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Double Helix Point Spread Function, A fluorescence microscopy technique

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A fluorescence microscopy is an essential tool in the life sciences. In particular, it can be used for tracking a single molecule in a living cell or organic substance such as a polymer. Single molecule trajectory analysis allows an efficient method to explore intermolecular dynamics. Introduction of a technique named double helix point spread function enables accurate localization and orientation determination of a single fluorescent molecule in three dimensions [1]. It consists of changing the phase of the electric field of the emitter in order to make the intensity pattern sensitive to position and orientation [2]. The method uses optical Fourier processing through a 4f imaging system and a modelled phase loaded onto a spatial light modulator placed on the Fourier plane of the 4f imaging pathway [3]. The intensity pattern is changed from the conventional point spread function to a double helix point spread function. In this work, we introduce the phase mask in order to get a double helix point spread function then show results for its usefulness in fluorescence microscopy.

References
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