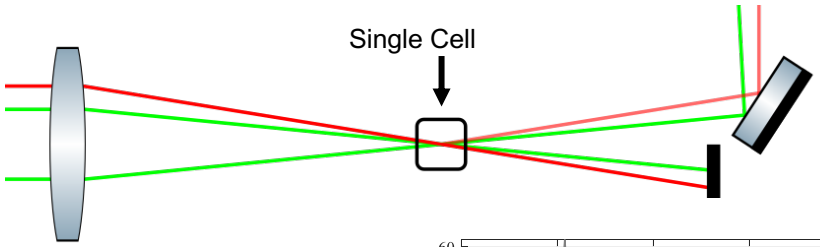
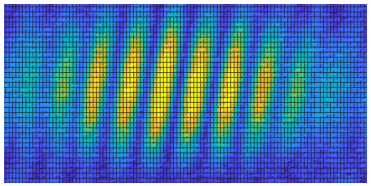
Masterthesis/Oberseminar/SHK/WHK

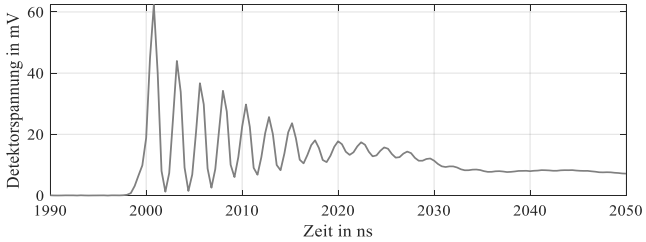
Impulsive stimulated Brillouin Microscopy

ISBS (Impulsive stimulated Brillouin Scattering) refers to the measurement of the laser beam modulated on a density grating. In this process, the crossed beam path of an fs laser is used to write a transient interference pattern into the sample. This provides a density modulation within the sample, which contains information about the sound velocity in the sample via a cw readout laser and thus allows to investigate the elasticity of living cells without direct contact.

This work will fundamentally investigate the optical setup of an ISBS microscope involving phonon-photon interaction. Exciting physical experiments should be performed on cellular resolution (using photo-detectors with 10 GHz bandwidth). A paradigm shift for medical applications can be achieved with the novel ultrafast ISBS microscope. Physics students can receive credit after successfully attending the MST upper seminar. Likewise, the topic is suitable for a thesis in the master's program in physics and for a paid job as SHK or WHK. Depending on the work, the framework of this thesis can be flexibly adapted.







Tasks

- Realization of Brillouin microscopy with high spatiotemporal resolution.
- Investigation of phonon-photon interaction
- Linking quantum mechanical and classical models
- Demonstration of functionality on animal cells (blood diagnostics)

Keywords

Bio-physical measurement techniques for cell elasticity, ultrashort laser pulses, phonon-photon interaction, damped harmonic oscillator

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