Magnetic trapping of copper and silver using buffer gas loading
NATHANIEL BRAHMS, Harvard University, BONNA NEWMAN, CORT JOHNSON, THOMAS GREYTAK, DANIEL KLEPPNER, MIT, JOHN DOYLE, Harvard University — Atomic silver and copper are magnetically trapped using buffer gas loading. Copper (Cu) is trapped in the $4s^2 S_{1/2}, m_j = 1/2$ state with lifetimes as long as 8s. Silver (Ag) is trapped in the $5s^2 S_{1/2}, m_j = 1/2$ state with lifetimes as long as 2.3 s. Lifetimes are limited by collisions with background $^3$He. Inelastic Zeeman state-changing collisions are observed between Ag and $^3$He. The ratio of transport to inelastic cross-sections for Ag-$^3$He is found to be $2.9 \pm 0.2 \times 10^6$ at 410 mK in a 4.0 T anti-Helmholtz trapping field. The spin relaxation cross-section is observed to vary with temperature as $T^{5.8 \pm 0.4}$ between 300 mK and 630 mK and vary with trap magnetic field depth as $B^{-0.9 \pm 0.2}$ between 2 T and 4 T. The transport to inelastic cross-section ratio for Cu-$^3$He collisions is found to be $8.0 \pm 0.3 \times 10^6$ at 400 mK. Comparison is made to alkali-noble gas theory, showing that additional considerations are necessary beyond the typical treatment restricted to the $s$ valence electron.