Atomic photoexcitation by twisted light

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Photoexcitation with twisted light, *i.e.*, by a vortex light field that carries orbital angular momentum, excites atoms with quantum number transitions not possible with plane wave photons. Experiments have observed single trapped Calcium ions that serve as a localized and precisely positioned probe of the exciting field, and have observed the relative strengths of different transitions, depending on the ion's transverse position with respect to the center of the vortex light field [1, 2]. We calculate transition amplitudes initiated by a twisted light field using Bessel beam and other formalisms, and will show that the experimentally obtained transition amplitudes and the theoretical predictions agree at a level of better than 3% [2]. We will propose ideas to enhance the sensing accuracy of vortex modes in future experiments.

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[1] Christian T. Schmiegelow, Jonas Schulz, Henning Kaufmann, Thomas Ruster, Ulrich G. Poschinger, Ferdinand Schmidt-Kaler, Nature Communications **7** (2016) 12998.
[2] Andrei Afanasev, Carl E. Carlson, Christian T. Schmiegelow, Jonas Schulz, Ferdinand Schmidt-Kaler, and Maria Solyanik, New J. Phys. **20** (2018) 023032.