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A fully-integrated single-photon source based on single Rb atoms GARRETT HICKMAN, CECILIA VOLLBRECHT, BRANDON MEHLEN-BACHER, ZHAONING YU, YUZHE XIAO, RANDALL GOLDSMITH, MIKHAIL KATS, MARK SAFFMAN, University of Wisconsin-Madison — We describe recent work towards a fully-integrated single-photon source based on the use of single atoms captured from a grating magneto-optical trap (GMOT). Single Rb atoms from a fiber-coupled GMOT will be loaded into an optical dipole trap formed by light from an integrated polarization-maintaining (PM) fiber. Trapped single atoms will be excited to the $^2P_{1/2}$ state using resonant light. The resulting single-photon florescence will be collected through the same PM fiber as is used for trapping, and routed to further experiments. We describe progress towards an intermediate implementation incorporating integrated optical fibers and free space light sources. The completed, fully-integrated single-photon source will have numerous applications in quantum communications and quantum information processing, and particularly in improvement of the performance of quantum key distribution systems.

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