TECHNISCHE UNIVERSITÄT
IN DER KULTURHAUPTSTADT EUROPAS
CHEMNITZ

Institut für Physik
Physikalisches Kolloquium

Donnerstag, 25.06.2026, 15:30 Uhr

Ort: Reichenhainer Str. 90;
Zentrales Hörsaal- und Seminargebäude, Raum C10.013

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Information in the Structure of Light: Probing Matter Across Scales

Light is a powerful carrier of information, encoded in its spatial and spatiotemporal structure through properties such as amplitude, phase, polarization, coherence, and angular momentum. When light interacts with matter, these properties are transformed, revealing otherwise hidden information about the medium across scales. Examples range from the polarization patterns of the daylight sky, which encode the position of the sun, to the structured emission of individual fluorescent molecules, which carries information about molecular orientation and dynamics.

In this talk, we explore how both analyzing and engineering the structure of light enable new ways of probing complex, dynamic systems. At macroscopic scales, we show how the orbital angular momentum (OAM) of light, carried in optical vortices, can be exploited to retrieve microfluidic parameters in flowing droplet emulsions (Fig. 1) [1]. Further, opening the door to sensing nanoscale dynamics, we present a coherence-based framework for studying the degree of three-dimensional polarization in non-paraxial, structured light [2, 3]. Together, these examples demonstrate how encoding and decoding information in the structure of light provides new opportunities for probing and understanding complex physical systems across scales.

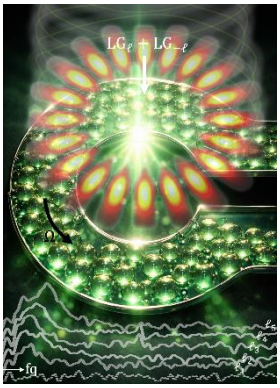

Figure 1: Conceptual illustration of OAM-based sensing of microfluidic parameters in flowing droplet emulsions. © The Authors of [1].

[1] R. Zamboni, V. Bobkova, S. Kirschke, C. Denz, C. Rosales-Guzmán, E. Otte. 'A twist on droplet microfluidics: OAM-based investigation of emulsion properties.' *Laser & Photonics Reviews* (Accepted, May 2026).

[2] A. Fallah & E. Otte, 'Structured beam-driven multipolar mode control in nanoparticles. ' *Nanophotonics* 14, 4387 (2025).

[3] S. Erdogan & E. Otte, 'Cylindrical Vector Beam Basis for 3D Degree of Polarization of Focused Light', submitted (June 2026).

Alle Zuhörer sind ab 15:15 Uhr zum Kaffee vor dem Hörsaal eingeladen.