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Voltage-controlled spin mechanics
A tribute to Wróblewski and Olszewski
The Single-Atom Transistor
Physics in daily life: muddy cyclists
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The degree of anisotropy in bead packs is a structural measure that shows a clear signature of both the transition from mechanically unstable to stable configurations ('jamming') and of the onset of partial crystallisation at the random close packing limit. This suggests that the degree of anisotropy may be an order parameter for granular systems.

The local anisotropy of packing of *isotropic* particles may also explain the properties of packing of *anisotropic* particles. If generic packing considerations imply locally anisotropic environments it is a simple leap to assume that anisotropic particles can make more efficient use of this anisotropic space. Indeed, the hypothetical substitution of the bead positions with ellipsoids that match the cell anisotropy gives almost non-overlapping packing with packing fractions similar to those observed experimentally.

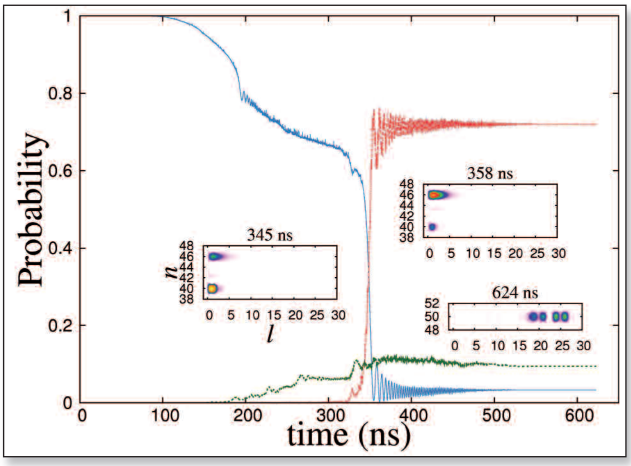
The novel *Minkowski Tensor* method to quantify anisotropy applies to arbitrary spatial structure. Code is available at www.theorie1.physik.uni-erlangen/karambola. ■

▮▮▮ **G.E. Schröder-Turk**, **W. Mickel**, **M. Schröter**, **G.W. Delaney**, **M. Saadatfar**, **T.J. Senden**, **K. Mecke** and **T. Aste**, 'Disordered spherical bead packs are anisotropic', *EPL* **90**, 34001 (2010)

ATOMIC PHYSICS

Multi-photon population transfer in a kicked Rydberg atom

Prohibitively small dipole moments connecting highly excited states of atoms are limiting factors when it comes to population transfer by absorption of a single resonant photon. Traditionally, transfer has been achieved by chirping the photon frequency to induce a series of single photon transitions, carrying the population up to the desired final state. Commonly termed ladder climbing, this method requires a wide range of frequencies to be traversed in order to reach the desired final state. A relatively new alternative technique demonstrated efficient population transfer in Li atoms by adiabatically chirping a microwave field through a multi-photon resonance connecting the two states. Following theoretical investigations showed that besides the quantum resonance picture, the physical mechanism behind the transition could alternatively be explained as a classical transition, taking place in phase space. We exploit this to achieve a significant level of population transfer in a Li atom when the atom is impulsively *kicked*. This is different than previous investigations involving kicked atoms in the sense that here we actually drive a well-defined multi-photon transition with a series of electric field impulses. We were able to achieve roughly 76% population transfer from 40p state to n=46 manifold of Li by chirping the kick frequency through a 6-photon resonance. A small fraction of the population ends up in n=50 due to an accidental 4-photon resonance. The populations just before and after the



▲ **Time evolution of the probabilities to find the atom in 40p state (blue), n=46 (red) and n=50 (green) manifolds of Li. Inserts show the probability distribution in n and l quantum numbers just before (345 ns) and after (358 ns) the transition.**

transition exhibit an angular momentum distribution that substantially resembles that of the initial p-character, which is in stark contrast with that observed using microwaves. ■

▮▮▮ **T. Topcu** and **F. Robicheaux**, 'Multi-photon population transfer in a kicked Rydberg atom: adiabatic rapid passage by separatrix crossing', *J. Phys. B: At. Mol. Opt. Phys.* **43**, 115003 (2010)

OPTICS

Artificial **multiple helices**

Polarization and electromagnetic properties in artificial multiple helix structures are investigated. It was found that increasing the numbers of helical backbones, resulting in higher values of chirality index, a unique beam splitting behaviour is observed. These split left and right circular polarized waves provide opposite refractive index broad passband, propagating within the structure with very low loss.

Circular polarization and EM responses in artificial multiple helices are investigated. Left (LCP) and right circular polarized (RCP) waves are individually launched in the same direction as ▮▮▮

▼ **Artificial multiple helices. Wave splitting, resulting from quadruple helices.**