LIGHT-SHEET MICROSCOPY USING SECTIONED BESSEL BEAMS AND THE STED-PRINCIPLE

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Light-sheet microscopy is an imaging technique, which features enhanced optical sectioning by using a thin, sheet-like illumination to excite fluorescence only in the plane of focus of the detection lens. The use of computer-generated holograms permits the generation of self-reconstructing sectioned Bessel beams, which show enhanced propagation stability and penetration depth in scattering media [1]. Sectioned Bessel beams possess a ring system only in those parts of the beam not intersecting with the detection cone and therefore excite intrinsically less background fluorescence and generate higher contrast images. To enhance sectioning and enable single cell volumetric imaging with isotropic resolution, stimulated emission depletion (STED) is used by superimposing a coaligned sectioned Bessel beam with a line-like intensity minimum [2, 3]. Thus, effectively thinner non-diffracting light-sheets are generated, which enable high contrast and high resolution volumetric imaging in a field of view larger than 8400 µm^2. We present first results, give an outlook and discuss the potential as well as the advantages and challenges of this particular technique.

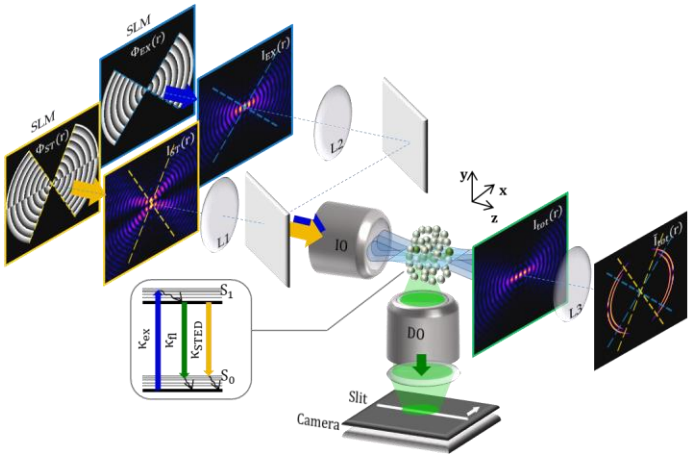

Figure 1: Exemplary phase holograms and beam profiles in a setup sketch illustrating the imaging method.

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