

Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

A pulsed Sisyphus scheme for laser cooling of atomic hydrogen
SAIJUN WU, ROGER C. BROWN, WILLIAM D. PHILLIPS, J.V. PORTO, University of Maryland and NIST — We discuss a 3-level laser cooling scheme and its application to cooling atomic Hydrogen. In this scheme, ground state atoms are repetitively excited to a meta-stable state that is shifted and quenched by a standing wave laser, and are subsequently cooled by a Sisyphus effect. We demonstrate numerically that this cooling scheme can have a large capture velocity and can have sub-Doppler equilibrium temperatures. The scheme may be particularly useful for cooling of atomic species that require deep-UV lasers for electronic excitations. In particular, we discuss the possibility of cooling magnetically trapped hydrogen atoms from a Kelvin down to 10's of milli-Kelvin temperatures with manageable photo-ionization and spin-flip losses, using high-power 2S-3P laser light (at 656 nm) and pulsed 1S-2S 2-photon excitation (at 243 nm).

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Date submitted: 22 Jan 2010

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