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Cooling single ions with an optical frequency comb ANTHONY RANSFORD, MICHAEL IP, XUEPING LONG, CONRAD ROMAN, UCLA, ANDREW JAYICH, UCSB, WESLEY CAMPBELL, UCLA — Laser cooled ions have become indispensable tools in a host of atomic clocks and quantum information systems. The vast majority of these ion species, however, have cooling transitions in the UV that are difficult to access with continuous wave (CW) lasers. Mode locked (ML) lasers, due to their high instantaneous intensities, can be frequency multiplied to deep UV efficiently without the need for the complex machinery of CW frequency multiplication systems. While large bandwidth is the hallmark of ML lasers, their spectra also have sufficiently narrow features to make them useful for laser Doppler cooling with performance similar to more complex CW systems. We have demonstrated control of a single 174 Yb+ ion's temperature with a frequency doubled optical frequency comb, including single and multiple comb tooth effects, with a scattering rate high enough to rival the performance of CW systems. This work is supported by the US Army Research Office.

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