Kink dynamics and quantum simulation of supersymmetric lattice Hamiltonians

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We propose a quantum simulation of a supersymmetric lattice model using atoms trapped in a 1D configuration and interacting through a Rydberg dressed potential. The elementary excitations in the model are kinks or (in a sector with one extra particle) their superpartners - the skinks. The two are connected by supersymmetry and display identical quantum dynamics. We provide an analytical description of the kink/skink quench dynamics and propose a protocol to prepare and detect these excitations in the quantum simulator. We make a detailed analysis, based on numerical simulation, of the Rydberg atom simulator and show that it accurately tracks the dynamics of the supersymmetric model.

[1] Kink dynamics and quantum simulation of supersymmetric lattice Hamiltonians, Jiri Minar, Bart van Voorden and Kareljan Schoutens, arXiv:2005.00607