

Diffusion of quantum particles: Rigorous renormalization group approach

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We consider a quantum particle interacting with a field of phonons at positive temperature. Under mild assumptions we prove that the particle diffuses in the long time limit, at small but fixed coupling strength. This result is achieved by a renormalization scheme in real space and time. The first step of this renormalization scheme consists in showing that, in the limit of vanishing coupling and for rescaled times, the particle motion is described by a quantum Boltzmann equation. Our result holds in dimension > 3 for non-equilibrium initial phonon states and > 2 for equilibrium initial phonon states. This is work in collaboration with A. Kupiainen building on earlier work (arXiv:0906.5178) with J. Fröhlich.