UNIVERSITÄT DUISBURG ESSEN

PHYSIK

Physikalisches Kolloquium

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13:00 Uhr
MC 122 und Zoom

https://uni-due.zoom-x.de/j/64228670246?pwd=RjVQeFNIUkRKRkpiNVpKYXhJaFNLdz09 (gilt für alle Vorträge)

A time-resolved glimpse into nanoscopic electromagnetic near-fields and their interactions with matter

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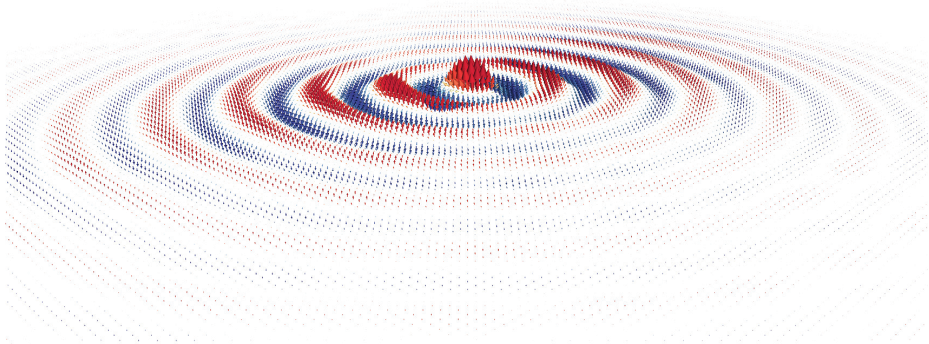

Electromagnetic near-fields are ubiquitous in solid-state physics: at surfaces, interfaces and in nanostructures, they shape fundamental dynamical processes and the optical and electronic properties of matter. By confining electromagnetic energy on subwavelength scales, near-fields enable precise control of nanoscopic light-matter interactions, opening up technological avenues for highly-efficient photonic communication, computing, and energy conversion. Despite this broad interdisciplinary relevance, until recently no experimental approach could capture the complete three dimensional vectorial structure of electromagnetic near-fields in space and time. Moreover, a profound understanding of nanoscale light–matter interactions requires combining such field metrology with direct access to the electronic excitations generated by those fields.

To address this gap, we established two novel experimental approaches during my time in Duisburg, tailored to, but not limited to, the spatio-temporal dynamics of surface plasmon polaritons. The in-house developed vector microscopy is, to our knowledge, the only method with direct access to the spatio-temporal vectorial dynamics of near-fields at surfaces, whereas time- and angle-resolved plasmoemission spectroscopy gives insights into the resulting electronic excitations. Together, these methods give an unprecedented glimpse into nanoscale light-matter interactions at the native length, momentum, time and energy scales. I will review the key milestones that led to these developments and present recent results exploring the topology of near-fields and the fundamental processes that drive their decay into hot carriers on ultrafast timescales.