EXPLORING INNER CELL STRUCTURES BY COMBINATION OF HOLOGRAPHIC OPTICAL TRAPPING AND SELF INTERFERENCE MULTI-FOCUS QUANTITATIVE PHASE MICROSCOPY

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ABSTRACT
We combined a recently developed holographic optical tweezers (HOT) system [1] that is based on a phase-only spatial light modulator with self interference digital holographic microscopy (self interference DHM) [2]. The HOT system enables flexible three-dimensional optical manipulation of particles and cells while self interference DHM provides simplified multi-focus quantitative phase imaging and 3D tracking [3]. Results from investigations on living cancer cells show that the high-precise three-dimensional manipulation of particles in cells by HOT together with accurate DHM-based 3D localization and quantitative phase imaging provides new possibilities for the label-free analysis of the intracellular morphology and investigation of photodamage.

![Figure 1: Z-localization of particles in cells by cross-sections through focus stacks of amplitude images that are obtained by numerical propagation from single self interference digital holograms. (a): Initial position of two microspheres denoted with A and B (diameter 1 µm) that were optically manipulated in living pancreatic tumor cells; (b): final position after lifting up particle B by HOT. The position of the particles is indicated by circles. The scale bar corresponds to 5 µm.](image)

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REFERENCES