CHROMATIC PHASE PLATE FOR NANOSCOPY (P-1146)

Facts

•Chromatic phase plate designed for STED or RESOLFT fluorescence light microscopy
•Wavefronts of excitation light are unaffected
•Wavefronts of stimulation light over a wide range of wavelengths are shaped

Abstract

In order to achieve an ideal STED and RESOLFT fluorescence light microscopy result it is essential to generate a local intensity minimum at the focus point for stimulating or fluorescence-inhibiting light. On the other hand excitation light has to display a local intensity maximum at the focus point. Traditional chromatic waveplates are limited especially by a narrow wavelength range for the stimulating beam (typically +/- 5 nm).
The presented technology provides a chromatic phase plate that allows for a much wider (many 10nm) wavelength range that shapes the wavefronts of stimulation light, resulting in an intensity minimum at the focus point while, at the same time, extending the range of excitation light formed to a regular focus spot.

The Technology

DKFZ researcher Dr. Johann Engelhardt developed a new chromatic phase plate that contains different stacks of optical flats along a main axis. The individual stacks show no effective differences regarding optical path length for the excitation light of STED and RESOLFT microscopy, but alter the corresponding stimulation light (Figure). This design ensures an intensity minimum of a wide range of wavelengths of stimulation light at the focus point without affecting the excitation light.

Development Stage

Point spread function calculations for the systematic selection of the required glass combinations are available for desired wavelength ranges.

Applications and Commercial Opportunity

The chromatic phase plate is particularly suitable for STED or RESOLFT fluorescence light microscopy. Laser with wider wavelength ranges such as TiSa laser can be used with the chromatic phase plates presented here. A single phase plate can be used to match a number of laser lines from lasers such as RAMAN comb lasers without replacing and readjusting the system.

Inventors

The inventor is Dr. Johann Engelhardt, DKFZ Heidelberg.

Intellectual Property

The patent application “Chromatic phase plate” was filed 19.10.2015 at the EPO.

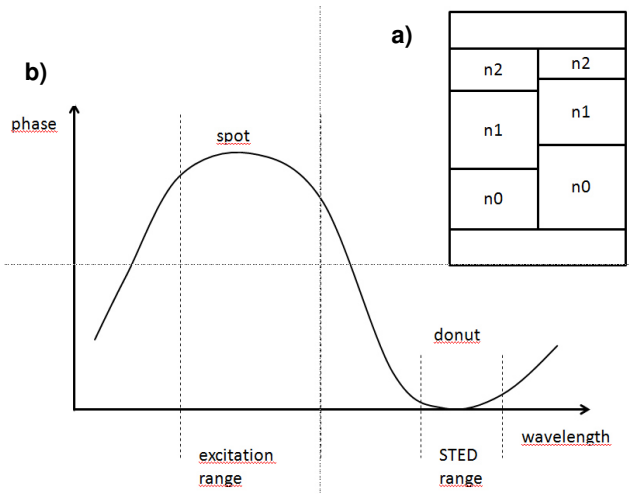

Figure: a) Side view of a phase plate example. (n0 to n3 represent distinct refractive indices of the different optical flats)
b) Graph indicating the phase difference between neighboring stacks of optical flats over the wavelength of light passing through the neighboring optical flats.

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