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[431] Laser cooling and shuttling of trapped ions in strongly inhomogeneous magnetic fields

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We demonstrate laser-cooling of Ca+ ions confined in a segmented linear Paul trap and in presence of a strongly inhomogeneous magnetic field. We show that by employing two cooling lasers with properly adjusted wavelengths and polarizations, the trapped ions can efficiently be cooled to millikelvin temperatures despite strong position-dependent Zeeman shifts. The experimental results are complemented by a theoretical analysis. We further demonstrate successful shuttling of the ions through these magnetic field gradients.

These experiments pave the way for studying cold collisions and reactions between ions and neutral molecules in hybrid traps composed of a Paul trap and a magnetic trap.

Theoretical Work

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