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Ground state cooling of a 2-dimensional ion array in a Penning trap[1] ELENA JORDAN, KEVIN GILMORE, NIST, Boulder, CO 80305, ATHREYA SHANKAR, ARGHAVAN SAFAVI-NAINI, MURRAY HOLLAND, JILA, NIST, and Department of Physics, University of Colorado Boulder, Boulder, Colorado 80309 USA, JOHN BOLLINGER, NIST, Boulder, CO 80305 — Trapped ion systems are a versatile platform for quantum simulations and the preparation of highly entangled states for quantum metrology. Lower ion temperatures, below the Doppler limit, close to the ground state of motion can substantially improve the fidelity of quantum simulations and state preparation. We implement electromagnetically induced transparency (EIT) cooling for the transverse drumhead modes of a 2-dimensional array of up to hundreds of Be^+ ions in a Penning trap. For the temperature readout, we employ a spin-dependent force to couple the drumhead modes to the valence electron spin, and detect the motion-induced spin dephasing. Here we present the results of our cooling experiments and show that average motional quantum numbers of $\bar{n} < 1$ can be reached within a few hundred μs.

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