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Relaxation in a System of Two Harmonic Oscillators ANTONIA CHIMONIDOU — In quantum information, one is often interested in a physical system C, composed of two quantum subsystems A and B, interacting through some external interaction Hamiltonian. We are interested in how the interaction Hamiltonian forces the two subsystems to relax when in contact with each other. Entanglement between two initially uncoupled subsystems leads to the exchange of quantities such as purity or polarization, or for thermodynamical systems, temperature. We would like to understand the process by which this exchange occurs. Starting from the initial density matrices of the two subsystems, it is possible to calculate the corresponding time-evolved density matrices of the subsystems at some future time, by taking partial trace of the density matrix describing the complete interacting system. In this poster, we present the mechanisms which generate relaxation of a bipartite system composed of two harmonic oscillators A and B. Both the systems A and B are initially at equilibrium at temperatures T1 and T2 respectively, and are assumed to be uncoupled. We apply a general interaction Hamiltonian for some time interval t, and study how the two subsystems evolve under this operation. After successive application of the interaction Hamiltonian, we expect that, for each oscillator, the initial Boltzmann distribution will be replaced by another Boltzmann distribution at a new equilibrium temperature. We calculate this new temperature by numerical methods.

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