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Trapping of atoms with a concentric cavity[1] YUN-JHIH CHEN, GEORG RAITHEL, The University of Michigan — A near-concentric cavity is the only stable, linear optical resonator with a focus at its center. The concentric configuration not only enables high circulating laser intensity at the cavity center, but also provides us with a rich variety of three-dimensional optical trapping potentials. Using shadow imaging, we have measured cold-atom area density distributions that replicate the near-perfect profiles of Hermite-Gaussian and Laguerre-Gaussian modes at the cavity center. Fluorescence images exhibit strong, stable radiation of the highly elongated atomic clouds confined in the cavity modes along the axial direction of the cavity, indicating light guiding and possibly cooperative emission in that direction. We also investigate spectroscopic shifts of Rydberg transitions in the cavity-generated optical trapping potential. In the talk, I will first review our experimental results. Then I will discuss possible applications, including adiabatic compression and Rydberg-level spectroscopy in high-intensity cavity fields and radiation guiding in dense, elongated atom clouds.

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