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Atom number counting and cavity optomechanics on an integrated atom chip - cavity QED apparatus DANIEL BROOKS, THOMAS PURDY, THIERRY BOTTER, DAN STAMPER-KURN, UC Berkeley — We have developed an atom chip based cavity QED apparatus. Atoms have been cooled, trapped, and transported to cavities on the atom chip. The cavities, a pair of high-finesse optical resonators in the single-atom, strong-coupling regime of cavity QED, sandwich an atom waveguide on the chip. A pair of holes were micromachined through the silicon chip substrate for the optical resonators. Microfabricated thick copper wires, capable of producing magnetic traps with tight confinement, allow for atoms to be precisely positioned relative to the standing-wave cavity mode. This provides for the capability to tune the coupling between mechanical and optical degrees of freedom of the atom-cavity system. Narrow-linewidth lasers are being developed to reduce noise on cavity-trapped atoms. We will also outline the experiments we plan to pursue related to cavity optomechanics and atom number counting.

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