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**Laser Cooling and Optical Trapping of CaF Molecules**

LAWRENCE CHEUK, Harvard University

In the past decades, advances in control of atoms have led to their use in many diverse areas, ranging from precision measurement and optical clocks to quantum information and quantum simulation of strongly correlated systems. With their rich internal structure, molecules promise to offer much more. Nevertheless, control of molecules is much more challenging precisely because of the many new internal degrees of freedom. In this talk, I will report on recent progress in direct cooling and trapping of CaF molecules. Starting from a buffer gas source, we have created cold, dense samples of CaF in a 3D magneto-optical trap. Further cooling using a gray molasses scheme brings these molecules well below the Doppler limit, allowing us to directly load molecules into an optical dipole trap - an ideal starting point for future experiments.