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Progress toward the magneto-optical trapping of dysprosium SEO HO YOUN, MINGWU LU, USHNISH RAY, BENJAMIN LEV, University of Illinois at Urbana-Champaign — We present details of an apparatus intended for the magneto-optical trapping (MOT) of dysprosium, a lanthanide (rare-earth) atom with an unsurpassed magnetic moment of 10 Bohr magnetons. The laser cooling and trapping of highly magnetic atoms with complex level structure opens a new frontier for ultracold dipolar physics, atom chip microscopy, and quantum information processing. While lanthanides do not generally have closed optical transitions beneficial for laser cooling, their large magnetic moments enable magnetic confinement in a repumper-less MOT region while the excited state population recycles to the ground state; such a scheme was recently successful for the laser cooling and trapping of atomic Er [1], and Dy should be amenable to sub-μK laser cooling as well. We discuss both the UHV system—including high temperature oven, Zeeman slower, and trapping region—and the stabilized 421 nm laser system for the slower, MOT, and imaging light. [1] J. J. McClelland and J. L. Hanssen,"Laser Cooling without Repumping: A Magneto-Optical Trap for Erbium Atoms," Phys. Rev. Lett., 96, 143005 (2006).

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