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An Atom Chip-Based BEC System Having High Resolution In-Trap Imaging and Dynamic Optical Projection Capability CAMERON J.E. STRAATSMA, SETH C. CALIGA, Department of Physics and JILA, University of Colorado, and NIST, EVAN A. SALIM, ColdQuanta Incorporated, DANA Z. ANDERSON, Department of Physics and JILA, University of Colorado, and NIST —
We present an Rb87 BEC system based on a glass and silicon atom chip that enables high-resolution (NA = 0.6) in-trap imaging of a hybrid magnetic and optical trap. Atoms can be condensed and tightly confined in a magnetic trap established with on-chip wires, while an optical projection system is used to impose optical potentials. The optical potentials are produced using blue-detuned light modulated by a two-dimensional acousto-optic deflector. The Fourier transform of the RF signals applied to the deflectors determines the projected optical pattern, and therefore the atoms can be subjected to a practically arbitrary two dimensional potential that has a separable Fourier transform. We have used both fluorescence and absorption techniques to image atoms. The system allows for in-trap dynamical studies, for example, observing trapped-gas behavior in response to thermal gradients and changing optical potentials. We have used this system to perform studies, described elsewhere, of an atomtronic battery and a matterwave transistor oscillator.

Dana Z. Anderson
Department of Physics and JILA, University of Colorado, and NIST

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