1032-78-174 **M Saffman*** (msaffman@wisc.edu), Department of Physics, University of Wisconsin, 1150 University Avenue, Madison, WI 53706. *Nonlocal beam propagation in hot and cold atomic vapors.*

We discuss beam propagation in atomic vapors in the presence of a nonlocal atomic response. In hot vapors nonlocality is due to ballistic transport of optically excited atoms. We show that the nonlocality stabilizes the propagation of vortex beams and higher order modes in the presence of a self-focusing nonlinearity. Numerical experiments demonstrate stable propagation of higher order nonlinear modes over a hundred diffraction lengths, before dissipation leads to decay of these structures.

In cold atomic vapors nonlocality arises from light induced drift and diffusion. This leads to novel collective effects including mutual focusing and modulational instability of light and atoms. We present analytical solutions for the profile of one-dimensional mutual focusing and study the growth of modulational instability. In contrast to the case of hot atomic vapors where nonlocality serves to stabilize beam propagation, the nonlocal response in cold vapors may render unstable what would otherwise be a stably propagating wave. (Received August 21, 2007)