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Dissipative models of spontaneous wave-function collapse

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Collapse models explain the absence of quantum superpositions at the macroscopic scale, while giving practically the same predictions as quantum mechanics for microscopic systems [1,2,3]. A well-known problem of the original models is the steady and unlimited increase of the energy induced by the collapse noise. In this talk, I discuss two recently introduced collapse models [4,5], which guarantee a finite energy during the entire system's evolution, while preserving the specific features any collapse model must have. The first model is a generalization of the Ghirardi-Rimini-Weber model [2,4]: here, the wavefunction undergoes instantaneous localization processes, distributed in time according to a Poisson process. In the second model [3,5], which also applies to identical particles, the collapse noise modifies continuously the wavefunction, inducing a diffusive localization process. We define new localization operators, which depend on the momentum of the system and thus introduce dissipation in the dynamics, leading to an exponential relaxation of the energy to a finite value. Such a finite value is naturally associated with a finite temperature of the collapse noise and, remarkably, the models are effective even in the presence of a low temperature noise.

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