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High resolution spectroscopy of Rb atoms in hollow-core fibers
AARON SLEPKOV, VIVEK VENKATARAMAN, AMAR BHAGWAT, PABLO LONDERO, ALEXANDER GAETA, School of Applied and Engineering Physics, Cornell University — Recent demonstrations of light-matter interaction with atoms and molecules confined to hollow waveguides offer great promise to ultralow-light-level applications. The use of waveguides allows for tight optical confinement and orders of magnitude increases in interaction lengths. However, the combination of strong atom-photon interactions and nonuniformity of guided light modes gives rise to spectroscopic features that must be completely understood in order to take full advantage of the properties of such systems. We use light-induced atomic desorption to generate an optically-dense Rb vapor at room temperature inside the 6-μm core of a hollow-core photonic bandgap fiber. Saturable absorption spectroscopy elucidates large ac-Stark shifts, and the substantial power and transit-time broadening that occurs in this system. These effects persist at nW powers and thus provide a limit on the achievable linewidths.

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