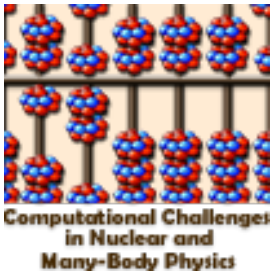

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Coupled channel analysis in nuclear structure

Nuclear structure is better understood in terms of interacting building blocks.
As the first example we discuss the coupled channel Quasiparticle Random Phase Approximation (ccQRPA) for even-even deformed nuclei [1]. The basic building blocks are particle states coupled with the Wigner function to a given total spin.
In this way, we are able to describe collective excitations in deformed nuclei by using building blocks with good angular momentum in the laboratory system.
We obtain a system of coupled QRPA equations with different multipolarities.
An application to E2 transitions shows a significant improvement for the well deformed region in comparison to the standard QRPA. Several applications are proposed.
As a second example we describe electromagnetic and alpha transitions in even-even nuclei by using a common approach for spherical, transitional and deformed nuclei [2].
We use projected coherent states to describe the structure of daugher nuclei and a quadrupole-quadrupole alpha-core interaction to compute decay widths to excited states.
It turns out that the strength of this interaction, reproducing alpha trasitions to 2^+ states, is proportional to the clustering probability. Predictions for electromagnetic
and alpha transitions to excited state are made for all available even-even emitters.
The coupled channel analysis for unfavored alpha transitions in odd mass nuclei is proposed as a promising tool to investigate nuclear structure by the using both spectroscopic and alpha decay data.
[1] D.S. Delion, J. Suhonen, Physical Review C87, 024309 (2013).
[2] D.S. Delion, A. Dumitrescu, Physical Review C87, 044314 (2013).

Primary author: Prof. DELION, Doru S. (Horia Hulubei National Institute of Physics and Nuclear Engineering, POB MG-6, Bucharest, Romania)

Co-authors: Mr DUMITRESCU, Alexandru (Horia Hulubei National Institute of Physics and Nuclear Engineering, POB MG-6, Bucharest, Romania); Prof. SUHONEN, Jouni (Department of Physics, University of Jyvaskyla , POB 35, FIN-40351, Jyvaskyla , Finland)

Presenter: Prof. DELION, Doru S. (Horia Hulubei National Institute of Physics and Nuclear Engineering, POB MG-6, Bucharest, Romania)