PHYSIK

Physikalisches Kolloquium

Twisted light-matter interaction

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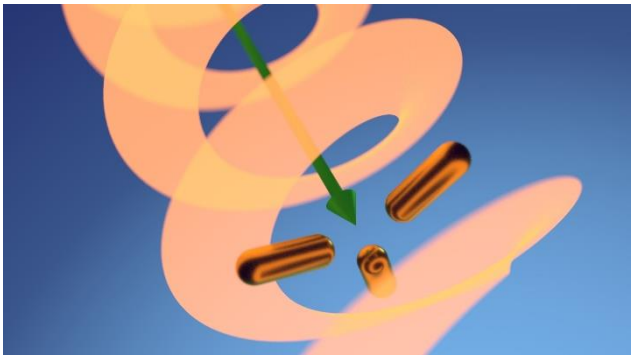
Twisted light is light with a non-trivial phase and a vortex at the beam axis. It typically has a doughnut-shape beam profile and can carry orbital angular momentum (OAM). Recently it has emerged as a new way to encode information using the phase of a light beam. When an twisted light beam interacts with matter, transitions which are dark for an excitation with plane waves can be excited and unusual effects arise.
In the first part of the talk I will address the mathematical description of the twisted light-matter interaction. After revisiting the dipole approximation, which cannot grasp the complex spatial structure of the twisted light beam, I will introduce a gauge transformation to cast the interaction Hamiltonian into a form which has the advantages of the dipole moment approximation but still accounts for the spatial structure. This can be used to excite for example unusual transitions in a semiconductor quantum dot.
In the second part of the talk I will consider the optical excitation of plasmonic structures with twisted light. Due to its spatial structure the illumination with twisted light leads to an excitation of bright and dark modes. When considering a plasmonic nano-antenna with rotationally arranged arms, this can be used to read out the OAM of the light beam. Employing stacked nano-antennas, which are also rotationally arranged, I will briefly discuss the appearance of dichroic behaviour regarding the OAM of the twisted light. Finally, I will consider Archimedean spirals made of bent gold arms, which can be utilized to generate and detect twisted light.
All examples underline the fact that twisted light-matter interaction gives rise to many interesting phenomena and that the spatial structure of both light and matter is of great importance.



Der Gast wird betreut von Herrn Prof. Dr. Aeschlimann
Gäste sind herzlich willkommen
Kaffeeausschank ab 17:00 Uhr

Montag, 24. Juni 2019, 17:15 Uhr
Gebäude 46 / Raum 46-270

TECHNISCHE UNIVERSITÄT KAISERSLAUTERN