Stuttgarter Physikalisches Kolloquium

Fachbereich Physik, Universität Stuttgart
Max-Planck-Institut für Festkörperforschung
Max-Planck-Institut für Intelligente Systeme

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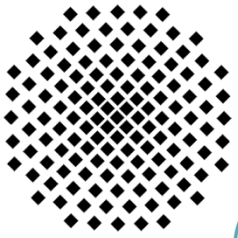

Dienstag, 3. November 2015	17:15 Uhr	Hörsaal V 57.01

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Chiral interaction of light and matter in confined geometries

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Abstract

When light is strongly transversally confined, significant local polarization components that point in the direction of propagation arise. In contrast to paraxial light fields, the corresponding intrinsic angular momentum of the light field is position-dependent - an effect referred to as spin-orbit interaction of light. Remarkably, the light's spin can even be perpendicular to the propagation direction. The interaction of emitters with such light fields leads to new and surprising effects. For example, when coupling gold nanoparticles or atoms to the evanescent field surrounding a silica nanophotonic waveguide, the intrinsic mirror symmetry of the particles' emission is broken. This allowed us to realize chiral nanophotonic interfaces in which the emission direction of light into the waveguide is controlled by the polarization of the excitation light or by the internal state of the atoms, respectively. Moreover, we employed this chiral interaction to demonstrate nonreciprocal transmission of light at the single-photon level through a silica nanofiber. The resulting optical diode is the first example of a new class of nonreciprocal nanophotonic devices which exploit the chiral interaction between quantum emitters and transversally confined photons.