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Research Article

Development of a Confocal Optical System Design for Molecular Imaging Applications of Biochip

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Abstract

A novel confocal optical system design and a dual laser confocal scanner have been developed to meet the requirements of highly sensitive detection of biomolecules on microarray chips, which is characterized by a long working distance (wd>3.0 mm), high numerical aperture (NA=0.72), and only 3 materials and 7 lenses used. This confocal optical system has a high scanning resolution, an excellent contrast and signal-to-noise ratio, and an efficiency of collected fluorescence of more than 2-fold better than that of other commercial confocal biochip scanners. The scanner is as equally good for the molecular imaging detection of enclosed biochips as for the detection of biological samples on a slide surface covered with a cover-slip glass. Some applications of gene and protein imagings using the dual laser confocal scanner are described.