Abstract Submitted
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Cascaded collimator for atomic beams traveling in planar silicon devices[1] CHAO LI, XIAO CHAI, BOCHAO WEI, JEREMY YANG, ANOSH DARUWALLA, FARROKH AYAZI, CHANDRA RAMAN, Georgia Institute of Technology — We present a microfabricated planar device for thermal atomic beams production. Etched microchannels were used to create highly collimated, continuous rubidium atom beams traveling parallel to a silicon wafer surface. Precise, lithographic definition of the guiding channels allowed for shaping and tailoring the velocity distributions in entirely novel ways not possible using conventional machining. Multiple miniature beams with individually prescribed geometries were created, including collimated, focusing and diverging outputs. A new, "cascaded", multi-stage collimator was realized through a sequence of self-aligned micro capillaries. Doppler sensitive fluorescence spectroscopy, Monte Carlo and master equation simulations were performed to understand the performance of the cascaded collimator. We conclude that such cascaded design achieves 40 times better suppression of off-axis atoms emitted into large angles than conventional collimators, without deteriorating the on-axis beam brightness at all. A patent is pending (U.S. Patent Application No. 62/672,709).

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