However, it occurs only if the nucleon configuration is restricted, i.e. the particle and the hole configurations space spans only the lowest and the highest orbitals of a high-j shell. In nuclei such a restriction on the nucleon configuration is unlikely to be realistic. The results, obtained for a symmetric nucleon configuration in the 130 mass region, with both the proton and neutron occupying $h_{11/2}$ orbitals, were reported in Ref. [4].

In this contribution we will discuss: (i) conditions for reaching degeneracy in chiral bands not only in the 130, but also in the 100 and 190 mass regions, where the nucleon configuration is asymmetric, (ii) the impact of the change of the proton and neutron Fermi levels, and (iii) the effect of changing the nuclear (deformation. Other characteristics of chiral bands were also examined and the results will be presented.

References:

- [1] S. Frauendorf and J. Meng, Nucl. Phys. **A 617**, 131 (1997)
- [2] S. Frauendorf, Rev. Mod. Phys. **73**, **463** (2001)
- [3] P.B. Semmes and I. Ragnarsson, AIP Conf. Proc. **259**, 566 (1992)
- [4] E.A. Lawrie and O. Shirinda, Phys. Lett. B **689**, 66-71 (2010)