Abstract Submitted
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Submillikelvin Dipolar Molecules in a Radio-Frequency Magneto-Optical Trap[1] MATTHEW STEINECKER, ERIC NORRGARD, DANIEL MCCARRON, Yale University, MICHAEL TARBUTT, Imperial College London, DAVID DEMILLE, Yale University — The rich level structures of diatomic molecules enable a wide range of experiments in ultracold chemistry, precision measurement, and quantum simulation, but this same structure poses challenges in laser cooling and trapping [1,2]. Here we present a scheme for magneto-optically trapping SrF molecules by rapidly and synchronously reversing the trapping laser polarizations and the applied magnetic field gradient to destabilize optical dark states [3]. We achieve trapping of SrF at temperatures one order of magnitude lower and phase-space densities 3 orders of magnitude higher than obtained previously with laser-cooled molecules. The number of molecules and trap lifetime are also improved by loading the trap with high laser power and then reducing the power for long-term trapping. With this procedure, temperatures as low as 400 μK are achieved. We are currently pursuing several approaches to increase the phase-space density of the trapped sample, including applying sub-Doppler cooling and improving the efficiency of the laser slowing stage, prior to loading the molecules into a conservative trap. [1] J. F. Barry *et al.*, *Nature* **512**, 286–289 (2014). [2] D. J. McCarron *et al.*, *New J. Phys.* **17**, 035014 (2015). [3] E. B. Norrgard *et al.*, arXiv:1511.00930, to appear in *Phys. Rev. Lett.*

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