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Superperturbation theory approach to thermoelectric transport in strongly correlated quantum dots

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The description of transport in correlated matter beyond the linear response regime is usually based on the semiclassical Boltzmann equation in the relaxation time approximation. Such an approach relies on the existence of well-defined quasiparticles which is not always warranted. Perturbative methods on the other hand are straightforwardly extended onto the Schwinger-Keldysh contour but often suffer from internal inconsistencies like non-conservation of the charge current away from particle-hole symmetry. We devise a superperturbation approach on the Schwinger-Keldysh contour to treat the transport through a quantum dot. This method is free of such issues as the non-conservation of the current and allows to study various transport properties at and away from particle-hole symmetry. Perturbative in nature, this approach is generalizable to more complex situations.