REDUCE SPHERICAL ABERRATION IN A POLARIZED PHOTON-PAIRS
CONFOCAL LASER SCANNING MICROSCOPE

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ABSTRACT
Refractive-index mismatch produced from a specimen in a conventional confocal microscopy results in severe degradation on axial resolution of the sectioning image. In this study, we propose the theory of spherical aberration reduction of a polarized photon-pairs confocal laser scanning microscope (PCLSM) in which a two-frequency paired polarized laser beam is used. The common-path configuration of the PCLSM integrated with optical heterodyne detection is able to reduce the spherical aberration in a specimen. Therefore, the axial resolution and the lateral resolution of the sectioning image are improved. In our experiments, we study the axial response of the PCLSM in which an oil-immersion objective is adopted and compare the results with that of a conventional confocal microscope. Finally, the ability of PCLSM which can decrease the spherical aberration associated with polarization gating, spatial coherence gating and spatial filtering gating is discussed.