

Fermionic and bosonic spectral walls in kink collisions

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A spectral wall is an obstacle in the dynamics of a bosonic soliton. It involves the formation of an arbitrary long-living stationary state due to the transition of a normal mode into the continuum spectrum. It appears when coupling the original bosonic model to other fields like other bosons, impurities, or fermions. This spectral wall can be experienced if the boson or fermion field is in an excited state. A spectral wall acts as an obstacle in the kinetic motion of a kink. It can be a long-range obstacle as modes may enter the continuum even at a considerable distance before the kink meets the other field or impurity. The wall is a selective obstacle experienced only if the pertinent mode is sufficiently excited. In the fermionic case, we have shown that, while passing through a spectral wall, an incoming kink-fermion bound state can be separated into purely bosonic kink, which continues to move to spatial infinity and a fermionic cloud that spreads in the region before the wall.