

Microscopic description of proton emission from deformed odd-odd nuclei

Monika Patial*

Department of Physics, KTH (Royal Institute of Technology), SE-10691 Stockholm, Sweden

Proton decay in the exotic nuclei near proton drip-line, mostly takes place from the continuum of energy spectrum which has single-particle character due to the Fermi level being closer to the continuum [1, 2]. We can study the physics of these nuclei through the decay width which provides relevant information about the deformation and we can infer the details of amplitudes of wave functions of the decaying state. The details for these wave functions can vary for different mean field potentials as they lead to different ordering of single-particle levels. In this work we have considered the Woods Saxon potential in the two quasi-particle plus rotor model [3] which includes the effect of deformation in its central and spin-orbit part.

In my talk I will discuss the microscopic calculations for proton emission based on the non-adiabatic quasiparticle approach for deformed odd-odd proton emitters, which can be considered as the most consistent theoretical approach for deformed proton emitters [4, 5]. The justification of the formalism will be given by explaining ground state band of ^{180}Ta , including the observed odd-even staggering. The details for calculating the decay widths for proton emission will be presented with the systematic way of identifying relevant states in the daughter and parent nuclei. The proton emission from the decaying state $I^\pi = 1^+$ state in ^{130}Eu , is confirmed after analysing all probable combinations of spin and parity for the parent nucleus. The residual neutron-proton interaction could influence the effect of Coriolis interaction and such effects can significantly modify the proton emission half-lives. This study provides us with an opportunity to look into the details of wavefunctions of deformed odd-odd nuclei to which the proton-emission half-lives are quite sensitive.

References

- [1] L.S. Ferreira and E. Maglione, Phys. Rev. Lett. **86**, 1721 (2001).
- [2] E. Maglione, L. S. Ferreira, and R. J. Liotta, Phys. Rev. Lett. **81**, 538 (1998).
- [3] A.K. Jain, J. Kvasil, R. K. Sheline and R. W. Hoff, Phys. Rev. C **40**, 432 (1989).
- [4] M. Patial, P. Arumugam, A.K. Jain, E. Maglione and L. S. Ferreira, Phys. Lett. B **718**, 979 (2013).
- [5] M. Patial, P. Arumugam, A.K. Jain, E. Maglione and L. S. Ferreira, Phys. Rev. C **88**, 054302 (2013).

*Electronic address: monikapatial@gmail.com