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Laser cooling and trapping with optical frequency combs ANDREW JAYICH, XUEPING LONG, ANTHONY RANSFORD, ANNA WANG, WESLEY CAMPBELL, Univ of California - Los Angeles — A large number of atoms and molecules are difficult to control with continuous wave lasers because generating sufficient power at all of the necessary wavelengths is technologically challenging. Mode-locked lasers, through their enhanced efficiency of nonlinear frequency conversion, provide some of these hard to access wavelengths. As a step towards control of exotic atoms and molecules we report on laser cooling and trapping of atoms using an optical frequency comb in two different regimes. Using a single comb, we have created a simultaneous dual-species (isotopes) MOT, demonstrating that multiple comb teeth can be used in parallel to cool and confine species requiring many cw lasers. Separately, we demonstrate comb-based laser cooling on a two-photon transition, which efficiently uses the full time-averaged optical power of the entire comb [1]. Our progress toward extending this to include trapping by making a MOT using this two-photon transition is presented. This work is supported by the National Science Foundation.

[1] D. Kielpinski, Phys. Rev. A 73, 063407 (2006)

Andrew Jayich
Univ of California - Los Angeles

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