

CONFOCAL IMAGING BASED ON CYLINDRICAL VECTOR BEAMS

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The strong dependence of high-numerical-aperture (NA) system on the polarization of light makes vector beams important and interesting for high-NA systems. Such vector beams are expected to lead to new effects and phenomena that may enhance the capability of high-NA optical systems [1]. The most famous example is the cylindrical vector beams (CVBs), which include radially polarized beam (RPB) and azimuthally polarized beam (APB). A series of seminal papers have already investigated the unique focusing properties of such beams in the presence of a single focusing lens, with or without a pupil filter [2–5], which shows the excellent focusing properties of such beams.

This talk presents the imaging characteristics of confocal microscopy using CVBs with a clear aperture or pupil filter. While RPB with an annular filter can be focused into a tighter spot and azimuthally polarized beam with vortex (APV) has a tighter focal spot with purely transverse electric field component only, we verify whether these beams indeed provide better resolution and image quality (Figure 1(b) and (d)). APB is used to test the image quality of a doughnut-shaped focal field comprising purely transverse electric field components (Figure 1(c)). The images of the large object structures are analyzed and explained by using a proposed complete model of confocal microscopy in terms of the induced currents [6,7]. It is found that RPB provides better image quality and good resolution if an appropriate pinhole size is chosen to allow the maximum signal from the z -directed dipole. This is because the detection PSF of z -directed dipole is a doughnut shape[8]. What is more, one more pupil filter is inserted into the detection path to modulate the detection point-spread function (PSF) for RPB illumination, some new phenomena can be observed based on such separated pupil filters in the illumination and detection path, which benefits to imaging application, such as super resolution imaging.

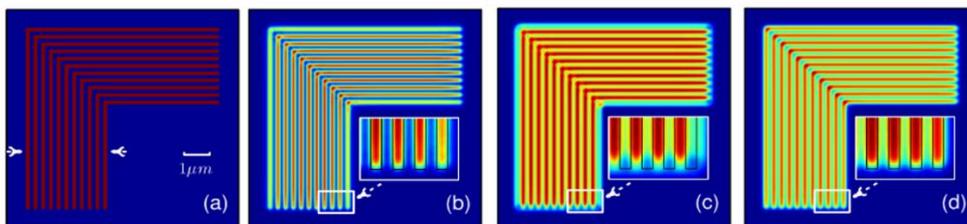


Figure 1 Confocal imaging of (a) Monitorlines using (b)RPB,(c)APB and (d) APV

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