Abstract Submitted
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Efficient detection of $2^3S_1 m = 0$ states of atomic helium for improved precision measurements of helium 2^3P fine structure[1] K. KATO, H. BEICA, E.B. DAVIDSON, D.W. FITZAKERLEY, M.C. GEORGE, C.H. STORRY, A.C. VUTHA, M. WEEL, E.A. HESSELS, York University — Thermal helium 2^3S metastable atoms can be detected with near unit efficiency by the electron ejected when they strike a stainless-steel surface. However, the 2^1S atoms and UV photons created in generating the metastable beam also produce ejected electrons. We remove the 2^1S atoms from our beam using 2.06-micron photons from a dc discharge lamp to drive the 2^1S atoms to the 2^1P state (which subsequently decays to the ground state). A Stern-Gerlach magnet removes the m=-1 and m=+1 2^3S atoms. Elastic collisions with argon gas scatters the 2^3S atoms out of the initial beam path, and thus away from the direction of the UV photons. The combination of these elements allows for high-efficiency detection of 2^3S_1 m=0 atoms with very low background due to singlet atoms, UV photons or 2^3S_1 m=$\pm$1 atoms, allowing for an improved signal-to-noise ratio for precision helium fine-structure measurements.

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