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Toward Laser Cooling of CaF BOERGE HEMMERLING, GARRETT DRAYNA, EUNMI CHAE, AAKASH RAVI, HSIN-I LU, Department of Physics, Harvard University and Harvard-MIT Center for Ultracold Atoms, MARK YEO, MATTHEW T. HUMMON, ALEJANDRA COLLOPY, BENJAMIN K. STUHL, JUN YE, JILA, National Institute of Standards and Technology and Department of Physics, University of Colorado, Boulder, CO, JOHN M. DOYLE, Department of Physics, Harvard University and Harvard-MIT Center for Ultracold Atoms, Cambridge, MA — The prospects of novel physics employing polar cold molecules encompass quantum computing and simulations, controlled ultra-cold chemistry and precision measurements. However, a method liable to bring a general class of chemically diverse molecules to the ultracold regime still needs to be developed. We report on the progress of experiments to laser cool CaF molecules, including the implementation of a magneto-optical trap (MOT). We use a 2-stage buffer-gas cooled beam source to produce a cold and slow beam of particles [1]. In this experiment, we plan to load the trap from this buffer-gas source. As a precursor to working with CaF, we successfully implemented the first buffer-gas loaded MOT of Yb, without the use of a Zeeman slower, but using only a non-chirped slowing laser. The lifetime of the MOT was measured to be $> 100\,\mathrm{ms}$, with the distance between the source and the MOT $\sim 30\,\mathrm{cm}$. We describe a scheme for the laser cooling and magneto-optical confinement of CaF molecules, following an approach similar to those used in the cooling of SrF and YO [2,3].
[1] N.R. Hutzler, et al., Chem. Rev. 112, 4803 (2012). 2. E.F. Shuman, et al., Nature 467, 820 (2010). 3. M.T. Hummon, et al., arXiv:1209.4069 (2012)

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