

Abstract Submitted
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A diode laser system for sideband cooling of Sr⁺ KENNETH BROWN, Department of Chemistry, Georgia Institute of Technology, JAROSLAW LABAZIEWICZ, PHILIP RICHERME, ISAAC CHUANG, Center for Ultracold Atoms, Massachusetts Institute of Technology — Sideband cooling is performed on the 5S_{1/2} to 4D_{5/2} line of Sr⁺ in an RF Paul trap using a diode laser system in which the linewidth is reduced by optical feedback and the frequency is stabilized to the ion. The diode laser system uses optical feedback from a filter cavity to narrow the linewidth of an external cavity diode laser to ≤ 30 kHz.¹ The frequencies of the sideband cooling (674 nm) and Doppler cooling (422 nm) lasers are stabilized by performing a shelving experiment on the 5S_{1/2} to 4D_{5/2} carrier transition. This stabilization feedback is included in the pulse sequence used for sideband cooling. Using this scheme, the axial motion is sideband cooled to an average quanta $\langle n_z \rangle \leq 0.11$ without stabilizing the lasers to a high-finesse cavity.

¹J. Labaziewicz, P. Richerme, K. R. Brown, I. L. Chuang, and K. Hayasaka, “Compact, filtered diode laser system for precision spectroscopy,” *Opt. Lett.* 32, 572-574 (2007)

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