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Status of the QRPA Boson expansion method

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The determination of the nuclear level densities is of particular importance in a large number of nuclear applications. They indeed govern the decay process from the compound nucleus and are mandatory when dealing with capture cross sections. For decades, theoretical estimates of nuclear level densities have relied on phenomenological models whose parameters are fitted to experimental data. Such adjustments respond to the high accuracy needed for many nuclear applications, but their predictive power is questionable in particular for nuclei far from the mass regions where data are available.

Microscopic approaches, in particular the combinatorial ones, have shown their ability to provide nuclear level densities with a degree of accuracy comparable with the best phenomenological models. In the present project, we propose to estimate nuclear level densities on the basis of two distinct sound and reliable models, namely the combinatorial one and the QRPA-Boson Expansion approach. Both models make use of nuclear ingredients estimated within the non-relativistic Hartree-Fock-Bogolyubov model (HFB). The first one is based on triaxial-deformed HFB solutions obtained using a Skyrme effective interaction and the second one on QRPA predictions based on axially deformed HFB solutions using the D1M Gogny effective interaction.

The status of the developments around the QRPA-Boson Expansion approach will be presented.

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