On the nonlinear response of a particle interacting with fermions in a 1D lattice

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By the Bethe ansatz method we study the energy dispersion of a particle interacting by a local interaction with fermions (or hard core bosons) of equal mass in a one dimensional lattice. We focus on the period of the Bloch oscillations which turns out to be related to the Fermi wavevector of the Fermi sea and in particular on how this dispersion emerges as a collective effect in the thermodynamic limit. We also discuss the adiabatic coherent collective response of the system to an applied field.