

## Theoriekolloquium

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Am **18. November 2021 um 14.15 Uhr** hält

**Herr Dr. Oliver Melchert (Hannover)**

im Raum **W2 1 - 143** einen Vortrag mit dem Titel

**Accurate modeling and simulation of the dynamics of  
ultrashort optical pulses in nonlinear waveguides**

Numerical simulations build a bridge between theoretical ideas and observations in the lab. In our group "Theoretical Optics and Computational Photonics" we develop accurate and fast numerical methods for simulating light-matter interaction in small scale devices with ultrashort optical pulses. Our goals are twofold: to explore complex mathematical models, and to explain laboratory experiments.

In this talk I will first consider the nonlinear Schrödinger equation, a basic model for the slowly varying envelope of the field, and successively introduce and illustrate additional effects that provide the interaction mechanisms required for ultrashort pulse propagation simulations. I will then consider an up to date propagation model, which is especially valid for few-cycle pulses, and demonstrate its potential to reproduce and explain challenging experiments.

Finally, I will discuss our recent work on molecule-like two-color pulse compounds. They result from the nonlinear interaction between group-velocity matched optical solitons, separated by a vast frequency gap. Constituting paradigmatic examples of extreme states of light, they exhibit a strong binding-mechanism, emit dipole-like radiation, and offer intriguing insights to the atom-like features of individual solitons, including their ability to act as localized trapping potentials with a discrete level spectrum. While conditions for such bound-states of light can be realized in nonlinear waveguides, not much is known about their properties. We study these two-color pulse compounds as fundamental phenomena in nonlinear waveguides and explore their use for the all-optical manipulation of light in optical technologies.

Interessierte sind herzlich eingeladen.

gez. Prof. Dr. Alexander Hartmann