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Biography

Albrecht Lindinger has earned his PhD on helium droplet spectroscopy in Gottingen in the group of J-P Toennies and took his postdoc term in Berkeley in the group of D Neumark. He received his habilitation in the field of coherent control at the Freie Universität Berlin in the group of L Wöste and is now a lecturer (PD) in the Institute of Experimental Physics at the Freie Universität Berlin. He has published 84 peer-reviewed papers in reputed journals. His main scientific interests are laser optics, coherent control, and biophotonics.

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TAILORED LASER PULSES FOR SELECTIVE MULTIPHOTON EXCITATION AFTER OPTICAL FIBERS

In recent years ultrashort laser pulses were increasingly used for multiphoton excited imaging in biological samples. Fluorescent molecules were employed to distinguish between tissue structures and a high contrast is favorable for microscopic imaging. There to, laser pulse shaping provides a powerful tool by tailoring the pulses such that two species may selectively be excited. In particular, shaping of laser pulses is applied to exploit intrapulse interference effects in multiphoton excited fluorescence. Furthermore, laser pulse shaping is successfully used to control photo-induced molecular processes. Novel pulse shaping schemes for simultaneous phase, amplitude, and polarization control were designed recently, and a parametric sub pulse encoding was developed. Thereby, physically intuitive parameters like chirps and polarization states can be controlled. This yields new perspectives of utilizing all properties of the light field in the pulse modulation.

This contribution reports pulse shaping methods for improved multiphoton excited fluorescence contrast after transmitting a nanostructured kagome fiber. The distortions due to the optical fiber properties are precompensated to receive predefined shaped pulses at the distal end of the fiber. Special antisymmetric phase functions are employed for scans of the multiphoton excitation fluorescence. Application of phase-shaped pulses for imaging contrast enhancement is demonstrated for the auto fluorescing vitamins A and B2. Moreover, particularly phase and polarization tailored pulses are generated to optimally excite one dye in one polarization direction and simultaneously the other dye in the other polarization direction, thereby utilizing the anisotropy of the dye molecules. The presented method has a high potential for endoscopic applications due to the unique kagome fiber properties for imaging of endogenous fluorophores.

Note: