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Cold Atom Cloud Evolution in Optical Tunnels[1] N. CHATTRAPIBAN, I.V. ARAKELYAN, S. MITRA, W.T. HILL, III, University of Maryland — An optical tunnel is a basic element upon which networks and circuits (e.g., SQUIDS, transmission lines, etc.) for ultra-cold neutral atoms can be built. Optical tunnels can be formed with light tuned blue or red of strong transitions, typically involving ground state atoms. For these elements to be useful, negative influences, particularly those related to decoherence, must be nonexistence. We have investigated some aspects of the cloud-tunnel dynamics. Specifically, we have monitored cloud evolution quantitatively and modeled its dynamics in steady-state with Boltzmann's equation. We find that by an appropriate adjustment of the tunnel potential relative to the cloud temperature, significant transverse cooling of the cloud is possible; a reduction in the temperature by a factor of 10 was observed. This leads to a very directional cloud of atoms with a density distribution across the tunnel that has a small curvature, which may be useful in atom interferometry. These and other results will be presented.

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Wendell T. Hill, III
University of Maryland

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