Abstract Submitted
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Design for a compact CW atom laser ERIK POWER, GEORG RAITHEL, Department of Physics, University of Michigan — We present a design for a compact continuous-wave atom laser on a chip. A 2D spiral-shaped quadrupole guide is formed by two 0.5 mm x 0.5 mm wires carrying 5 A each embedded in a Si wafer; a 1.5 mm x 0.5 mm wire on the bottom layer carries -10 A, producing a horizontal **B**-field that pushes the guiding channel center above the chip surface. The center-to-center separation between the top wires is varied from 1.6 mm at the start of the guide to 1 mm at the end, decreasing the guide height from $\sim 500\ \mu$m to $\sim 25\ \mu$m above the surface as the atoms travel the 70 cm-long guide. The magnetic gradient of the guiding channel gradually increases from $\sim 100\ G$/cm to $\sim 930\ G$/cm. These features result in continuous surface adsorption evaporative cooling and progressive magnetic compression. Spin flip losses are mitigated by a solenoid sewn around the guide to produce a longitudinal **B**-field. ^{87}Rb atoms are gravitationally loaded into the guide. A far off-resonant light shift barrier at the end of the guide traps the atoms and allows formation of a BEC. Tuning the barrier height to create a non-zero tunneling rate equal to the loading rate completes the implementation of a CW atom laser. Two options for atom interferometry are implemented on the first-generation chip (matter-wave Fabry-Perot interferometer and guide-based Mach-Zehnder interferometer). Current construction status and challenges will be discussed, along with preliminary results.

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