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Progress towards laser-cooled CH molecules LUCAS RAILING, JAMIE SHAW, DANIEL MCCARRON, University of Connecticut — We present an experimental effort to extend newly developed molecular laser cooling and trapping techniques to produce ultracold samples of CH radicals. Our approach uses two complementary techniques to apply significant optical forces to slow, cool and trap a beam of CH molecules from a cryogenic buffer gas beam source. The first uses intense bichromatic laser light on the $X^2\Pi$-$A^2\Delta$ transition to apply coherent stimulated forces to initially deflect and then slow the molecular beam. The second uses the radiative force from optical cycling on the $X^2\Pi$-$B^2\Sigma^-$ electronic transition for laser cooling and trapping. We project that the bichromatic force will be up to 50 times larger than the maximum radiative force while also reducing the spontaneous emission rate by a factor of two. The proposed optical cycling schemes for CH rely on established techniques previously demonstrated using other molecular species. CH molecules offer favorable properties for laser cooling and will ultimately provide access to tests of ultracold organic chemistry using a simple molecular species. This simplicity will enable future comparisons to calculations by quantum chemists.

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