

# Are Friedel oscillations in one-dimensional Hubbard chains noninteracting v-representable?

Vieira, D.<sup>1</sup>

<sup>1</sup>*Centro de Ciências Naturais e Humanas, Universidade Federal do ABC, Brazil*

The widely known Kohn-Sham (KS) formalism of density-functional theory leads to a restriction on the density: it needs to be noninteracting v-representable. This is a direct consequence of considering the noninteracting kinetic energy functional, which, on the other hand, can allow computational simplicity by means of the KS equations. Friedel oscillations in one-dimensional (1D) model systems are known to suffer a  $2k_F - 4k_F$  crossover in the frequency as electronic interaction effects become more prominent. The current local density functionals which are applied to the 1D Hubbard model, however, are not seen to reproduce such a crossover, referring to a more fundamental question: Are the Friedel oscillations in such systems noninteracting v-representable? Or, is there an exchange-correlation potential which is able to correctly yield them? Finding an appropriate answer to both questions is our main task here, and by means of the exact many-body solution for small Hubbard chains, we show the answer to be positive.