

Transport of localized and extended excitations in a nonlinear Anderson model

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We study the propagation of electrons (or excitations) through a one-dimensional tight-binding chain in the simultaneous presence of nonlinearity and diagonal disorder. The evolution of the system is given by a disordered version of the discrete nonlinear Schrödinger equation. For an initially localized excitation we examine its mean square displacement (Formula presented) for relatively long times (Formula presented) for different degrees of nonlinearity. We found that the presence of nonlinearity produces a subdiffusive propagation (Formula presented) with (Formula presented) and depending weakly on nonlinearity strength. This nonlinearity effect seems to persist for a long time before the system converges to the usual Anderson model. We also compute the transmission of plane waves through the system. We found an average transmissivity that decays exponentially with system size (Formula presented) where γ increases with nonlinearity. We conclude that the presence of nonlinearity favo