Asymmetry and spin-orbit coupling of light scattered from subwavelength particles

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Light spin-orbit angular momentum (AM) coupling phenomena are receiving an increasing interest in the analysis of scattering processes from sub-wavelength objects [1]. They are of particular relevance in far-field optical imaging [2], where this coupling leads to significant shifts between the measured and actual position of particles [3], known as optical mirages for spherical scatterers [4]. Here we show that for small isotropic particles with electric and magnetic dipolar response, the angular scattering pattern of the spin-orbit coupling and optical mirage is fully determined by the (measurable) degree of circular polarization (DoCP) at a right-angle scattering [5]. We explicitly show that the maximum AM exchange, the zeros of the DoCP and the maximum optical mirage do not appear at the same scattering angle. Our results open the possibility to infer optical properties by a single measurement of the polarization in the far-field limit.

References

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