DÃ©partement de Physique NuclÃ©aire
SÉMINAIRE

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Microscopic description of radioactivity : from cluster states to 2 α decay

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Among the various approaches to the nuclear many-body problem, a covariant formulation of the energy density functional (cEDF) method has proven able to successfully describe both quantum liquid-like and cluster-like properties of atomic nuclei (nature of the excited states, energy/radius of the ground/excited states, transition probability, ...).Â Emission processes such as fission and cluster-radioactivity, interpreted as an extremely asymmetric fission process, were also extensively studied within the EDF framework. It provided both a qualitative understanding and a quantitative description of these decay modes.Â

On the other hand, a microscopic description ofÂ α-radioactivity was missing, until itsÂ recent formulation within the cEDF framework, where it appears as an evenÂ more extremely asymmetric fission process. The α-decay properties of the mid-mass nuclei ^{108}Xe and ^{104}Te were tackled using the cEDF machinery and found to be consistent with the experimental data. The cEDF approach thus provides a powerful framework not only for tackling nuclear structure features, but also for describing, in a unified way, the various processes by which a nucleus is emitted, from α and cluster radioactivities to fission.Within this frame, a new exotic radioactive mode was recently predicted, under the form of two α-particles emitted back-to-back. The corresponding lifetime was computed for two different nuclei and found to be close to whatÂ is observed for cluster-radioactivity. Therefore,Â the confirmation or refutation of the existence of a two-α decay-mode could be amenable to current experimental investigations.

Le cafe sera servi 10 minutes avant
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