

On Quantum Decoherence and Thermalization

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I present rigorous results on the standard model of decoherence involving a small quantum system interacting with the environment, with the latter described by a massless Bose or Fermi quantum field. In particular, I will describe a careful mathematical formulation of the problem and the connection of the decoherence and the quantum resonances of the Liouvillean dynamics of the total system, leading to estimates of the decoherence and thermalization times. If time permits I will describe use of the rigorous renormalization group in this problem.

The talk is based on the paper in preparation stemming from the joint work with G.Berman and M.Merkli ([1]–[4]).

[1] G. Berman, M. Merkli, I.M. Sigal. *Physical Review Letters* Vol. **98**, No.13, 30 March 2007.

[2] G. Berman, M. Merkli, I.M. Sigal. *Virtual Journal of Quantum Information*, *Annals Physics*, **323**(2) 373–412, 2008.

[3] G. Berman, M. Merkli, I.M. Sigal. *Adv Math Phys* Vol. 2010, Article ID 169710, 2010.

[4] G. Berman, M. Merkli, I.M. Sigal *J. Math. Phys* **52** no. 9, 092201, 2011.