Abstract Submitted
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Loading of laser-cooled caesium atoms into a hollow-core fiber aided by an axicon-generated funnel beam[1] PAUL ANDERSON, SHENGXIANG LIN, BEHROOZ SEMNANI, TAEHYUN YOON, BRIAN DUONG, MICHAL BAJCSY, IQC, University of Waterloo — Laser-cooled atoms confined inside a hollow-core photonic-crystal fiber with a red detuned dipole trap guided by this optical waveguide offer an excellent platform for studies of light-matter interactions. We recently demonstrated loading of $\sim 10^4$ caesium atoms into a photonic-bandgap fiber with a $\sim 7\mu$m diameter hollow-core and their confinement inside the core with a magic wavelength ($\sim$935nm) dipole trap [1]. This experiment used the potential created by the trap beam exiting the fiber tip and expanding in free space to guide the atoms from a free-falling laser-cooled cloud into the fiber core. However, the loading efficiency in this approach is relatively low and highly sensitive to the alignment of the falling atom cloud with the fiber. Here, we present the results of an enhanced loading procedure using a blue-detuned hollow-beam formed with a pair of axions to create a funnel-shaped potential, which robustly guides the falling atoms towards the fiber tip. This guiding further improves the loading efficiency by allowing us more freedom to optimize our initial cooling procedure. [1] T. Yoon and M. Bajcsy, arXiv:1812.02887 (2018)

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