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## Perturbative Non-Equilibrium Thermal Field Theory

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In arXiv:1211.3152, we present a new perturbative formulation of non-equilibrium thermal field theory, based upon non-homogeneous free propagators and time-dependent vertices. The resulting time-dependent diagrammatic perturbation series are free of pinch singularities without the need for quasi-particle approximation or effective resummation of finite widths. Introducing a physically meaningful definition of particle number densities, we derive master time evolution equations for statistical distribution functions, which are valid to all orders in perturbation theory and to all orders in a gradient expansion. For a scalar model, we truncate these evolution equations in a loopwise sense, whilst still capturing the dynamics on all time-scales. We show that the early-time transient behaviour of this system is dominated by non-Markovian energy-violating processes.

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