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Apparatus for fermion atomic clock, atom interferometry and quantum pumping experiments[1] M.K. IVORY, A. ZILTZ, J. FIELD, S. AUBIN, College of William and Mary — We present the current state of an apparatus designed to create and manipulate ultracold bosonic and fermionic Rb and K isotopes for a fermion atomic clock, atom interferometry, microwave trapping, and quantum pumping experiments. Quantum pumping is a phenomenon which can precisely control bias-less flow of single electrons in a circuit. Using ultracold atoms on atom chips, we can test theoretical predictions which have not yet been verified due to experimental difficulties in solid state systems. The apparatus design consists of a magneto-optical trap, magnetic transport system, atom chip, and optical dipole trap. We have demonstrated basic laser cooling and trapping and are working towards transport of the collected atoms to the atom chip for cooling to quantum degeneracy. Once quantum degeneracy is achieved at the chip, micro-magnetic reservoirs of ultracold atoms connected by a 1D "wire" create a circuit for various quantum pumping schemes. These schemes are also more broadly applicable to atomtronics experiments.

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