ID de Contribution: **28** Type: **Non spécifié**

Status of the FIFRELIN code. Focus on angular momenta in fission

mercredi 22 juin 2022 10:20 (30 minutes)

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Angular momenta in fission can be discussed at different time steps of the process for different systems: incoming particle, target nucleus, compound nucleus at saddle, at scission for both nascent fission fragments, fission fragments before neutron emission, after neutron emission, before gamma/electron emission⋯
In the FIFRELIN code, up to now, we consider fission fragments (FFs) after full acceleration (before neutron emission). Fission fragments spins (JL and JH) are sampled through a statistical model following Bethe's original work: P(J)=(2J+1)/2σ2exp(−(J+1/2)/2σ2) where σ is the so-called spin cut-off parameter. Those two spins are correlated through the relative orbital angular momentum (L): JCN⟶=JL⟶+JH⟶+L⟶ where JCN⟶ is the total angular momentum of the fissioning system. There is no direct correlation between both FF spins because the orbital angular momentum related to both FFs is not accounted for in FIFRELIN code at the time being. They are sampled after introducing two free parameters (for rescaling the spin cut-off parameter for light and heavy fragment groups) in order to reproduce fission observables related to prompt neutrons and photons. However, this description can give rise to inconsistencies between the values of the nuclear level scheme, that is constructed from a combination between level density models and experimental low lying levels, and the spin values after scission. Finally, because the goal is to reproduce fission observables, a few model ingredients are strongly correlated and could hide some physical effects in angular momentum generation: pre-neutron data-dependent primary entry zone in (E, J, π), level densites, neutron transmission coefficients, photon strengths functions, electron conversion coefficients. All these 'key points'and potential 'shadow zones'will be discussed in the present work.

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Classification de Session: Fission modelling