

Quantum Physics

Non-Markovian dynamics for a free quantum particle subject to spontaneous collapse in space: general solution and main properties

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We analyze the non-Markovian dynamics of a quantum system subject to spontaneous collapse in space. After having proved, under suitable conditions, the separation of the center-of-mass and relative motions, we focus our analysis on the time evolution of the center of mass of an isolated system (free particle case). We compute the explicit expression of the Green's function, for a generic Gaussian noise, and analyze in detail the case of an exponential correlation function. We study the time evolution of average quantities, such as the mean position, momentum and energy. We eventually specialize to the case of Gaussian wave functions, and prove that all basic facts about collapse models, which are known to be true in the white noise case, hold also in the more general case of non-Markovian dynamics.

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