Steady-state transport: From quantum dots to extended structures with electronic correlations

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The interest in nonequilibrium transport has stimulated a tremendous activity in developing numerical methods for the study of the steady-state regime. I will present results obtained by using the adaptive time-dependent density matrix renormalization group method, applied to (i) steady-state transport in the single-impurity Anderson model and (ii) transport through a 1D Mott insulator. Our main results for (i) are the I-V curve at half-filling, in the mixed-valence regime, and in the presence of a magnetic field. In the latter case, we focus on the dielectric breakdown of the Mott insulating state by coupling the interacting region to noninteracting leads. We find that the charge current takes a stationary value which this is not the case for, e.g., the internal interaction energy. We discuss this observation in terms of the time-scales necessary for the relaxation towards the stationary state.