Beyond the Van Hove time scale

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Abstract: We study the effective time evolution of a finite level quantum system, induced by a linear coupling to a massless scalar quantum field. The massless spin-boson model is a prime example of such a system.

Using Bach-Fröhlich-Sigal Renormalization Group techniques, we construct the effective dynamics at any time scale. In particular, we recover the Davies generator at the van Hove time scale, but our analysis permits us to go beyond the van Hove timescale. A particular strength of our approach is that we do not have to impose a Fermi Golden Rule assumption.