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Sympathetic cooling of a atom in a transported trap via super-fluid immersion, preserving quantum information DAVID HAYES, University of New Mexico, IVAN DEUTSCH, UNM TEAM — We investigate the possibility of using sympatheitic cooling via super-fluid immersion in order to suppress diabatic transitions in a system governed by a time-dependent Hamiltonian. A simple model is constructed in order to study how to store quantum information can be stored in the nuclear spin of a group-II atom that is trapped in a harmonic oscillator, while it is traveling at a constant velocity inside of a stationary BEC. While the motion of the trap acts to heat the atom in the trap to higher vibrational levels, the motion of the trapped atom creates excitations in the BEC and carries the energy away in the form of phonons and decreases the effective heating. Quantum information is preserved as the nuclear spin is decoupled from all other degrees of freedom.

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