Contribution ID : **20** Type : **Short Contribution**

Symmetry unrestricted Skyrme mean-field study of heavy nuclei

Friday, 29 January 2016 17:00 (20)

In the light of recent experimental developments, increasing attention is devoted to nuclear phenomena related to rotational excitations of more exotic intrinsic nuclear configurations that often lack certain symmetries often present in the majority of nuclei. Examples include configurations with a non-vanishing octupole moment.
In order to describe this kind of states, we have developed a new method for self-consistent mean-field calculations, using effective Skyrme interactions in a coordinate-space representation. The code is based on the same principles as the EV8 code [1], but all symmetry assumptions assumed in EV8 (e.g. parity) can be individually relaxed. Another important generalisation is the replacement of the HF+BCS by the full machinery of Hartree-Fock-Bogoliubov transformations.
Another important aspect is that the code is fully equipped to deal with a large number of effective Skyrme interactions, which have been fitted in a multitude of different ways over the years [1]. To the best of our knowledge, there is at present only one other code that offers the same flexibility for self-consistent mean-field calculations [5], and which differs from ours by expanding the single-particle wave functions on an oscillator basis.
The first applications of this method are presently under investigation. The first one concerns the tilted axis cranking in the rare earth region which necessitates the breaking of both time-reversal and at least one spatial symmetry.
A second application concerns the octupole deformed nuclei in the A=220 region. We will address low-lying non-collective states in even and odd Ra isotopes, for which data are available and also odd-A Fr isotopes for which detailed experiments are planned in the near future.

References

[1] P. Bonche, H. Flocard, P.-H. Heenen, Comp. Phys. Comm. 171 (2005) 49;
W. Ryssens, V. Hellemans, M. Bender, P.-H. Heenen, Comp. Phys. Comm. 187 (2015) 175.
[2] P. Bonche, P.-H. Heenen, H. Flocard, D. Vautherin, Phys. Lett. B 175 (1986), 387.
[3] P. Bonche, H. Flocard, P.-H. Heenen, Nucl. Phys. A 467 (1987) 115.
[4] B. Gall, P. Bonche, J. Dobaczewski, H. Flocard, P.-H. Heenen, Z. Phys. A 348 (1994) 183.
[5] J. Dobaczewski et al, Comp. Phys. Comm. 180 (2009) 2361.

Summary

We will present the principle behind the new MOCCa code, capable of doing Skyrme mean-field calculations for a multitude of different symmetry assumptions. First applications include the description of tilted axis cranking in the rare earth region, as well as octupole deformed nuclei in the A=220 region.

Primary author(s) : Mr BENDER, Michael (CENBG Bordeaux-Gradignan); Prof. HEENEN, Paul-Henri (ULB); Mr RYSSENS, Wouter (ULB)

Presenter(s) : Mr RYSSENS, Wouter (ULB)

Session Classification : Friday Afternoon

Track Classification : Nuclear Structure and Astrophysics