

Fast super-resolution microscopy based on spatial light modulation device.

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1. Introduction

Here we introduce a new microscopy system based on spatial light modulation device (SLM) to achieve parallel scanning spots to improve the scanning speed of fluorescence emission difference microscopy. Fluorescence emission differences microscopy (FED) can easily realize the effect of super resolution without considering the particular characteristics of fluorescent probes. This method, however, for its special strategy of scanning method, cannot realize very fast imaging speed. Considering the modulation flexibility of SLM, this new microscopy system, in order to achieve vivo cell imaging, fully use left and right sides of modulation area of SLM to multiply modulate excitation light to realize parallel scanning spots and overcome the speed limitation of FED.

2. Method

The basic principle of fluorescence emission difference can be described as dynamic subtraction between positive confocal image and negative confocal image. On the other hand, only one specific polarization direction of excitation light can SLM modulate. Using this particular characteristic of SLM, we firstly modulate the p polarization of excitation light in the right side of SLM and then rotate 90 degrees of the polarization direction of excitation light and modulate the rest polarization component of excitation light in the left side of SLM.

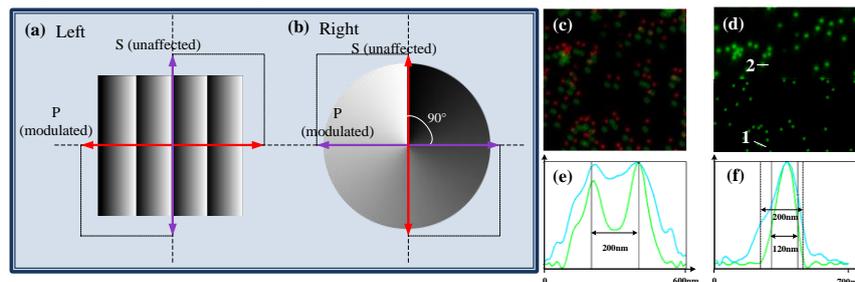


Fig 1. a, The modulation pattern in left side of SLM. b, The modulation pattern in right side of SLM. c, the superposition image scanning simultaneously by two parallel spots, the red spot is the positive confocal image and the green spot is the negative confocal image. d, the comparison of confocal image and FED image, the upper image is confocal image and the below image is FED image. e, the profile of Num.1 line shown in d. f, the profile of Num.2 line shown in d.

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