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Photoacoustic microscopy for high-resolution imaging

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Photoacoustics is a hybrid technology based on the photoacoustic effect that detects absorbed photons ultrasonically. Photoacoustic imaging combines ultrasonic resolution with high contrast due to light absorption depending on the physiology of the examined biological tissue. The resolution of conventional systems is not sufficient for in-vitro measurements of small tissue samples or individual cells.
In this work, we present a high-resolution photoacoustic microscopy platform based on the SASAM acoustic microscope that allows high resolution imaging on living cells. The system based on an inverted optical microscope consists of a laser source for optical multi wavelength excitation (diode- and solid-state-laser) which emits nanosecond laser pulses with a wavelength in the near infrared spectrum (optical window). It allows the usage of different ultrasound transducers in the frequency range up to 300MHz. In addition to the photoacoustic imaging mode, all common optical modalities are implemented. Pure acoustic imaging mode is used for reference imaging.
The developed photoacoustic microscopy platform is a system for high-quality volumetric imaging in different scanning modes. 3D offline reconstruction is possible based on the presented 2D imaging. The system was characterized by in-vitro measurements with a lateral resolution better than 100μm in the confocal mode.