MAR05-2004-000424

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

**Generation and focusing of radially polarized beams**

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Light beams with spatially homogeneous state of polarization have been extensively studied in the past. However, if one can spatially arrange the polarization of light beam purposefully and carefully, new effects that can expand the functionality and enhance the capability of the optical system are expected. One such example that has gained increasing interest recently is laser beams with radial polarization symmetry. In this talk, methods of generating and manipulating radially polarized light in free space using radial analyzer and spiral phase element are described. Realization of optical fiber modes with radial and azimuthal polarization symmetry will be presented. Simple methods of manipulating these radially polarized beams have also been developed. Radially polarized beam has very unique focusing properties when it is focused by high numerical aperture objective lens. For example, a radially polarized beam can be focused into a much tighter focus than linearly or circularly polarized light due to an extremely strong longitudinal field component. Meanwhile, this strong longitudinal field component does not contribute to the Poynting vector along the optical axis. The focusing properties of radially polarized beams can be used for three dimensional shaping of the optical focal field. With proper combination of radial polarization and azimuthal polarization, optical focal field with flattop profile can be obtained. Combined with diffractive optical phase element, it is possible to obtain optical focus with maximally homogenized field profile in both longitudinal and transversal directions. Optical bubble with dark hollow center as well as chain-like optical focal field can be generated. Finally, the applications of radially polarized beams in optical tweezers, high resolution optical microscopy and materials characterization will be discussed.