

Abstract Submitted  
for the DAMOP20 Meeting of  
The American Physical Society

**$\Lambda$ -enhanced sub-Doppler cooling in a grating magneto-optical trap** DANIEL S. BARKER, ERIC B. NORRGARD, Joint Quantum Institute, University of Maryland and National Institute of Standards and Technology, College Park, MD 20742, NIKOLAI N. KLIMOV, STEPHEN ECKEL, Sensor Science Division, National Institute of Standards and Technology, Gaithersburg, MD 20899 — We report our observation of sub-Doppler cooling of lithium using a tetrahedral laser beam arrangement, which is produced by a nanofabricated diffraction grating. We are able to capture 10 % of the lithium atoms from a grating magneto-optical trap into  $\Lambda$ -enhanced  $D_1$  gray molasses. The molasses cools the captured atoms to approximately 30  $\mu\text{K}$ . In contrast to results from conventional counterpropagating beam configurations, we do not observe cooling when our optical fields are detuned from Raman resonance. Our results show that grating magneto-optical traps can serve as a robust source of cold atoms for tweezer-array and atom-chip experiments, even when the atomic species is not amenable to sub-Doppler cooling in bright optical molasses.

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Date submitted: 30 Jan 2020

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