

AXIAL RESOLUTION ENHANCEMENT FOR LIGHT SHEET MICROSCOPY

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Light sheet microscopy (LSM) has the rapid development to 3D live imaging, because this technique has high-speed, low photo-bleaching and noninvasive 3D live imaging [1, 2]. LSM reduces minimally the out-of-focus excitation by employing two object lenses with optical axes orthogonal to each other separately for excitation and detection. However, there is trade-off between the thickness and the length of Gaussian light sheet. It well known that the axial resolution depends on the thickness of light sheet. In order to obtain higher axial resolution in conventional LSM, some superresolution methods which are used in confocal fluorescence microscopy have combined with LSM, such as STED [1], SIM [2], RESOLFT [3] and so on. Recently, the subtraction method is a new method to obtain superresolution in confocal fluorescence microscopy [4, 5]. In this paper, we propose the combination of the subtraction method with LSM to improve the axial resolution.

The experimental results of the fluorescence sample with size equal to $1\mu\text{m}$ for Gaussian light sheet and subtraction light sheet are shown in Fig. 1. The laser is wavelength 647nm . The sample is prepared with agarose 1.5%. The axial resolution is along z axis. As Fig. 1 shows, it is not difficult to see that the axial resolution of subtraction light sheet is higher than that of Gaussian light sheet. This means that the thinner thickness of light sheet is obtained.

In summary, we propose the combination of subtraction method with LSM to obtain thinner thickness of light sheet. The experimental results demonstrated that the proposed method can be used to improve axial resolution in LSM.

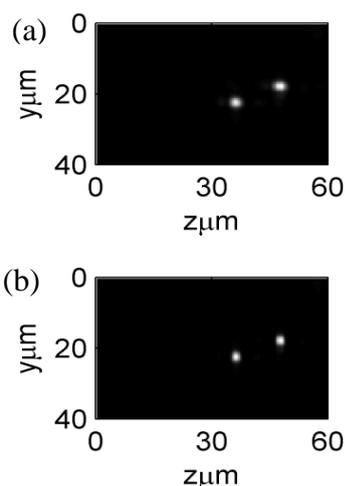


Fig. 1 Experimental results of (a) Gaussian light sheet, (b) subtraction light sheet. The axial resolution is along z axis.

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