Bifurcations in dissipative fermionic dynamics

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The Boltzmann-Langevin One-Body model (BLOB), is a novel one-body transport approach, based on the solution of the Boltzmann-Langevin equation in three dimensions; it is used to handle large-amplitude phase-space fluctuations and has a broad applicability for dissipative fermionic dynamics**[1]**.

We study the occurrence of bifurcations in the dynamical trajectories describing nuclear reactions at Fermi energies. The model, applied to the transition from fusion to fragmentation in dilute systems formed in central collisions at Fermi energies, reveals to be closer to the observation than previous attempts to include a Langevin term in Boltzmann theories.

The onset of bifurcations and bimodal behavior in dynamical trajectories, reflects in the fragment formation mechanism. At the transition energy, fluctuations between two energetically favourable mechanisms stand out, so that evolving from the same initial conditions, either the system reverts to a compact shape, or splits into several pieces of similar sizes.

This result gives quantitative indications about two interconnected aspects. First, the fusion-to-multifragmentation threshold in central heavy-ion collisions at Fermi energies can be described and

compared to new experimental measurements**[2]**. Second, this scenario is compatible with recent experimental findings**[3]** of bimodal distributions for observables characterising fragmentation processes.

[1] P. Napolitani and M. Colonna, arXiv:1302.0241 (2013); J. Rizzo, Ph. Chomaz and M. Colonna, Nucl. Phys. A806, 40 (2008).

[2] F. Gagnon-Moisan et al. (INDRA coll.), Phys. Rev C 86, 044617 (2012).

[3] E.Bonnet et al. (INDRA coll.), Physical Review Letters 103, 072701 (2009); M. Pichon et al. (INDRA coll.), Nucl. Phys. A779, 267 (2006) 267.